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Thought Leadership Paper
Commissioned By Huawei
Technologies

September 2013

Business Agility Starts With The Network

Deploying An Agile Campus Network Enables A Business To Maximize Value With Cloud, Mobility, And Communication Services

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Executive Summary

Cloud, virtualization, and mobility have changed what customers expect from businesses and altered the way business is now being done, which means that infrastructure and operations (I&O) teams need to optimize a set of technology or applications and a much broader set of user experiences. Compounding the infrastructure demands: 1) The new business environment has narrowed the period between change; 2) data, users, and applications are in constant motion; 3) personal and business resources are no longer separate flows within the business; and 4) now there are mobile, web, traditional, and hybrid applications traversing the network.

Data center networks needed to evolve to handle server virtualization. Current campus networking infrastructures are too rigid and old to support the orchestration of services needed to optimize a user's experience and support all the new services. In August 2013, Huawei commissioned Forrester Consulting to evaluate what enterprises needed from a campus network to support this new world of instant gratification where customers expect to get what they want, when they want it, wherever they are. Forrester Consulting surveyed 213 IT business decision-makers from enterprises across the globe and found that organizations will require an agile network to support a mobile, empowered, and dispersed workforce that is taking advantage of bring-your-own-device options, leveraging cloud services, connecting with video, and hosting virtual desktops.

KEY FINDINGS

Forrester's study yields four key findings:

Now is the time to build out an agile campus network. Whether I&O initiatives focused on consolidation or virtualizing servers, few organizations were satisfied with the results. Many of them hadn't included the network in the transformation and had to go back and refresh it to accommodate the changes. With video, virtual desktop infrastructure, and cloud services now being planned or implemented, this is the time to re-architect the next-generation network to support those services.

Networking needs to be a top priority for IT investing. Networking has typically taken a back seat to other, flashier initiatives; however, the network connects everything. Respondents indicate that cloud services and mobility, to name a couple of initiatives, will impact the network. Since those and others initiatives are on the horizon, I&O professionals should put the campus network refresh at the top of their list.

I&O needs to take new approach. Next-generation campus networks will be stressed in many of the same ways as today's. However, with the Internet of Things and users bringing multiple devices to work, the campus network will be taken past the deformation point of data center networks. Fundamentally, it isn't enough to upgrade the network with high speeds or new products. As with the data center, a completely new approach needs to be taken that unifies wired and wireless, coordinates Layer 2 through 7 services, automates and programs in the infrastructure, and interweaves the appropriate network services based on user experience.

I&O cannot rely on traditional networking capabilities. I&O organizations look for reliable, high-performing, and scalable solutions. Yet those are the least challenging aspects they have with the network. Operational costs continue to plague them. Because of the number of services, complexity of the network, and speed in which they need to deliver, networking professionals should be investing in networks that can be orchestrated and automated. Manual operations must be eliminated. A business needs to deploy a campus network that can be programmed through software: software-defined networking.

Agile Businesses Depend On Cloud, Mobility, And Communications Services

The pace of business is no longer months, days, or even hours. Whether customers are consumers or other businesses, they require immediate results. But that isn't the extent of it. The products and services also have to match that customer's requirements. The have-it-my-way and always-connected generation demands this level of immediacy. These customized services and products require a company to be as agile, dynamic, flexible, mobile, and connected as its customers. Consequently, CEOs have turned to CIOs to help transform their business into one that's agile. Fifty-three percent of respondents to our survey indicated that their infrastructure had significant impact on three areas: 1) improving workforce productivity; 2) improving customer relationships; and 3) improving business flexibility via faster time-to-market and a quicker response to changing business conditions (see Figure 1).

Business agility pushes the workforce to become:

- **Empowered.** Not only are employees bringing their own devices to work, but because the technology at home is better than the technology at work, they're bringing their own applications to work, too. These applications can be cloud-based back-up storage systems to on-line survey tools. Businesses are turning to cloud-based services as well. Survey respondents put leveraging cloud-based services such as infrastructure-as-a-service and software-as-a-service as their top priority (see Figure 2). With business resources no longer separate from personal applications, mobile, web, traditional, and hybrid applications serve needs from both business and personal across the network. Sixty-nine percent of decision-makers put cloud services as the most significant impact to their network (see Figure 3).

  What this means for your campus network. Besides the variety of access profiles that I&O professionals need to set up, mobile applications will share the network with traditional business applications and mobile applications. Thus, IP addresses and TCP/UDP port numbers won't give you sufficient information to apply policies to traffic. Policies and optimization can't just start at the WAN edge. Like total quality management principles, policies and optimization must be embedded throughout the WAN edge through the campus network — from the virtual machine port all the way to the client port.

