

February 19, 2009

## **A Single Network OS: Maximizing Operational Efficiency And Flexibility**

Why Cutting Costs And Supporting New  
Applications Require A Single Network Operating  
System

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



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## Executive Summary

The network is at the heart of many IT transformation projects. It's the connective tissue that's involved in all of IT, whether it's delivering new applications, enabling service to an increasingly distributed user population, or consolidating infrastructure to improve efficiency. In fact, the current economic environment has savvy IT executives refocusing on the network to achieve:

- **Efficiency.** The top overall objective is to do more with less. Although this has always been an IT mantra, new technologies and processes are enabling a leaner IT.
- **Responsiveness.** Today's climate requires high-performing applications and IT services to help with ever-changing business requirements.
- **Profitability.** Innovation and customer experience are still critical for IT to partner with the business and improve revenue-generating opportunities while still driving out costs.

But there's a problem. Most organizations are not maximizing the operational efficiency of their network. Some organizations are consolidating assets and moving to higher-performance infrastructure, but that's not enough. The enterprise can either choose to figure out the root cause of a problem and address it, or sit on the sidelines and continue to suffer through the network as an operational bottleneck.

To ensure that companies maximize IT efficiency, Forrester Consulting recommends architecting the network as a strategic *platform*. Invest not only in your network hardware and software, but also focus on the critical nature of the network operating system (OS) in particular. The network OS refers to the software that runs your core (data center) and edge (aggregation, access, and wiring closet) routers and switches. The network OS is responsible for driving the operational efficiency and ensuring that your network is aligned with business and IT objectives. To do so, Forrester recommends three steps:

1. **Build your business case on more than just capex.** Connect the network to your own business and IT objectives by building a business case that focuses on both technical and financial justifications. But to ensure a faster return on investment (ROI) that will pass muster with your CFO, place the emphasis on operational expenditure (opex) and not just capital expenditure (capex). Select a vendor with the right network OS, which cuts the operational costs that account for about \$0.70 out of every dollar spent in IT.
2. **Standardize your network — but focus on the number of versions of network OSes.** Organizations are aggressively standardizing network components in order to cut costs. The key, however, is to make sure you don't just select a single vendor. You need to go deeper and make sure you are implementing a single network OS that scales across your entire network infrastructure. This is the most critical step in demonstrating an ROI for your business case.
3. **Go beyond just the network.** What else can you consolidate with the right network foundation? Once you've built a solid foundation with a single network OS, you can begin to tackle critical architectural initiatives that will further improve responsiveness and decrease costs. Leading organizations we talked to use a single network OS to:
  - Collapse data center tiers.
  - Push virtualization further into servers, storage, and desktops.
  - Deploy new applications and services without rewiring the enterprise.

## Business And IT Objectives Shift To Efficiency

As we enter 2009, business and IT investment priorities and overall objectives have shifted. Organizations have always looked to IT to bring efficiency to the business, but in tough economic times, IT must find yet more efficiency as organizations look to further streamline operations, improve profitability, and maximize revenue. However, the current environment is unlike other downturns we've seen. Gone are the days of cutting IT to the bone. Unlike previous downturns, companies will:

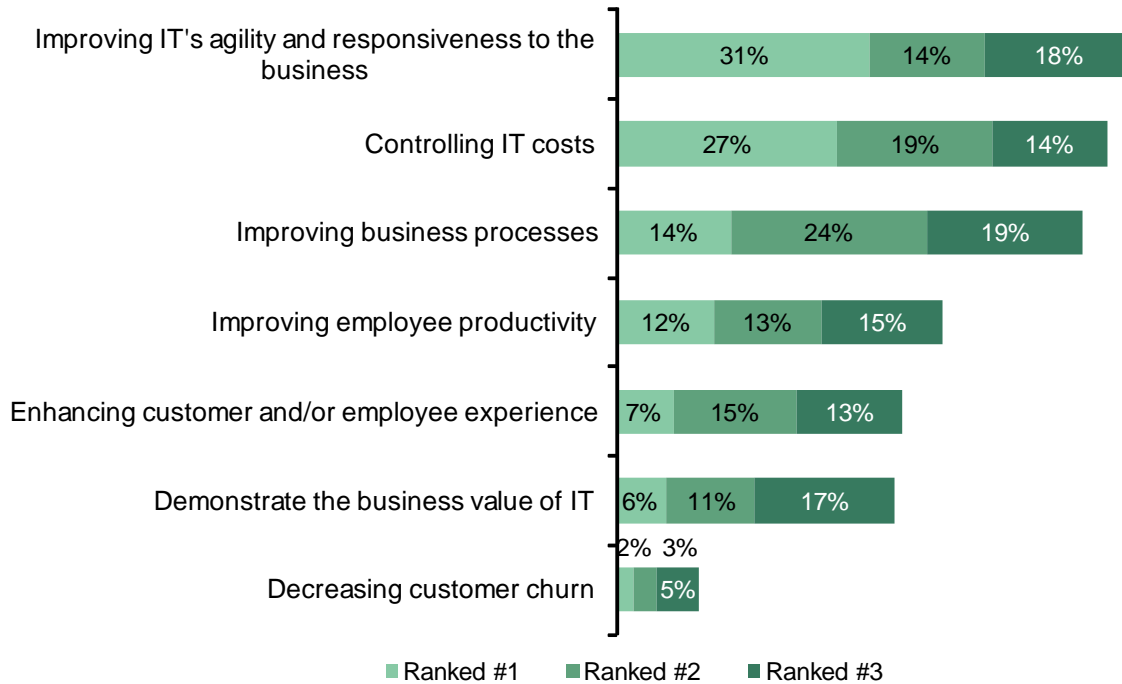
- **Move beyond slash-and-burn approaches.** CEOs and CIOs alike realize they can't cut the IT budget too much without harming business operations.
- **Avoid punitive outsourcing.** IT organizations will shy away from signing large, 10-year outsourcing deals where the entire infrastructure is handed over to a service provider.
- **Turn to IT to improve top and bottom lines.** IT is evolving into business technology (BT) and is now an intimate part of the business fabric.<sup>1</sup>

