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Focus Your Network Strategy On User Experience, Not Application Delivery by Andre Kindness

for Infrastructure & Operations Professionals



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Focus Your Network Strategy On User Experience, Not Application Delivery

To Remain Business-Relevant, I&O Managers Need A New Network Architecture

by Andre Kindness with Robert Whiteley and Eric Chi

EXECUTIVE SUMMARY

Networking isn't about applications or technology — it's about users. The business pressure to consolidate IT, support empowered users, and provide customized experiences to customers is stressing today's architectures and reshaping networks. The old approach of building networks around applications is too static. Application delivery networks (ADNs) aren't designed to support the user-centric collaboration tools, Web 2.0 tools, and cloud services that are needed to solve today's business challenges. ADNs can't connect users to services that are relevant to the moment, are aggregated at the point of use, and originate from multiple locations. A new architecture will emerge: the user experience network (uXn). The uXn will: 1) monitor the users, their devices, their location, and their needs; 2) combine the appropriate technologies to deliver the best service; and 3) control the delivery of the service to meet a user's SLAs. To create an end-to-end uXn, I&O professionals will need to combine wide-area network (WAN) optimizers, application delivery controllers, and cloud gateways.

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Forrester interviewed several vendor and user companies, including Citrix Systems, Exinda, F5 Networks, Ipanema Technologies, Radware, and Riverbed Technology.

Related Research Documents

"The Future Of Online Customer Experience"
January 28, 2010

"Product-Centric Development Is A Hot New Trend"

December 23, 2009

"Best Practices In User Experience (UX) Design" September 4, 2009



THREE BUSINESS DRIVERS WILL CHANGE HOW I&O BUILDS NETWORKS

Over the past few years, business executives have driven fundamental business practices into IT to contain costs. So it's no surprise that while budget freezes start to thaw and initiatives are ignited, infrastructure and operations (I&O) teams have responded by identifying virtualization and consolidation as top priorities. Both provide I&O with the ability to demonstrate cost savings while achieving new infrastructure capabilities. But now new expectations from customers and business stakeholders are causing tectonic shifts in IT. Specifically, enterprises are:

• Reducing and eliminating infrastructure and operations waste. Companies have started the consolidation process to effectively eliminate the "death by a thousand cuts" that comes from having too much infrastructure. IT consolidation and standardization is the discipline of sorting out and merging redundant and fragmented IT capabilities by removing duplicate assets, support functions, relationships, and processes for the purpose of increasing the real value from IT investments. In fact, Forrester has found that two-thirds of companies are restructuring their IT organization to be better aligned with the business and reduce costs (see Figure 1).²

How this affects your network: Consolidating IT infrastructure and processes moves IT assets to a more centralized model. This creates new and larger loads on your WAN links, as resources must now traverse the network rather than access local versions of the resource. These efforts — and especially those for data center consolidation — mean your network may not have the capacity or capability to handle the shift in traffic loads.

• Empowering employees. A tidal wave of personal devices is crashing into the enterprise.³ Even though the first signs of freedom can be attributed to the iPhone, enterprises will see tablets and notebooks tapping into the corporate Wi-Fi as employees search for refuge from their carrier's tiered data plans. Companies are looking to offload the complexity of providing endpoint devices to employees who are becoming much more transient and distributed. Much like the change in corporate policies around mobile phones, companies will start to push notebook and tablet purchases to their employees.

How this affects your network: Edge access ports — wired, wireless, and remote access links — were deployed with the assumption that a standardized device with a certain profile was attaching to the infrastructure. Very little security and other functions were turned on, as it was assumed that the other parts of IT were managing and securing endpoints. Now networks are the new gates and must have the capability to understand users and their needs so that the right services are created for that particular connection. Networks need to become much more intelligent about the user, device, location, and required services.

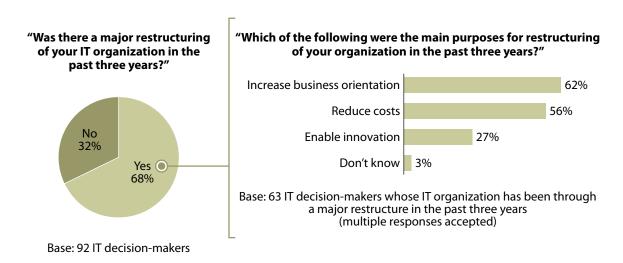
• Focusing on customized experiences. With physical distance barriers being ripped apart by technology, companies from mom-and-pop corner stores to multinational corporations are tapping into new consumers around the world. Applications, cloud, and Web 2.0 tools are

creating environments where businesses can create a unique experience for their customers. The future of online customer experience will include sites that are: 1) customized by the end user; 2) aggregated at the point of use; 3) relevant to the moment; and 4) social as a rule, not an exception. Social content will be integrated into most online experiences, not segregated into today's blogs, microblogs, and wikis.⁴