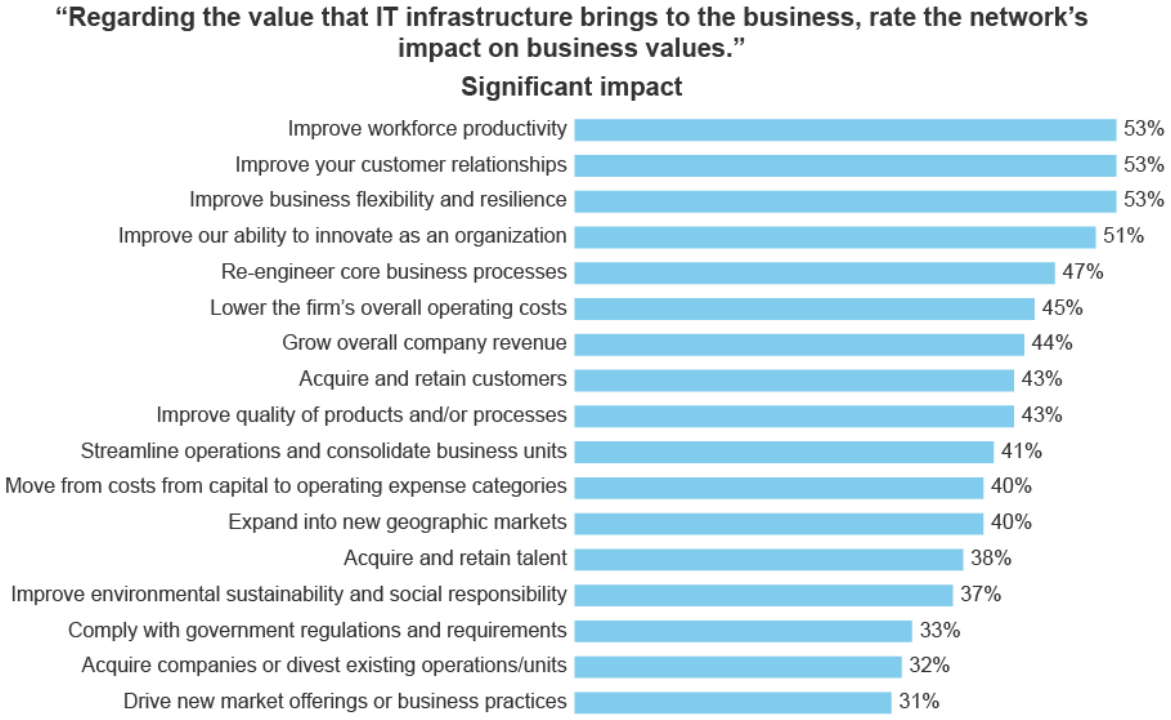
- **Mobile.** More and more consumer devices walk through the door every day; employees are choosing to do their work on iPads, Android smartphones, and personal laptops. Application developers recognized this phenomenon and responded with a deluge of mobile applications.

  What this means for your campus network. Typical wireless deployments weren't designed for the new loads: number of connections, bandwidth requirements, application sensitivity, and user profiles. I&O managers will be virtually unplugging every wired port and tossing it into the air to create seamless connectivity for every worker, guest, contractor, and partner in a harsh and borderless environment while continuing to ensure that corporate data is properly managed and secured across all devices, regardless of who owns the hardware. This is why 40% of respondents have as their No. 2 initiative going forward the deployment of virtual desktop infrastructures (see Figure 2). Business information stays containerized within the business boundaries.

- **Dispersed.** To react quickly and serve customers' needs, organizations are decentralizing their workforce and placing it in the flow of their customers' lives.

  What this means for your campus network. Communication becomes an essential ingredient to the efficiency of distributed companies and gets more problematic as the distance between contributors increases. To facilitate teamwork and trust, collaborative applications, videoconferencing, file-sharing, voice over IP (VoIP), email, and messaging solutions offer multiple methods of sharing information and connecting users within an organization. Campus networks need high bandwidth, seamless roaming, and low latency as the top requirements to support these apps across a distributed workforce.

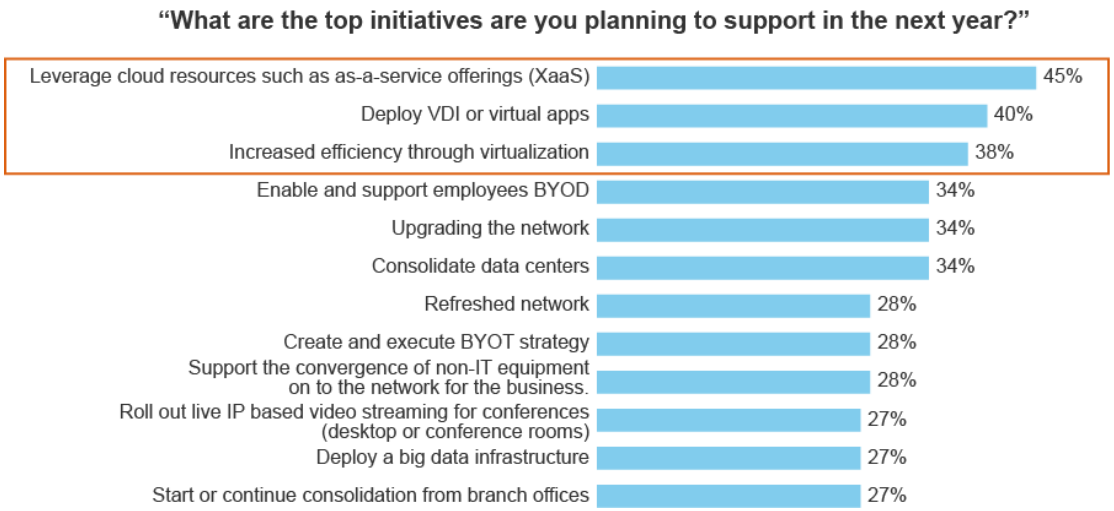
FIGURE 1
IT Infrastructures Have A Direct Impact On The Business



Base: 213 IT decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of Huawei, August 2013