As part of a study commissioned by Juniper Networks and conducted by Forrester Consulting, Forrester asked 206 senior-level IT decision-makers to tell us about their top business and IT initiatives. Today's savvy CIO is not looking to just cut costs but rather to find ways of improving efficiency and prioritizing projects with faster ROI. Our survey revealed (see Figure 1):

- The top business priority ranked by 31% of respondents is improving agility and responsiveness.
- Controlling costs is not far behind with 27% ranking it a top priority.
- Improving business process is a distant third with 14% ranking it No. 1.

Figure 1: Improving Responsiveness Is IT's Top Business Objective

“Which of the following are business goals of your organization in 2009?  
Please rank your top three.”



Base: 206 global IT decision makers

Source: Single Network Operating System Study, a commissioned study conducted by Forrester Consulting on behalf of Juniper Networks, January 2009

## Today's IT Department Is Well Aligned To Meet 2009's Challenges

While the focus on agility as the top priority has recently skyrocketed to prominence in light of economic uncertainty, the IT decision-makers we surveyed are well suited to meet the challenges ahead. The top three IT initiatives map directly to the business objectives that senior IT execs must enable. Specifically, we found (see Figure 2):

- Nearly a quarter of respondents rank investing in the network as the top IT priority.** The No. 1 IT initiative is to improve network performance to better service users and applications. This is directly mapped to IT's ability to be more agile and responsive, as well as directly impacts user productivity. In previous years, we've seen organizations invest in services-oriented architectures, new application platforms, and collaboration tools to increase agility. But organizations are becoming increasingly distributed, and IT must deliver applications and services to employees, customers, and partners across the globe. The network ensures that these investments are maximized with speedy delivery of IT services.
- Close behind at 22% is implementing consolidation and virtualization.** Second on the overall IT initiatives list, with 22% ranking it as a top priority, is reducing network and data center costs via consolidation and virtualization. Over the past 18 to 24 months, we've seen

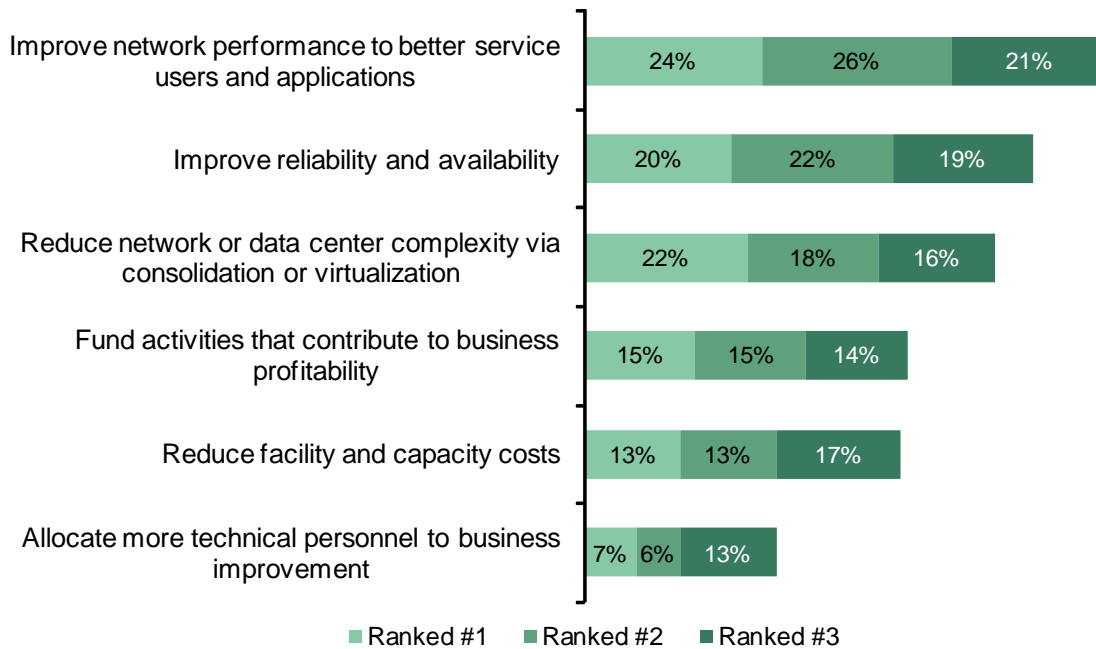
organizations successfully cut 50% of their server hardware costs by implementing virtualization.<sup>2</sup> Moreover, virtualization enables new levels of data center consolidation in the server, storage, and network tiers that can lead to additional opex and capex savings. By decreasing data center complexity, organizations can demonstrate immediate cost reductions and improve IT staff productivity.