How this affects your network: With applications and services originating from inside and outside the infrastructure, networks can no longer be static. Infrastructures will need to understand where users are located, what devices they have, and what they want, in order to optimize the right services and control where the requested service is going by leveraging networking resources on the fly. Networks need to be automated and dynamic and provide customized connections.

The business pressures of reducing cost through eliminated infrastructure, empowering employees, and revamping customer experience will force I&O to focus on individual employees as the central design point. But that's not how today's networks are built. Today's networks focus too much on technology and put the application as the central design point.

Figure 1 Most Reorganizations Aim To Improve IT's Business Orientation And Reduce Costs



Source: Q3 2009 Global IT Services Orientation Online Survey

THE OLD NETWORK APPROACH: FOCUS TOO MUCH ON APPLICATION DELIVERY

IT industry professionals, like iron to magnets, are innately drawn to technology and technology metrics when they're trying to solve a business issue or implement a business initiative. This is especially true when it comes to connecting users with information; applications are today's solution. And when users call in to complain about their experience with technology, different parts of the organization grab their application visibility tools to demonstrate that their app is not to blame. As a result, companies have focused on building extensive application delivery networks. For rester defines application delivery networks as:

A set of network infrastructures that, when deployed together, provide application availability, security, visibility, and acceleration.

Application delivery networks are composed of two basic network infrastructure components:

- WAN optimization controllers (WOCs). Early on, WOCs were deployed as bandwidth "band-aids," providing short-term benefits on congested WAN links where it was infeasible or too expensive to buy additional bandwidth. Although each vendor has its own proprietary implementations, WAN optimization solutions rely on two underlying technologies: compression and quality of service (QoS). By using a combination of compression and QoS techniques, first-generation WAN optimization products enabled enterprises to get more out of their congested WAN links. In some instances, this saved money by delaying the purchase of additional bandwidth. As the technology matured, deeper packet inspection and intelligence enabled caching, protocol-specific latency reduction, data reduction, and packet coalescing.
- Application delivery controllers (ADCs). Load balancers developed as traffic cops placed in front of web servers. By leveraging Layer 4 the transport layer attributes, the load balancer would direct IP addresses to certain servers. The next generation of load balancers evolved to use deep packet inspection to manipulate and manage application-specific information, such as TCP, HTTP, or SSL. These ADCs track login sessions and redirect the client to the same server for subsequent connections (also called persistence or server affinity). ADCs also provide web acceleration often using caching and compression techniques also found in WOCs and web security technologies to optimize web and application infrastructure, providing higher availability, performance, and scalability for web apps. ADCs simplify the management of network resources and optimize and accelerate user access to diverse servers, content, and transactional-based systems.

Application Delivery Networks Don't Accommodate New User-Centric Technologies

ADNs assume a homogeneous environment where users are the same; information is utilized in a repeatable and similar manner; there is a single data source; and there is a limited set of devices and connection types. But with the thawing of budgets in 2010, business are learning from past mistakes and looking to create a dynamic environment that quickly adjusts to business conditions without these restrictions. As a result, ADNs are becoming too rigid.

For example, take what happens when a company launches a new product. The firm draws on designers, marketing communications staff, and market intelligence personnel who specialize in taking that product to market. But companies are hiring this staff on an as-needed basis instead of carrying everyone full-time. This results in a pool of experienced resources that taps into personnel beyond the 75-mile radius from the company headquarters. These distributed workforces are located in branch offices, at remote sites, or at home. To leverage these new labor pools, companies have invested in three user-centric technologies:

• New video technologies that advance collaboration. A new generation of collaboration tools connects employees, contractors, customers, and vendors who are spread over the globe. Studies have shown that there are higher levels of teamwork and trust when team members can see each other.⁵ Collaboration tool benefits can be horizontal, applying across many industries, like usergenerated content-sharing or message development; or vertical, where there are highly tuned solutions to that industry, like distance learning in education or remote medical procedures in healthcare.

How the traditional ADN approach falls short: ADN focuses on applications from distinct and static sources within a particular network as opposed to optimizing the services from various users who are mobile and dynamic.