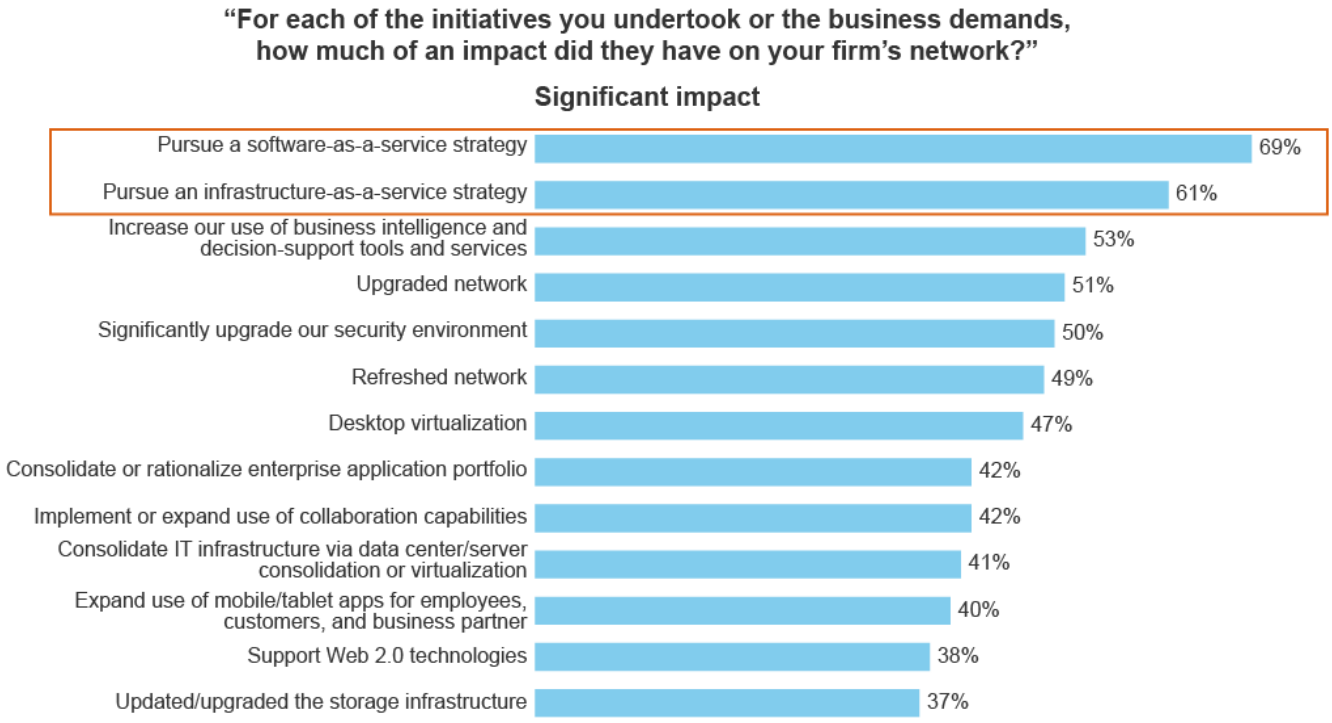
FIGURE 2
Dramatically Different Types Of Services Are Going Through Campus Edge Ports



Base: 213 IT decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of Huawei, August 2013

FIGURE 3
Cloud Services Are The Most Significant Impact On The Network



Base: 213 IT decision-makers
Source: A commissioned study conducted by Forrester Consulting on behalf of Huawei, August 2013

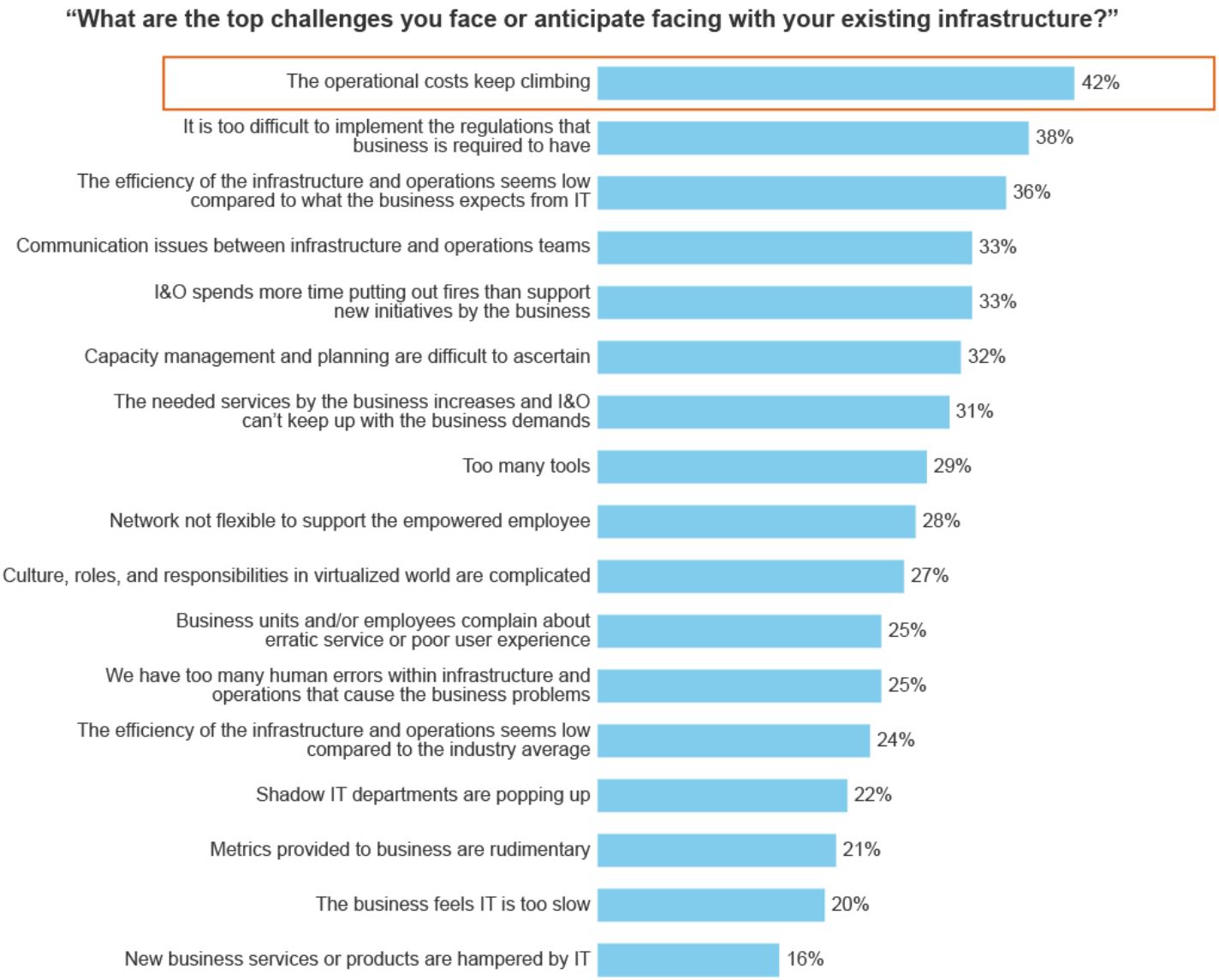
IT Initiatives And Network Investments Have Been Misaligned