- **At 20%, the third highest priority is improving reliability and availability.** IT organizations must also bolster the overall reliability and availability of IT systems. Why? Because any service outage is unacceptable to the business, but in today's economic environment, there is no room for error. Outages become catastrophic as companies maintain even tighter operating margins — and often with reduced budgets. Twenty percent of respondents rank this as a top priority, which is consistent with the pressure to both improve responsiveness and control costs. We anticipate IT companies will continue to invest in improving IT uptime as one of the top infrastructure goals in 2009.

We see that IT organizations are also looking to proactively fund technology initiatives that can improve business profitability, but this is less of a priority in the current environment. Companies are more interested in removing waste and inefficiencies, and we expect more innovative projects will rebound in 2010. Also on the list is reducing facility and capacity costs as well as allocating more technical personnel to improve the business. Again, these are critical initiatives that can impact business process, but we expect IT tactics to focus on the network, virtualization, and consolidation projects to demonstrate the best short-term wins.

**Figure 2: Companies Look To The Network As The Top Priority To Meet Business Objectives**

**“Which of the following IT objectives do you plan to prioritize in 2009 to support these business initiatives? Please rank your top three.”**



Base: 206 global IT decision makers

Source: Single Network Operating System Study, a commissioned study conducted by Forrester Consulting on behalf of Juniper Networks, January 2009

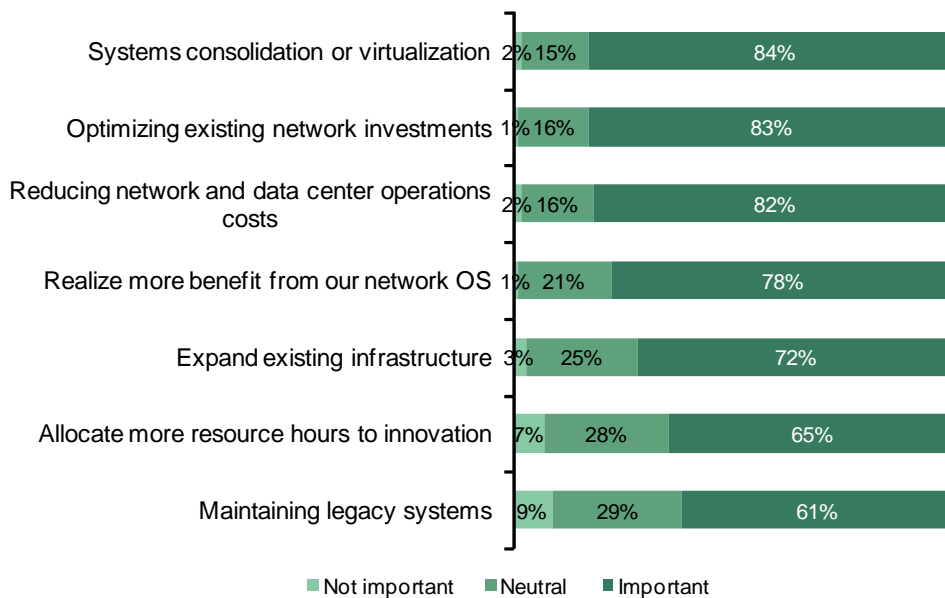
## IT Initiatives Reveal The Network As Key To Success

There are some critical steps that will help get IT priorities funded and deployed. These initiatives all share the central element of doing more with existing systems. As discussed, the addition of headcount is not a critical priority — and in many cases, likely not a reality — for many of the organizations we spoke with. In order to up the performance of the systems that support the business, IT needs to be able to better utilize the tools that it has in-house. And one particular element of the infrastructure shows up time and time again as the most critical component: the network (see Figure 3). Today’s organizations position the network as a strategic IT asset and, despite the downturn, are increasing network investment. In fact, networking equipment joins software as the two areas that will see more IT — outpacing servers, storage, and IT outsourcing services.<sup>3</sup> As a result, we see that:

- **The network shows up in three of the top four data center priorities.** The network is a critical success factor in today’s data center. Optimizing existing infrastructure, reducing operational costs, and investing in the network OS are among the top four strategies IT is using to align with business objectives.
- **Firms seek to optimize network infrastructure . . .** Eighty-three percent of respondents are looking to optimize the existing infrastructure, and 78% are looking to do so by realizing more benefits from their network OS.
- **. . . to improve the data center environment without adding labor.** We found 82% of organizations are looking to reduce network operational costs. Innovations in networking hardware, software, and OSes allow opex reductions to occur while still improving performance, reliability, and security.

**Figure 3: The Network Is Critical To Three Of The Top Four Data Center Initiatives**

“Please rate the importance of the following network and data center priorities for your organization.”