• The latest Web 2.0 tools that allow for localization of content. Traditional apps can alienate users when language and customs aren't designed into the enterprise apps, yet no one app can deal with the sheer magnitude of languages. Web 2.0 technologies — such as social networking sites, blogs, wikis, video-sharing sites, hosted services, web applications, mashups, and folksonomies — connect people with each other on global bases to collaborate and share information, but in a way that is easily customized and localized. For example, mashups allow apps to be easily created in any language and data sourced from a variety of locations.

How the traditional ADN approach falls short: ADN lacks the capability to balance connections and optimize services from multiple locations. The architecture just focuses on optimizing applications from point A to point B.

• Cloud computing that lets individuals scale infrastructure as and when needed. Small to large organizations can contract and grow on the fly as the market demands. There are no boundaries to where services may ignite. Advanced applications and services may be partitioned between the cloud and data center. Depending on the loads within the data center at any one time, users might be redirected to the cloud for a particular service. For example, during the peak buying season, retail companies may want to use most compute power to manage online transactions and force internal users to a cloud service for things that fall outside of supporting customer purchases, such as Microsoft SharePoint, training videos, and inventory control software.

How the traditional ADN approach falls short: ADN lacks the capability to look at the users, business cycle, and location to determine what services they need and to optimize them.

THE NEW NETWORK APPROACH: BUILD THE NETWORK AROUND THE USER'S EXPERIENCE

Just as enterprise human resources are morphing from static and dedicated pools of resources to ones that come and go with ebb and flow of the business, transports of information will be created and disassembled within nanoseconds. Moving forward, I&O teams must design their networks to accommodate this rapidly changing user environment. Today's application delivery networks must be transformed into uXns. As with the web, enterprise networks will be understood not as a single instance solving a specific issue but as a fluid and intertwined set of functions leveraging the most optimized set of capabilities and resources for the users. Forrester defines a uXn as:

A network architecture that focuses on monitoring, controlling, and optimizing the quality of user experience.

Users could be defined as internal personnel who are working remotely on the road, within the office, or at a branch office — basically, anywhere. They may be connecting and creating a virtual work or personal environment depending on their immediate needs; endless options of hardware and operating systems will be the door that opens into that world. It's up to the infrastructure to understand the users and vehicles they are using to create the new world. There are customers, vendors, and partners outside your organization who will demand their own instantaneous virtual world. To do this they will need a user experience network that: 1) has granular visibility to customize services for each user; 2) optimizes the transport mechanisms by combining and accelerating the required service; and 3) can control the flow based on policies of the business. All three of these capabilities are tied together using a common policy framework designed to set user service-level agreements (SLAs) (see Figure 2).

The supporting technologies for uXn aren't much different from those for ADN; however, the deployment and ignition of technologies mimic virtual technology in the data center as opposed to dedicated point solutions that provide redundant functionality. Global load-balancing, firewall, QoS, compression, encryption, caching, data deduplication, protocol acceleration, and packet-coalescing will be distributed, activated, and coordinated for each user and his or her services. Point solutions will still exist, but the core competency of one product will work in tandem with the core competency of another product as opposed to having features turned on in two different products doing repetitive tasks and wasting resources. ADN is an isolated set of products that duplicate processes whether they're needed or not.

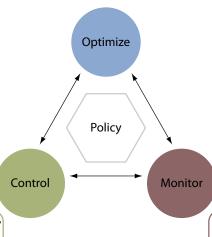
User experience networking is critical to ensure that I&O is solving business issues, not technology issues. There are three business scenarios that uXn needs to address in your environment:

- Enhancing the experience of disbursed and mobile workers.
- Enhancing the experience of web and collaboration sites.
- Enhancing the experience of user access to data and storage.

Figure 2 The Three Pillars Of A uXn: Monitor, Control, And Optimize

What a uXn does: It effectively combines technologies to deliver the best possible service.

How it differs from ADN: It does not just accelerate applications to point products.



What a uXn does: It automatically molds and combines resources and services to meet user-based SLAs.

How it differs from ADN: It does not just adjust traffic based on application hierarchy.

What a uXn does: It provides visibility of user, location, device, infrastructure, and services.

How it differs from ADN: It does not just monitor basic app characteristics.