Even though users are bringing their own devices to work and business units have procured their own cloud services, most of the focus and investment for infrastructure teams over the past five years has been on data centers, cloud, virtualizing servers, and consolidating hardware. All of them were based on reducing costs and increasing speeds. And each of them has been tackled as individual initiatives. By taking a siloed approach to the IT initiatives, I&O professionals only took into account a small portion of network disruption and don't understand the full extent of what all those initiatives do to wide-area networks, local-area networks, wireless networks, etc. Surveys and Forrester clients have indicated that organizations have not been satisfied with the results of their cloud, virtualization, and consolidation initiatives. Forty-two percent of respondents indicate that their No. 1 issue with their infrastructure is rising costs (see Figure 4). Only a quarter of respondents have been very satisfied with their IT initiatives improving operational costs.

By prioritizing the network as a component of those initiatives, 51% of I&O professionals had been upgrading the network over the past two years, and it was third on the list of priorities (see Figure 5). Network upgrades center on adding more bandwidth or functionality on top of what already existed. I&O teams put a Band-Aid on the issues they run across, which has been a common tactic. By improving link speeds or deploying a new protocol, networking organizations solve a small technical issue such as policy movement but don't address a bigger one, that operational costs continue to rise. On the other hand, refreshing the network involves re-architecting the infrastructure to align it with multiple IT strategies that will serve the business. This initiative was ninth on the list for IT decision-makers (see Figure 5).

FIGURE 4

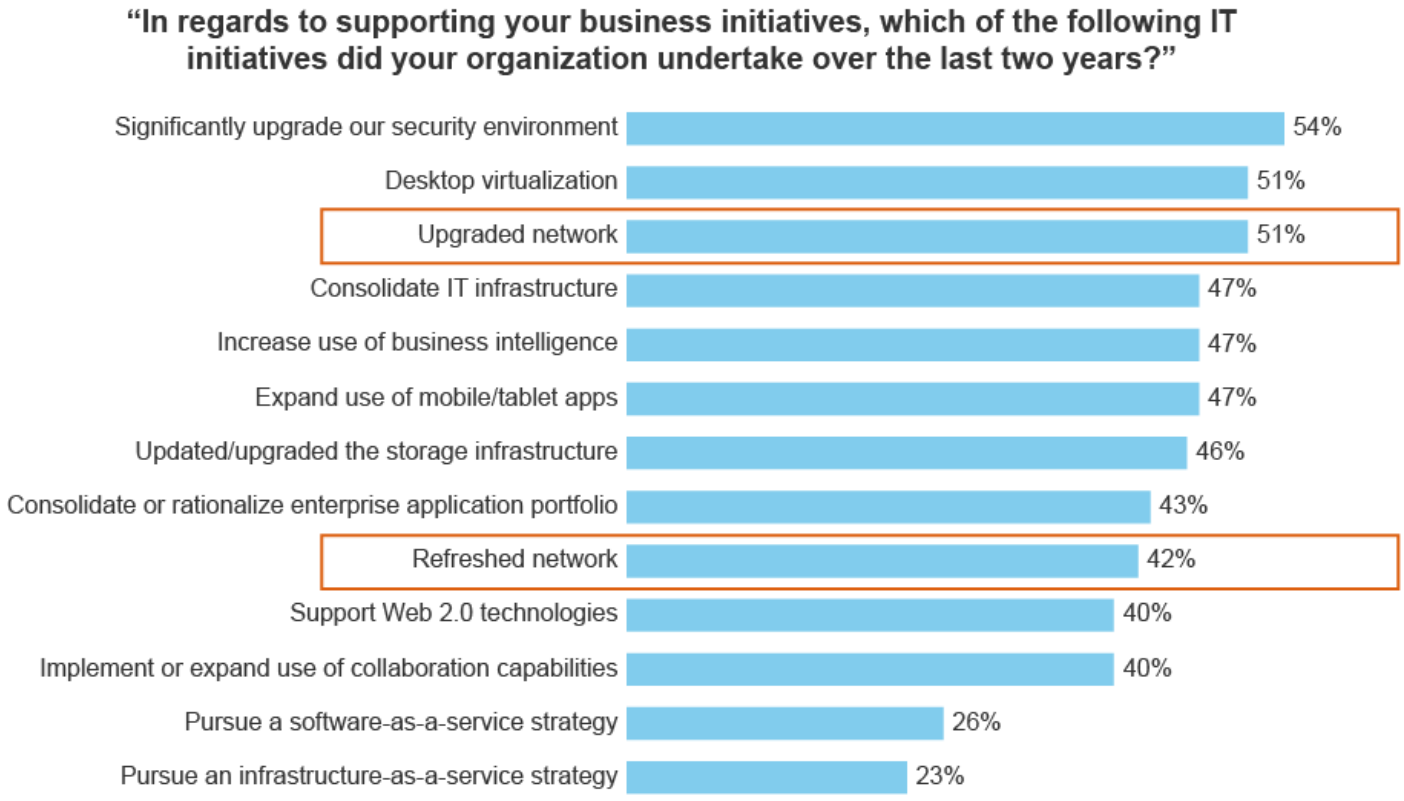
Operational Costs Keep Rising After Years Of IT Initiatives In Cost-Cutting And Efficiency Improvements