Base: 206 global IT decision makers

Source: Single Network Operating System Study, a commissioned study conducted by Forrester Consulting on behalf of Juniper Networks, January 2009

## Today's Network Is A Critical Enterprise Asset, But Organizations Face A Fourfold Challenge

The good news is that today's networks are directly aligned with supporting IT and business objectives. So it's no surprise that 79% of organizations agree the network is a strategic asset for their business. But IT managers face a series of challenges in making sure that network investments keep pace with rising expectations. Consider this:

- More than 80% of respondents agree that evaluating and tracking network costs are important.
- Yet that number drops quickly — down to 53% — for respondents who feel they have a solid grasp on how to calculate the total cost of ownership for their network.

Why the discrepancy? Because networking requirements are changing too rapidly. Organizations struggle to right-size the network to accommodate performance requirements of current applications and IT services. We uncovered four specific challenges fueling this dynamic.

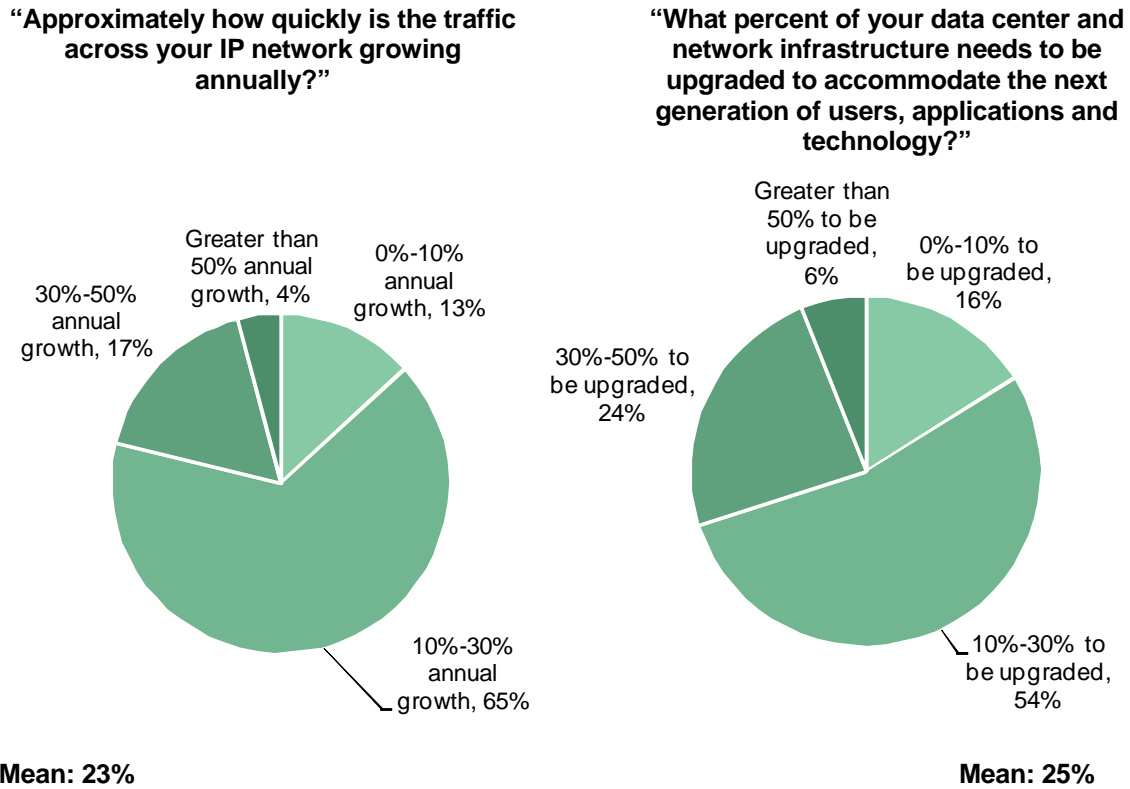
### Challenge One: Network Traffic Is Growing Quickly

Traffic is growing on networks at a record pace, thanks to SaaS, VoIP, video, and emerging cloud-based computing architectures. On average, we found that (see Figure 4):

- Traffic is, on average, growing at 23% year over year.
- At 65%, the majority of respondents are seeing a 10% to 30% increase in network traffic annually.
- Another 17% of respondents find that traffic is growing at a rate of 30% to 50% per year.

That means a gigabit of network traffic will quickly grow to 10 Gb in less than five years, and requirements are outpacing the standard network refresh time. This will have organizations aggressively moving to 10 GbE in the data center to keep up with traffic demands.