58491 Source: Forrester Research, Inc.

UXN SCENARIO NO. 1: ENHANCING THE EXPERIENCE OF DISBURSED AND MOBILE WORKERS

Users are connecting through the WAN at an ever-increasing rate as businesses expand their resource pool, consolidate the locations of hosting applications, and move software to the cloud. This trend will continue for the next five years, and I&O managers need to be concerned with: 1) access to applications that keep employees productive outside of the campus; 2) the exchange of large files during backups and migration of virtual images; 3) service levels for voice over IP (VoIP), video, and other applications running between offices and data centers; and 4) providing reliable connections to infrastructure-as-a-service (IaaS) cloud services. All of this must be maintained while balancing the cost, reliability, latency, and throughput of your WAN links.

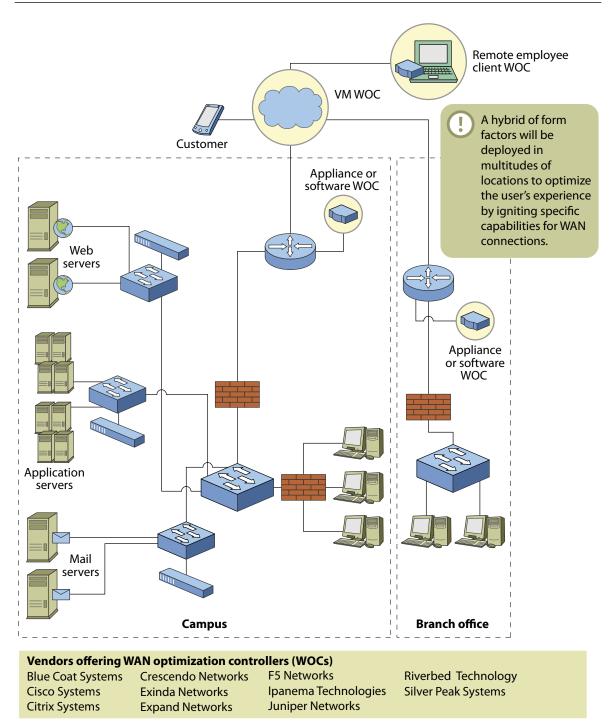
How uXn Can Help: Deploy WAN Optimization Tailored To Your Users

WAN optimization solutions are designed to improve the performance of the network. But emerging deployment options allow I&O managers to use them more strategically and in a way that improves the user experience for distributed and mobile workers. To deploy WOCs as part of a uXn you need to leverage multiple form factors: hardware appliances; mobile clients installed on individual devices; and software appliances that can be loaded on any commodity server or as a virtual machine (see Figure 3). Use these multiple form factors to deploy WOCs pervasively throughout your WAN. This solves the business issue of distributed and mobile workers by implementing the following uXn capabilities:

- Caching. The goal is to decrease the amount of traffic on the highway and increase the amount of critical data. By leveraging storage capacity on either end of the link for data indexing and deduplications, only the absolute minimum of bits is transferred across the WAN often providing a tenfold to one-hundredfold increase in effective throughput. Users will experience quicker response times on the applications they use. For example, Riverbed is known to have large pools of memory, which keeps its engineers from waiting too long while computer-aided design (CAD) and computer-aided manufacturing (CAM) software accesses engineering models with changes.
- Data compression. This can take the form of static data compression by finding redundancies in the data stream and removing them or deduping, which happens on smaller sized packets. On the larger side of data transfers, the dedupe techniques used by WAN optimization are effective when large files are transferred back and forth over a connection by one or many people, as large chunks of data are often repeated and the deduplication process significantly reduces the amount of data traversing the WAN. A car rental company saw 10 customers leave the queue because it was taking 45 minutes to process each renter across the WAN. The application was running too slowly.
- Protocol optimization and error corrections. Both techniques remove "chattiness" in inefficient protocols like Common Internet File System (CIFS), Messaging Application Programming Interface (MAPI), and Transmission Control Protocol (TCP). A protocol-specific approach avoids unnecessary transmissions and retransmissions across the WAN, providing a more responsive feel to applications without recoding the application to be WAN-friendly. Users sharing files with other clients could see a decrease in the amount of time files are loaded or shared.
- Packet-coalescing. This takes smaller packets and combines them to reduce the amount of traffic by attaching the payload to another header with the same destination. The goal is similar to caching, compression, and protocol optimization: reduce the number of transmissions across the network. VoIP call quality or interactive application experience would increase with packet-coalescing, enhancing a user's experience.