Base: 213 IT decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of Huawei, August 2013

FIGURE 5
Networks Continue To Be An Afterthought



Base: 213 IT decision-makers
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Not investing in networking and giving it low prioritization on the list of initiatives aren't the only aspects keeping IT organizations from realizing the results of their investments. Judging from the types of network investments, the network wasn't ready to handle the new stresses because of:

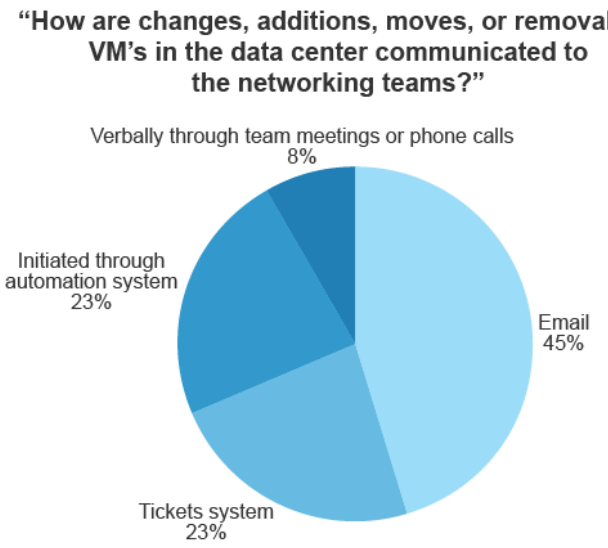
› **Manual operations.** Creating a user-centric infrastructure to serve the business requires the infrastructure to become agile, giving users rapid access to powerful and more-flexible IT capabilities. This means that I&O teams need to coordinate infrastructure elements to deliver the right set of services, to the right user, at the right time, and at the right location. Networks will reconfigure these elements on-the-fly and monitor the output to ensure that the newly created services are within the bounds of business policies and rules, but this can't happen if done manually. Seventy-seven percent of organizations indicate that changes are currently communicated not by automation but by email, phone calls, or ticket systems (see Figure 6).

› **Outdated priorities.** Dating back to the ARPNET days, networks have been built to be infrastructure with a single method to reliably communicate a host of multiple sets of flows, traffic, and workloads. Networking teams have invested in hardware that has the highest reliability, capability, and scalability, and these continue to be the top three most important capabilities for them (see Figure 7). However, those are the least problems they have with their network. A little more than 20% of survey respondents indicate they have reliability or performance issues (see Figure 8).

› **Packet-driven data.** More and more networking personnel have moved from monitoring latency, jitter, and packet loss to focusing on applications. The real goal is to deliver applications and data that are actionable. As with VoIP, the mean opinion score (MOS) test has been used for decades in telephony networks to obtain the human user's view of the quality of the network; networks need to be designed, deployed, managed, and monitored around users.

FIGURE 6

Seventy-Seven Percent Of System Communication Is Done By Manual Process

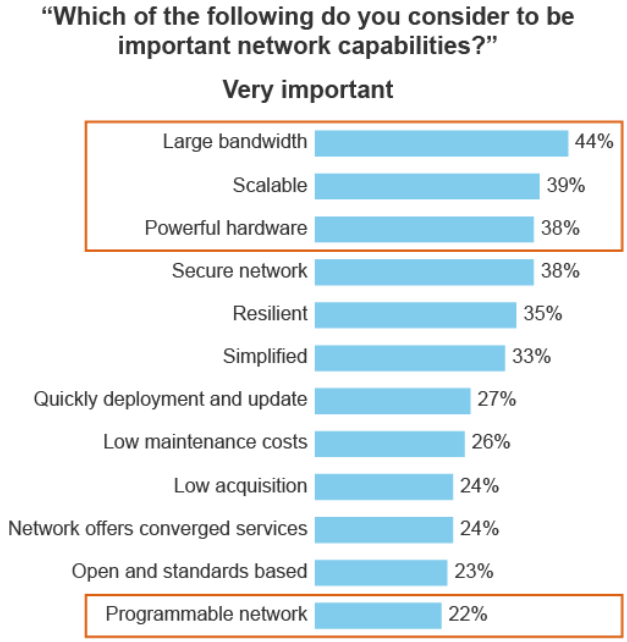


Base: 213 IT decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of Huawei, August 2013