Figure 4: Traffic Growth Contributes To Firms Upgrading A Quarter Of Their Network Gear



Base: 206 global IT decision makers

Source: Single Network Operating System Study, a commissioned study conducted by Forrester Consulting on behalf of Juniper Networks, January 2009

### Challenge Two: Networks Need To Be Upgraded . . . Soon!

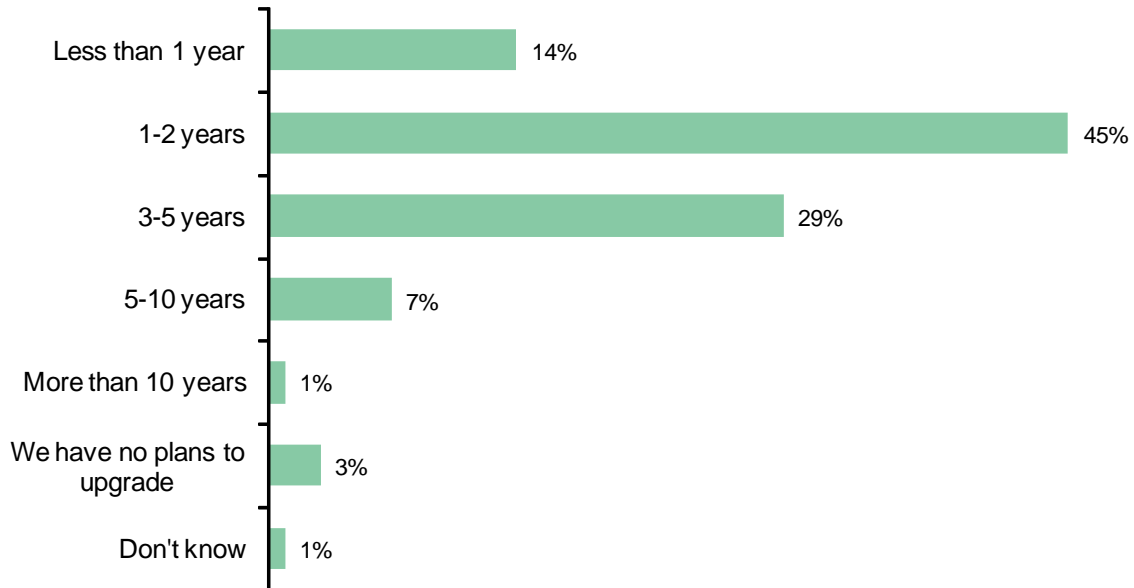
Compounding this increased stress on the network is the need to upgrade infrastructure. According to respondents (see Figure 5):

- On average, one-quarter of network infrastructure is due for an upgrade.
- More than half of the respondents noted up to 30% of their network is currently in need of an upgrade.
- The combination of traffic growth and aging gear leads 45% of respondents noting that upgrades will take place within one to two years.

This is consistent with other findings we've seen over the past 12 months, where standard network refresh plays a part. A lot of new networking gear was brought in-house in the 2000 to 2001 time period when organizations were flush with capital in the tech-driven boom. We saw a similar flurry of upgrades in 2005, and much of this gear will approach the end of their life cycles in 2010.

**Figure 5: Nearly Half Of Organizations Will Refresh Their Network In The Next Two Years**

**“How long will it take your organization to upgrade its network infrastructure to accommodate the next generation of users, applications and technology?”**



**Mean: 2.7 years**

Base: 206 global IT decision makers

Source: Single Network Operating System Study, a commissioned study conducted by Forrester Consulting on behalf of Juniper Networks, January 2009

### **Challenge Three: Just Throwing Bandwidth At The Problem Doesn't Cut It Anymore**

The need to upgrade networks is exacerbated by the fact that many companies still struggle with the sheer magnitude of traffic growth and upgrade challenges. Moving forward, a network upgrade does not mean just building bigger pipes. In short, bandwidth is necessary but not sufficient. Instead, high-performance networks that minimize latency, decrease packet loss, and prioritize mission-critical traffic are required. The primary driver will be the explosion in SaaS, the convergence of voice and video communication, IP-based storage, and a much heavier reliance on other real-time Web-based and network-based traffic. In fact (see Figure 6):

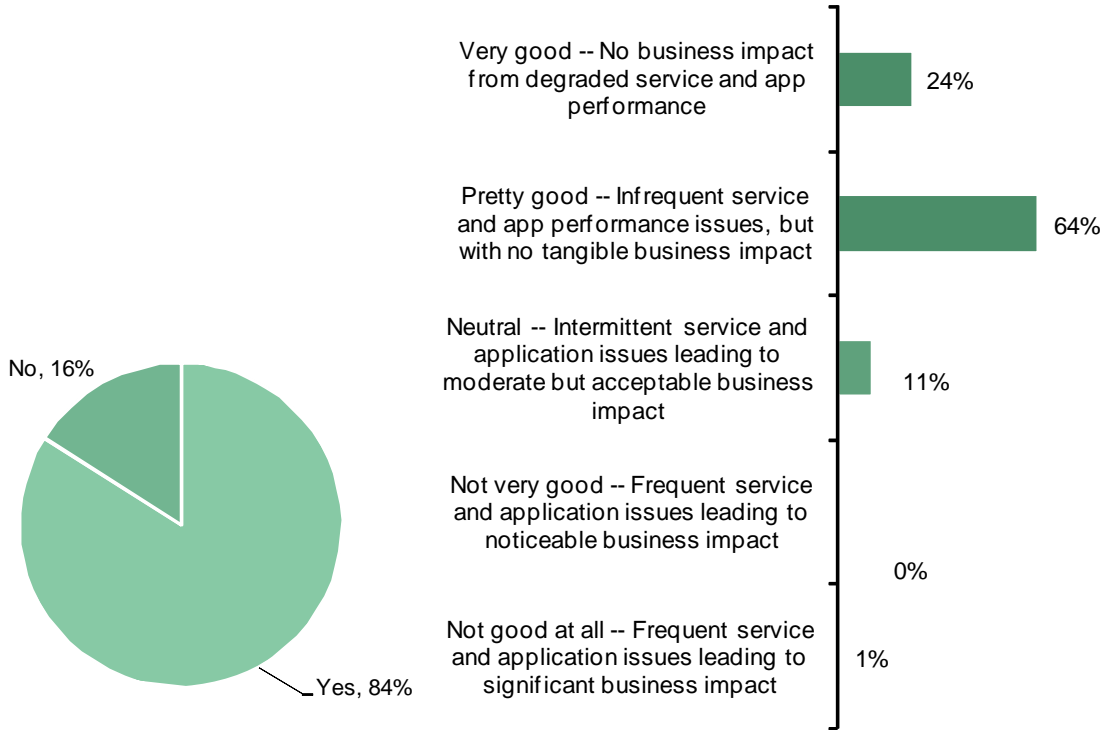
- An astounding 84% of the organizations we spoke to are already running these real-time applications on their IP networks.
- But only a quarter of organizations claimed they have no service interruptions in their network.
- The remaining 75% have some level of service interruption and varying degrees of business impact.