- Traffic control. Traffic management is usually done using QoS, which is complex despite the underlying idea being simple. But more sophisticated traffic control techniques use visibility and reporting tools to create more granular control policies. Most policies focus on traffic types and patterns; I&O teams rank them and give particular traffic priority. However, solutions are evolving to tie users into the mix. For example, Exinda leverages Active Directory to associate traffic with a user, which is the first step in customizing the network for user experience.
- Load-balancing. For distributed and mobile users, global load-balancing puts the traffic on different connections or across multiple connections, depending on the application or policies. This ensures that the user is always taking the most optimal path, and it will even reroute the user during disruptions or disasters that would normally throttle productivity. Ipanema offers I&O managers the capability to automatically move users' recreational traffic from the main connection to a back-up link that connects to the Internet.

Figure 3 WAN Optimization Must Be Deployed Pervasively To Improve User Experience



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UXN SCENARIO NO. 2: ENHANCING THE EXPERIENCE OF WEB AND COLLABORATION SITES

Both multinational companies and small businesses require that employees, customers, vendors, or partners have always-on access to websites like eCommerce, blogs, online communities, collaboration services like SharePoint, and desktop services. Users expect to reach these services 24 hours a day in a secure and fast manner. However, users' needs runs counter to what is being deployed within infrastructures. I&O teams focus on prioritizing internal business applications based on a one-dimensional set of criteria and deploy solutions to support the prioritization. A uXn would enhance or fortify other parts of the infrastructure. Take, for example, a large aerospace company that uses CAD software. The IT organization spent its resources on ensuring that CAD was always available. After receiving poor marks on an IT survey, its infrastructure team went to the engineering pool to find out what the issues were. The team realized that even though CAD was a critical tool, wikis and SharePoint were even more important. Engineers spent, on average, 20 hours researching and collaborating to every one hour of CAD work. The I&O team changed its priorities and spent more resources ensuring that collaboration sites were available, responsive, and secure.

How uXn Can Help: Deploy ADCs To Improve Access To Data Center And Cloud Resources

I&O managers have put applications on multiple servers to spread the load and help with availability. ADCs are the gateway to those applications and, like virtualization, optimize underutilized resources. These controllers can create a better user experience: Systems are more responsive and available to the user. ADCs maximize server utilization; optimize investments in existing equipment; improve performance by distributing user traffic loads among multiple web and application servers; optimize server and application resources by efficiently allocating traffic across servers based on application types; increase site performance by distributing user traffic based on actual server resources; and cost-effectively scale server capacity to keep up with growing traffic demands. Today's ADCs have evolved well beyond basic load-balancing and can be deployed as hardware appliances, as virtual appliances, or as software installed directly on a server OS (see Figure 4). Deploying ADCs helps create a uXn by providing a core set of services:

- **Server load-balancing.** A load balancer directs the user to the "best" server using various algorithms: round robin, sequential, random, server capability-, or resource-based. This capability can allow infrastructure teams to perform maintenance without interrupting users and preventing them from getting what they need.
- Global load-balancing. Global or multisite load balancers direct traffic to servers in more than one geographical location and multisite failover or disaster recovery sites. Services can always be available to users, even though there could be a large disaster, man-made or natural.
- Caching. Caching of objects by the controller keeps the server from spending time dishing up the same items with each connection. Connection types run the gamut, so users who connect through a 3G line could benefit from not having long wait times during page reloads.

- **Protocol optimization.** Protocol optimization occurs on the TCP and HTTP level. TCP optimization occurs with the client and server. Transactions can occur a lot more quickly, which allows users to get their jobs done quicker.
- **Protocol-offloading.** SSL and XML offloading transfers CPU-intensive tasks from the server to controllers to increase the number of requests that the server can handle. Users will get a better chance of connecting over a secure link, thus protecting their information and making them feel secure.
- **Compression.** HTTP compression is sent from the server using gzip, Deflate, or a similar protocol: Compliant browsers will announce what methods are supported to the server before downloading the correct format. This compression allows users to move more quickly from one page to another, since the pages and content will load faster.
- Security. Application firewalls coupled with session awareness and behavioral mode analysis will look for attacks and block them. When looking deep into the packet to optimize the traffic, Radware leverages the process to incorporate security profiling, which helps protect infrastructure. This will ultimately help create a customized secure environment, since the device will need to understand what users do and don't do.