FIGURE 7

There Is Too Much Focus On Speeds And Feeds

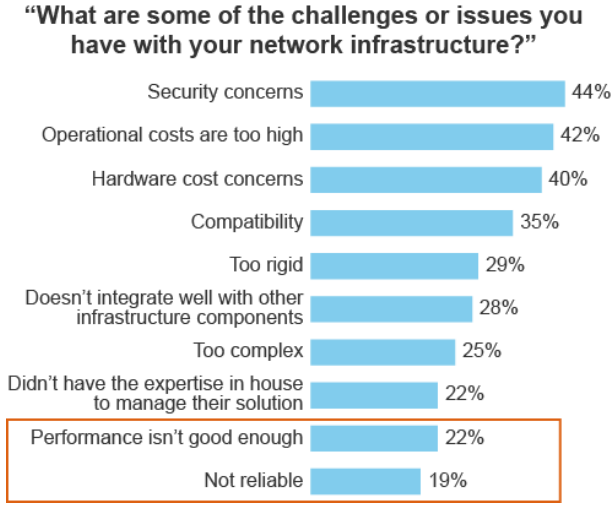


Base: 213 IT decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of Huawei, August 2013

FIGURE 8

Security And Operational Costs Challenge Networking Organizations



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Learn From The Data Center To Build A Next-Generation Campus Network

I&O teams need to take the lessons to heart and not repeat the same mistakes. More is at risk now that business competitiveness is relying on business being embedded in the lives of customers. The primary lesson is that networking must be a top priority. Mobility, cloud services, virtual desktops, unified communications, and virtual desktops all require the network. At a minimum, the network must be refreshed during those initiatives. Ideally, I&O teams would lay out a five-to-seven-year IT strategy and create a next-generation network to support those initiatives.

More should be done than just placing the network at the top of IT's priority list. I&O professionals can extract other valuable best practices from the data center initiatives. Some might consider the data center the testing ground for what is to come. All the applications and data that move within the data center, between data centers, and from data center to cloud will have to ultimately connect back to the users. Forrester's Forrsights data indicates that almost twice as many organizations will be using infrastructure-as-a-service compared with the previous year. As users connect those services, 67% of IT decision-makers believe this will have significant impact on their network (see Figure 9). Campus networks will need to be sophisticated enough to connect users to where the data and applications exist, just as the data center network connects multitiered applications across hybrid environments. I&O teams must extend the processes, procedures, and technology that are currently being deployed in the data center — where this agility and intelligence already exists — to the rest of the infrastructure. This allows I&O to ignite a set of orchestrated services to connect users, data, and applications.

Besides being intelligent enough to connect user to applications and data, networks will need to use all the resources, such as bandwidth, backplane speeds, and memory, to serve up resource-intensive applications, video, and virtual desktops. With users bringing their own devices to work, more than 50% of respondents will be deploying virtual desktop infrastructures so they can containerize business data (see Figure 9). Video will be used to connect a dispersed workforce. This means a network will need to leverage all the components. Instead of sending streams up and down the same links and wasting a redundant one like traditional networks do, next-generation networks will be using all the links, based on protocols — Transparent Interconnection of Lots of Links (TRILL) and Shortest Path Bridging (SPB) offers — once created for the data center.

Unlike the data center network, the campus network will be the door to a new world. The campus network will:

- **Mesh applications.** There are mobile, web, traditional, and hybrid applications traversing the network. All of them look very similar from Layer 3 and 4. The campus network will need to become an integrated stack of Layer 2 through 7 so that the right set of components can optimize those types of applications. Similarly, the campus network will coordinate the right set of security services since both personal data and work data will be riding the same types of applications.
- **Connect the Internet of Things (IoT).** In empowerment 1.0, most of the focus for IT professionals was on compute devices — smartphones, personal computers, tablets, and corresponding applications. However, technology is evolving beyond just proposing task solutions — such as executing a sales order — to sensing what is happening in the world around it, analyzing that new information for risks and possibilities, presenting alternatives, and taking action. This means that instead of having thousands of IP addresses, I&O teams could be deluged with millions of IP addresses (or devices connected), all of them sending and receiving data to enable the business. That's when the network will really see big data.

Campus networks have to be scalable, simple-to-use, and programmable. Then they will have the ability to program the underlying components to meet the user's expectations and deploy the right set of services to a mobile, empowered, and dispersed workforce.

The intersection of mobility, big data, virtual desktops, IoT, and cloud is a highly dynamic environment characterized by chaotic and stochastic property changes. I&O should be deploying a flexible, easy-to-use, standardized, billable, and responsive set of resources for the business. Consequently, it's imperative that the campus network itself mimic those capabilities. Almost 50% of respondents realize that the network will offer better control of infrastructure, be easy-to-manage, and be more responsive to the business (see Figure 10). Thus, campus networks have to be scalable, simple-to-use, and programmable. Then they will have the ability to program the underlying components to meet the

user's expectations and deploy the right set of services to a mobile, empowered, and dispersed workforce.