Low-performing networks are a leading contributor to service interruptions and application delivery issues, which in turn lead to lower employee efficiency and increased opex concerns.

**Figure 6: Most Companies Run Real-Time Apps . . . But Few Do So Without Interruption**

**“Does your organization run real-time applications, like Voice over IP or video conferencing over its network?”**

**“How well does your infrastructure support these real-time applications?”**



Base: 206 global IT decision makers

Base: 173 global IT decision makers whose organizations run real-time applications

Source: Single Network Operating System Study, a commissioned study conducted by Forrester Consulting on behalf of Juniper Networks, January 2009

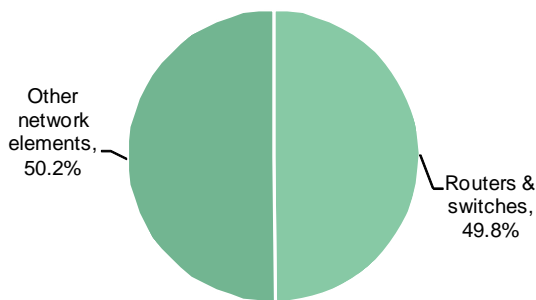
## Challenge Four: Network Operations Are Complex And Time Consuming

And finally, rounding out the current set of challenges, we found that today’s IT execs are struggling to stay on top of escalating network operations. A substantial amount of time is spent on basic infrastructure life-cycle management, whereas IT managers would rather see their network teams working on application-related issues or more proactive network design. Diving into the details, we noted that (see Figure 7):

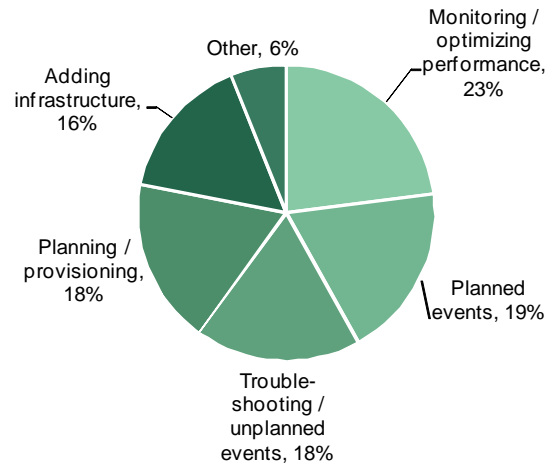
- For nearly 50% of all the network operations team, time is spent managing routers and switches.
- The time is spent evenly working on all elements of network life-cycle management.
- On average, network teams are spending approximately 20% of their time on each of the following tasks: monitoring and optimizing performance, working on planned events, troubleshooting unplanned events, provisioning, and adding infrastructure.

Figure 7: Nearly Half Of Network Operations Is Routine Router And Switch Management

“How much of your total network operations time is spent working with IP core or edge routers and switches v. other network elements?”



“For the routers and switches, what proportion of total network operations time do you spend on the following?”



Base: 206 global IT decision makers

Source: Single Network Operating System Study, a commissioned study conducted by Forrester Consulting on behalf of Juniper Networks, January 2009

## Tomorrow’s Environment Requires Standardizing Your Network Infrastructure

We know that organizations see the network as strategic to IT and business requirements, but as noted, they struggle with rapidly changing network requirements and the demand to build high-performance network infrastructure. To better understand these challenges, we asked respondents to characterize their network environment. Across the board, we found that:

- Most organizations have at least two or more vendors throughout the network.
- In the core, network companies had a mean of 2.45 vendors.
- Similarly, at the edge, the mean is a shade lower at 2.32 vendors on average.

So what does this all mean? Nothing on the surface. Every enterprise will have multiple network vendors. However, it does indicate a critical issue that underpins operational efficiency. Multiple vendors inevitably lead to multiple OSes. And for many organizations, this is made worse by the fact that vendors will often introduce multiple versions of any given OS. In other words, having an average of two vendors with the wrong underlying OS structure could easily mean that a company must manage two to three *dozen* network OS variants. In fact, we’ve come across large networks that find they have hundreds of versions of the same OS.