Web servers Software/VM ADC on laas Customer Appliance or software/VM ADC Web servers By understanding the user, uXn can turn on features that optimize experiences across multiple types of connections. The services can be deployed in many form factors and will interact with other components Application of the uXn. servers Appliance or software/VM ADC Mail servers Appliance or software/VM ADC Campus **Vendors offering application delivery controllers (ADCs)** Array Networks Cisco Systems Radware A10 Networks Crescendo Networks Strangeloop Networks ActivNetworks Barrácuda Networks **Aptimize** Brocade F5 Networks Zeus Technology

Figure 4 Newer ADCs Can Be Deployed As Hardware Or Software To Improve User Experience

UXN SCENARIO NO. 3: ENHANCING THE EXPERIENCE OF USER DATA ACCESS AND STORAGE

Storage is a key component in a user's experience. Users may not directly touch all aspects of storage, but they leverage the value in everything they utilize from the infrastructure, and business issues arise when the user's storage needs are not met. For example, if a main center crashes and there is no backup and disaster recovery site, users won't be able to get the information they need and will end up idle and unproductive. With a more distributed workforce, organizations are moving to video instead of face-to-face training, and users can tap into training libraries and see a large selection of educational material. Enterprises limited by budget, footprint, and personnel are turning to the cloud to alleviate frustration over email or project storage constraints.

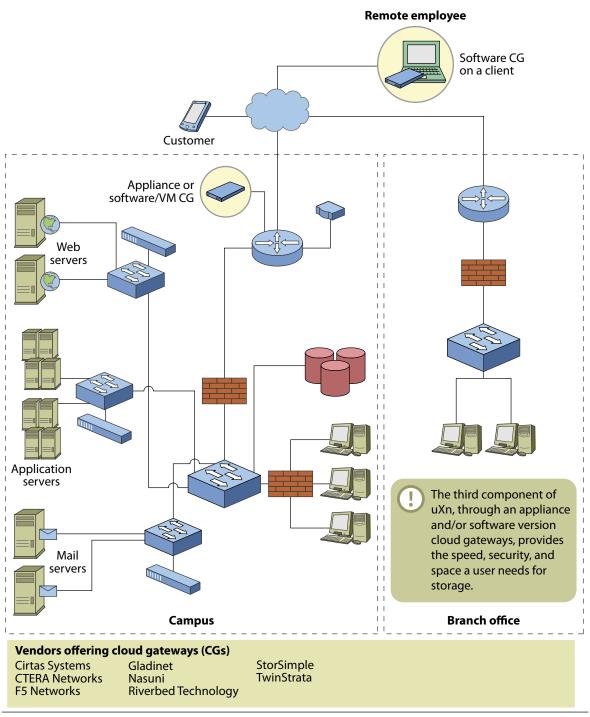
How uXn Can Help: Deploy Cloud Gateways To Improve Data Access

Cloud gateways offer a seamless way to integrate storage-as-a-service using network protocols that provide a seamless integration with existing applications while providing intermediaries to multiple cloud storage providers. The big issue of security is alleviated by an on-site appliance that encrypts data while keeping the keys local (see Figure 5). To get the best results from leveraging the cloud, I&O managers should implement cloud gateways with these options:

- **Device types.** Look for on-premises appliances or servers with software to translate cloud storage application programming interfaces (APIs) such as simple object access protocol (SOAP) or representational state transfer (REST) to block-based storage protocols such as iSCSI or Fibre Channel, or file-based interfaces.
- Security. Encryption secures the information while reducing the storage space through compression. Secure content puts users at ease because they know their data is safe, and they will more likely share it on systems that, unlike local storage, are available 24x7.
- **Deduplication.** Dedupe reduces the size of the storage space and the amount of data transferred to the site, resulting in cost savings, since most vendors now charge for both. By eliminating redundant data, files can be uploaded and downloaded more quickly, creating a better experience for the user.
- Caching. Caching reduces latency by locally storing data or keeping local copies if they are being accessed frequently. Users sharing files with others at the same time will see faster response times to access the file.
- Load-balancing. Load balancers spread data across different providers, but to the user it seems like it is one large pool of storage. Users could experience faster upload and download times with multiple choices on where the data is stored.
- Management. Management tools help write rules to determine which files are migrated to the cloud and how they are migrated, all while making it appear that they are on your local systems. Complexity is taken out of users' lives, giving them more time to spend in their function.

• **Policy.** With the right policy capabilities, individual files can be migrated between different types of storage based on attributes such as file age, type, and size. Users could be offered a variety of options that provide them faster access to larger storage volumes.