FIGURE 9

Reliability, Control, And Ease-Of-Use Are The Top Three Network Capabilities To Significantly Enable A Dynamic Infrastructure And Business

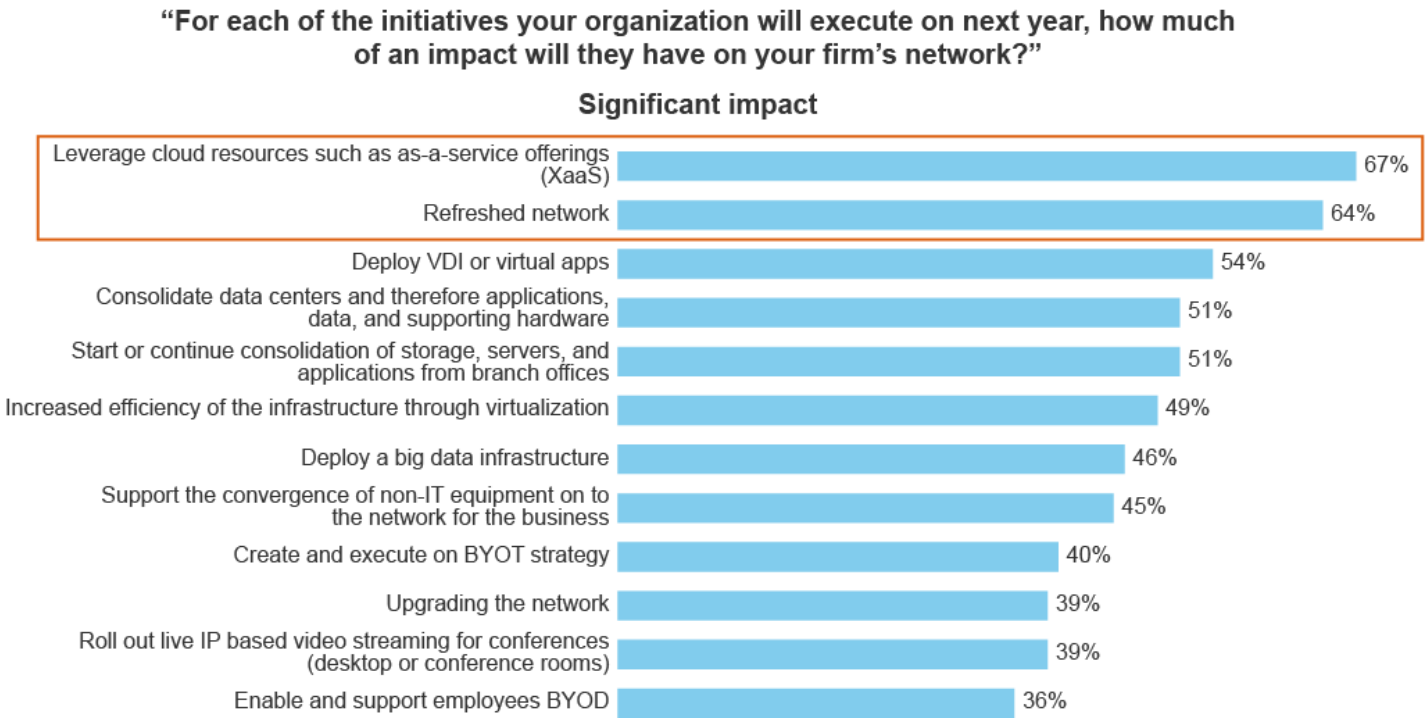

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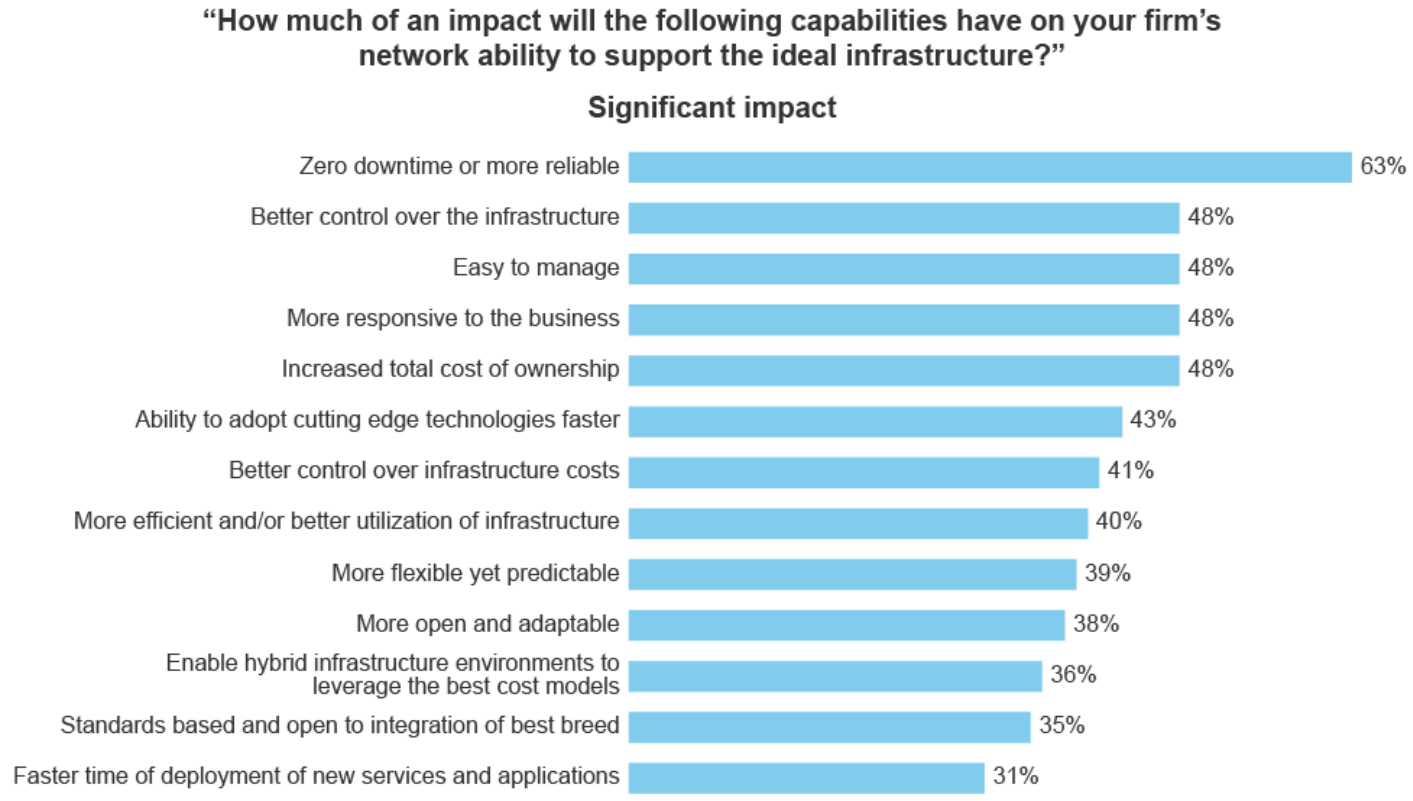
FIGURE 10