## Multi-Version Network OSes Are The Silent Killers Of Network Efficiency

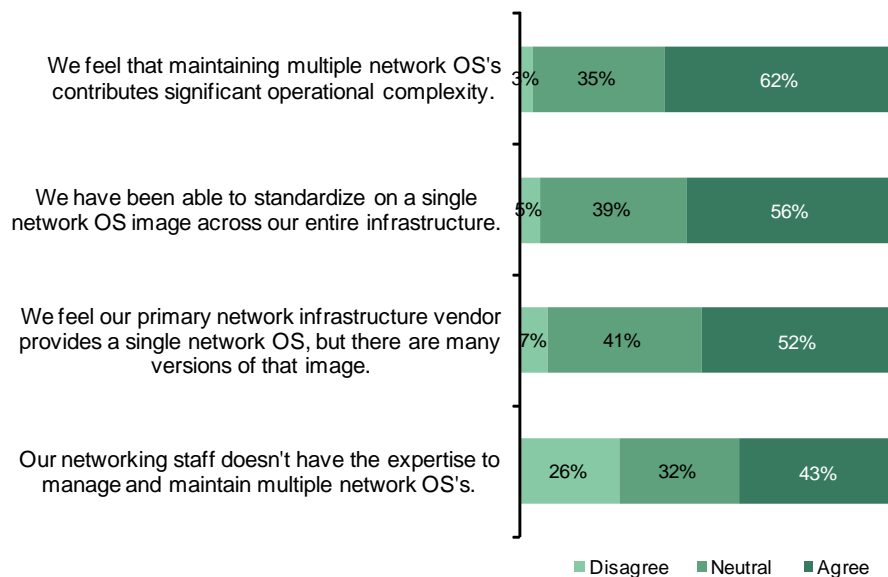
Ask any server administrator how easy it is to manage Windows, Linux, Unix, and mainframe OSes all at the same time. Unfortunately, most network operations teams face that exact challenge if they're running two to three vendors throughout their environment. As discussed above, the true killer of operational efficiency is the multi-version scenario. To better understand this, we asked companies to describe the impact of multiple network OSes on overall operations. The results were quite surprising. We found that (see Figure 8):

- **Sixty-two percent of respondents agree that multiple OSes impact efficiency.** This is consistent with our daily conversations with clients where all aspects of network management — from configuration to maintenance to optimization — are difficult to coordinate across multiple network OSes.
- **More than half of respondents claim they have a single network OS . . .** Organizations feel they have done well on standardizing on a single OS and are optimistic in the ability to tackle efficiency and interoperability woes.
- **. . . yet 52% also admit they have multiple versions of that OS.** The devils in the details, vendors define “single OS” differently. Many network vendors actually have dozens of OS variants depending on the product type (i.e., router versus switch versus security device) as well as the feature set (i.e., basic features versus advanced, which may include security or more comprehensive network protocols).

A true “single network OS” refers to an OS with a single source code base developed along a single release train.

**Figure 8: Organizations Strive To Standardize On A Single Network OS**

“Please rate your level of agreement or disagreement with the following statements.”



Base: 206 global IT decision makers

Source: Single Network Operating System Study, a commissioned study conducted by Forrester Consulting on behalf of Juniper Networks, January 2009

## Recommendations For Maximizing Efficiency

The network infrastructure is a critical component in maximizing efficiency and reducing costs. But building a strong business case hinges on selecting a vendor with a single network. We consistently hear from clients that IT investments in the current environment require a rock-solid business case. That means for your network, you must:

- Blend both technical and financial justifications.
- Consider the underlying network OS.
- Enable additional architectural capabilities.

To make sure you properly align your network with your IT and business objectives, we recommend a three-step approach.

### Step One: Build Your Business Case On More Than Just Capex

*“We chose a single network vendor to supply all of our Layer 2 and Layer 3 intelligence. Originally, we did so to improve our negotiation power and drive deeper equipment discounts. However, we quickly found that running a single OS image across the network cut the time to complete network operations tasks in half.”*

— Director of IT infrastructure for a large chemical manufacturer

Perhaps the most common mistake we see companies make is focusing their network investment business case on just capex. Consider that:

- **Opex is far more critical to compress.** Our data indicates that 70% of every IT dollar goes into maintaining and operating the IT organization, systems, and equipment.<sup>4</sup> Buying a “bigger, faster” switch will help improve capex and requires less infrastructure implementation. But as you recall from Figure 7, adding infrastructure accounts for only 16% of network operations.
- **Impacting the entire network management life cycle guarantees a faster ROI.** Selecting a vendor that improves your operational efficiency guarantees you’ll go after the additional tasks like monitoring, maintenance, provisioning, and troubleshooting.

### Step Two: Standardize Your Network — But Focus On The Number Of Versions Of Network OSes

*“In a recent network audit, we found we were running two dozen different network operating systems — and all from the same vendor.”*

— Network manager for a Fortune 500 financial services firm

It’s naive to think you can eliminate all the vendors in your network. In fact, for many of you, this may be impossible because you either a) live in a dynamic world where mergers and acquisitions will thwart homogeneity; b) have federated IT budgets that distribute purchasing authority, and not everyone agrees on a single vendor; or c) need to dual-source your network environment as part of a strategic initiative. However:

- **Create the most reliable network foundation without sacrificing flexibility.** Don't focus purely on a best-of-breed approach for all network elements. There are many advantages in streamlining your operations by picking a single vendor for most of the heavy lifting. For example, select a single switch vendor that also supplies your Layer 3 intelligence. This guarantees you can improve convergence times and flatten your network, which further improves responsiveness and controls costs. Select a specialty infrastructure player like an application delivery controller to replace an aging load balancer.
- **Push standardization efforts all the way down to the network OS level.** Ensuring that you're running a single OS across all of your routers and switches will allow you to capitalize on opex savings and validate the business case from step one. But here's the real critical success factor: make sure you are eliminating the multi-version network OS conundrum. A standardization effort at the OS level means you will focus on vendors with a single version and a single release train across all network components. Otherwise, your standardization efforts will be thwarted with the dozens of versions of the same OS that lead to operational inefficiency.

### Step Three: Go Beyond Just The Network — What Else Can You Consolidate With The Right Network Foundation?

*“Transforming my data center was easy once I realized the network was the hard part. I started off thinking I needed to just consolidate my servers, but I quickly found out that most of my waste was in an inefficient network design. After assessing my network, I quickly found that how I'd wired my servers was too complex. We consolidated the design down to fewer network tiers and drove an extra 20% of operational cost out of my environment.”*  
— CIO for a global engineering firm

If you're like other IT organizations, your network investment strategy is rather piecemeal. Even if you've invested with only one vendor, the products and components have been added slowly over time. Most companies have gone through extensive efforts to standardize server and storage environments, but few companies have focused that level of scrutiny on the network.

- **Conduct a detailed assessment of your network environment.** This will determine if you can squeeze both capital and operational costs out of the equation. Start in the data center where outdated server aggregation (e.g., blade, top-of-rack, and end-of-row switches) designs can be replaced with more efficient 10 GbE alternatives.
- **Go beyond the four walls of the data center.** The wiring closet is also a key place to further consolidate router, switch, and security devices into a single network element. And last but not least, target your branches for the most savings. Eighty percent of workers are now in remote or home offices, so consolidation of branch office network infrastructure will help improve responsiveness and control costs where you can maximize the impact on users.
- **Don't stop at just the network.** Standardizing your network will build a platform for additional consolidation. Fewer network tiers with high-performance infrastructure will enable new levels of server, storage, and desktop virtualization. Fewer moving parts will improve responsiveness, and thinking beyond the four walls of your data center will drive short-term and long-term savings.

## Appendix A: Research Methodology

In January 2009, Forrester Consulting conducted an online survey of 206 senior-level IT decision-makers and influencers. Specifically, in this survey:

- Thirty-two percent of respondents were based in the Americas, 33% in Europe, 35% in APAC, and 1% in the Middle East.
- Thirty-five percent of respondents were the senior-most IT decision-maker in the company (such as the CIO), 28% of respondents report directly to the head of IT, and 37% were managers of a team within IT.
- Respondents had a wide range of job titles.
- Ten percent of respondents worked for companies with between 250 to 499 employees, 13% for companies with between 500 to 999 employees, 32% for companies with between 1,000 to 4,999 employees, 29% work for companies with between 5,000 to 19,999 employees, and 17% work for companies of 20,000 or more employees.
- Respondents represented a broad range of industries.

## Appendix B: Endnotes

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<sup>1</sup> Every aspect of the enterprise is increasingly embodied in the technology it uses, from process-application-driven business operations to Internet-based interactions with customers and suppliers. Although today only a few enterprises recognize the implications of this trend, within five years, most will realize that this “BT” is vital to delivering business results. Enterprises will embrace the competitive potential of technology and actively manage its use. BT providers will hone offerings to enhance business results, flexibility, and configurability. See the May 7, 2007, “Business Technology Defined” report. [42338]

<sup>2</sup> By virtualizing your servers, you should experience decreased server hardware purchases and maintenance costs, lower facility costs, fewer network ports, reduced provisioning and migration costs, and fewer applications failures. More specifically, depending on their consolidation ratio, organizations are saving up to 50% on hardware costs as well as delaying new server purchases for 12 to 18 months. Server virtualization also frees up data center space that was previously occupied by mainly idle servers — which drew a great deal of power while not in use. See the September 30, 2008, “Inquiry Spotlight: Server Virtualization, Q3 2008” report. [47158]

<sup>3</sup> Our latest 2009 IT spending data shows that communication and networking will see 3% growth on a global basis. Software will see 6% growth, but computing infrastructure and IT services and sourcing will only grow at 2%. See Figure 3-2 in the January 12, 2009, “Global IT Market Outlook: 2009” report. [46676]

<sup>4</sup> Forrester refers to the amount of money dedicated to maintaining and operating the IT organization, systems, and equipment (MOOSE). In our December 2008 benchmark report, we estimated that on average, 68% of all of IT’s budget was dedicated to the MOOSE. See the December 23, 2008, “US IT Spending Benchmarks For 2008” report. [46674]