Reliability, Control, And Ease-Of-Use Are The Top Three Network Capabilities To Significantly Enable A Dynamic Infrastructure And Business



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Key Recommendations

The requirements within the campus network are integral parts in transforming a network into agile and dynamic infrastructure. The empowered, mobile, and dispersed employees will pull I&O in more directions than they have been within the data center. Compounding the demands, I&O responsiveness will become another factor as users leverage video, cloud, and social technologies to solve customer challenges. Individuals who leverage these new powers are reshaping business and forcing I&O to move from ticket systems, email, and verbal communications to a closed-loop system where networks automatically identify the demands of new application by users and provision the network to accommodate future demands like the IoT. Forrester recommends using virtual network infrastructure architecture and building an agile campus network that offers[1]:

Security through a coordinated set of security elements. With systems orchestrating services for each user, device, location, and need, no service would potentially be in the same spot twice. It would be impossible to cover all the locations and scenarios, especially with mobility, empowerment, and cloud bringing down the physical walls on where information goes and resides. Dedicated security devices in static locations would be circumvented. Security needs to be embedded throughout the network. As users connect with their devices, they get identified at the port (wired or wireless), and the appropriate security services are applied automatically through the infrastructure by coordinating a set of physical and virtual security and network components.

Unification of wired and wireless. Users are mobile, and it doesn't mean they're wireless. Whether users unhook from their desk and reconnect in the conference room, are wired or at a wireless port, policies need to be able to follow them. Besides having consistent security, procedures should be standardized, too. Managing wired and wireless infrastructures and applying consistent policies increases the efficiency of the organization by eliminating redundant work and errors.

Focus on user experience. As with the web, enterprise users don't use one application at a time but multiple ones (mobile, web, traditional, and hybrid applications) that may or not be work-related on their own device. To understand what should be optimized and prioritized, I&O will need to understand the user before it focuses on the application. By understanding what is important with users, I&O can prioritize the applications and use network bandwidth, quality of service, and prioritization, to name a few, to optimize the users experience.

Automation and programmability to enable better business agility. Nothing is static anymore, and there not enough resources in an organization to manual tweak all the knobs as the business climate changes or as users mesh internal and external resources to get their jobs done. By shifting the management manual controls to programming the network (also known as software-defined networking), the campus network can interweave network services (security, optimization, and policies) based on the user, applications, location of applications and data, regulations, and company policy on the file. In today's fast-changing business environment, the automation and programmability are critical characteristics to create a more agile network, which enables I&O professionals to react to shifting business demand quicker and to make business agile.

Appendix A: Methodology

In this study, Forrester interviewed 213 IT business decision-makers from enterprises in United States, United Kingdom, Germany, France, China, India, and Australia to evaluate how the new IT initiatives will influence the next-generation smart campus network. Survey participants included decision-makers in infrastructure and operations and networking. Questions posed to the participants asked about their current and the near-future IT initiatives and network initiatives. The study began in July 2013 and was completed in August 2013.

Appendix B: Supplemental Material

RELATED FORRESTER RESEARCH

"Virtual Network Infrastructure," Forrester Research, Inc., December 12, 2011

"How I&O Can Create A Wireless User Experience Network," Forrester Research, Inc., August 18, 2011

Appendix C: Endnotes

[1]A VNI accomplishes five goals. It: 1) leverages virtualized and physical infrastructure; 2) acts as a vertically integrated Layer 2 to 7 module within the infrastructure; 3) creates a fabric of horizontally interwoven networking components; 4) automates and orchestrates the infrastructure to deliver the right services for each user; and 5) allows management by business units (workload). Source: “Virtual Network Infrastructure,” Forrester Research, Inc., December 12, 2011.