Figure 5 Cloud Gateways Are Placed Near Internet Access To Improve Cloud Storage



BUILDING THE END-TO-END UXN

I&O must take a page from the virtualization playbook. Much like what virtualization did in the data center by freeing applications tethered to specific servers, today's network must deliver a set of services untethered from the application infrastructure. This delivery network must be optimized for the user and not the specific application. Internal personnel, customers, vendors, and partners will connect to business and will leverage multiple parts of the infrastructure to get the service they need. There may be unique considerations and ignition of technology, but fundamentally, there is a large, overlapping set of capabilities among WOCs, ADCs, and cloud gateways — like caching, compression, QoS, and other services — to ensure optimum experience (see Figure 6). Thus, building a uXn requires that you look at all three of these in tandem. Traditionally, companies have deployed these as separate point solutions. Moving forward, a uXn requires universal policies around delivering an end-to-end user experience across these three delivery technologies.

How do you integrate and rationalize this overlap? Focus on virtual appliances, not hardware appliances. WAN optimization controllers, application delivery controllers, and cloud storage are evolving from point solutions in hardware form into a hybrid appliance that runs software in a virtual machine dispersed over the infrastructure. This way you can specialize the uXn virtual machine (VM) on the unique aspect of environment in that area but leverage common functionality from another piece. I&O can then use policy to focus on building end-to-end uXn services for a user rather than on turning on features in a hardware appliance located in a specific data center or branch office.

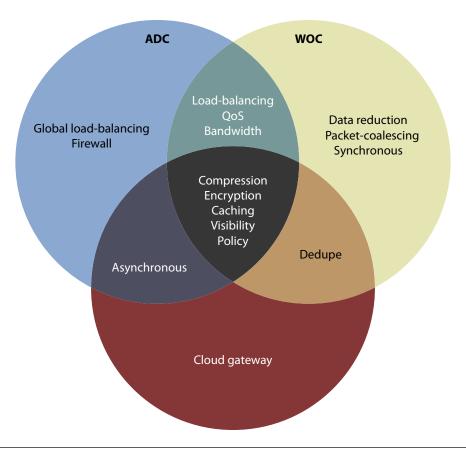
Three Vendors Are Leading The uXn Charge

Vendors are creating the necessary hybrid appliances and virtual software that will create streams of services that are optimized and controlled by management software with visibility into the user, location, device, and required services. Three vendors are leading the charge in delivery and end-to-end uXn: Citrix, F5, and Riverbed. What sets these vendors apart? Each approaches the architecture from different strengths. Specifically, we see that:

- Citrix provides the most compelling vision for user experience. Citrix's solutions are intimately tied to the user experience. Citrix's pedigree of delivering a virtual world to end users gives it a leading edge in understanding what users expect, and it is able to translate that into a strong uXn architecture. Its ability to deliver a complete portfolio today is still a work in process, and its experience on the virtual side of Citrix might be the step function in being able to deliver a tightly integrated set of optimization technologies following a user.
- F5 has the most sophisticated policy and developer resources. F5 provides customers a variety of optimization, monitoring, and control tools. Its ADC is still the most widely deployed and takes the lead in having a rich tool set that can offer control over the user experience. F5 also has the richest policy interface with iRules and a rich developer network on DevCentral. I&O managers can tap into a large knowledge base to help them connect F5's solutions with the users and create unique uXn services.

• Riverbed has the most advanced gateway technology. Riverbed rounds out WAN optimization with a solid cloud gateway. Riverbed Whitewater enhances enterprises' storage options by allowing its users to store data in the cloud securely. Riverbed's acquisition of Mazu offers customers an end-to-end uXn that is starting to focus more on the users than applications. The firm also provides an aggressive set of virtual form factors and even a virtualization platform — Riverbed Services Platform — from which user-centric services can be launched.

Figure 6 A uXn Marries Technologies From WOCs, ADCs, And Cloud Gateways



RECOMMENDATIONS

REMAIN COMPETITIVE AND DESIGN THE NETWORK FOR YOUR USERS, NOT YOUR APPS

Services, information, and applications will be as transient as the users who want to get at them. Virtualization and cloud are only the beginning of where resources exist and are leveraged. I&O professionals will always be on the defensive if they continue focusing on applications or specific technology. By embracing uXn, they will be able to stay in tune with business, drive down costs, and increase the services they deliver. Infrastructure and operation managers should:

- **Design your uXn by embracing the end user.** Use Forrester's principles for application delivery managers to design your uXn. This includes four steps: 1) become your users; 2) design first; 3) trust no one test; and 4) inject user experience design into your development life cycle.⁷ Adding these small and simple steps can save I&O managers project time and resources by building quality and experience into the development process, just as total quality management (TQM) is built into manufacturing processes.
- Build a true end-to-end uXn by deploying virtual appliances. Users and their needs are volatile and turbulent. Dedicated point solutions aren't flexible enough to support a uXn. Conduct a virtualization maturity assessment to understand where you are in your virtualization capabilities. As your organization moves into pooling and automation from consolidation and process improvement, you'll be ready to deploy virtual appliances. This allows you to deploy uXn capabilities pervasively and where the users require the resource optimization.
- Tie all three components together. Today's user can't be pigeonholed into a certain category. Employees, partners, and customers will leverage similar services and tools. Likewise, traditional networking solutions have common traits. When thinking about controlling, monitoring, and optimizing the user experience, I&O managers will need to look at solutions from all three scenarios and ensure they are working together to meet the user's needs, much like the engine, transmission, and fuel system in a car.
- Drive automation into the infrastructure. Nothing is static anymore, and there aren't enough resources in an organization to manually tweak all the knobs as the business climate changes and organizations can't afford to have the help desk be the gateway to users. You'll need to recruit automation champions from among the ranks of your most technical subject matter experts and avoid the common pitfalls of automating unrefined processes, starting with too large of a project, and not implementing control points. Next, look at the vendor solutions that give you visibility and the capability to create a system that automatically flexes the technology to service the end user while integrating the three components. At first, it will just be a common management platform that helps you manage the uXn from a single pane of glass.

WHAT IT MEANS

DON'T BE OVERWHELMED: IT'S THE DIRECTION YOU'RE ALREADY HEADED IN

User experience networking isn't a new concept when you think about other industries, such as eCommerce, embracing it over the years. While not all I&O shops can architect a uXn in the near future, they will take on uXns to achieve greater utilization, flexibility, and operational efficiency. But it's not an all-or-nothing proposition. The future IT infrastructure will have elements of dedicated physical deployments, hard-wired dedicated pools, shared pools of resources, and links to public cloud services and platforms where appropriate. Maturing your uXn capabilities makes this future consumable. Otherwise, it's just too much of a stretch to achieve.

ENDNOTES

- ¹ US economic growth is falling short of our already modest expectations and will expand at a snail's pace of less than 2.5% for real GDP in 2010 (avoiding a double-dip recession). As a result, we have trimmed our forecasts for the year to a still-robust 8.1% IT market growth for the US (down from our 9.9% forecast in July), with 7.4% growth in 2011. For more information, see the October 15, 2010, "US And Global IT Market Outlook: Q3 2010" report.
- ² Forrester surveyed 503 IT decision-makers and found that, in the eyes of these leaders, the perception of their IT organizations is improving. See the February 28, 2008, "<u>The State Of IT Governance In North American And European Enterprises</u>" report.
- The smartphone landscape has evolved dramatically over the past 12 months. BlackBerry's relentless assault, the iPhone's maturation of management features, and Android's device and carrier proliferation drive the evolution. This shift has had a profound effect on enterprise IT road maps. The days are numbered for limiting support to a single mobile operating system and not enabling workers with email and business resources on individually liable smartphones. For more information, see the October 28, 2010, "The Mobile Operating System Wars Escalate" report.
- ⁴ Forrester believes that four attributes will characterize the next phase of development of the Web. Online experiences will be: customized by the end user, aggregated at the point of use, relevant to the moment, and social as a rule, not an exception. In this report, we highlight companies that are providing online experiences that already exhibit one or more of these characteristics. For more information, see the January 28, 2010, "The Future Of Online Customer Experience" report.
- ⁵ Source: Nathan Bos, Darren Gergle, Judith S. Olson, Gary M. Olson, "Being there versus seeing there: Trust via video," Collaboratory for Research on Electronic Work (CREW), School of Information, University of Michigan (http://www.crew.umich.edu/publications/01-01.pdf).
- ⁶ With QoS, traffic is identified usually by its application type, source, or destination and given a priority for transmission over the WAN. This may include how long it has to wait before being sent over the WAN, or the amount of available bandwidth reserved for a given application. The result is to ensure that time-sensitive packets are sent as quickly as possible, but at the expense of less time-sensitive packets.

- Users have great expectations when they visit your Web and mobile applications. They increasingly want an experience that's valuable, easy to use, aesthetically pleasing, and emotionally satisfying. To retain and gain customers, you have to continually win their hearts and minds by providing them with a compelling user experience (UX) that is useful, usable, and desirable. Application development professionals can take the user experience bull by the horns by following these best practices: 1) become your users; 2) design first; 3) trust no one test; and 4) inject user experience design into your software development life cycle (SDLC). For more information, see the September 4, 2009, "Best Practices In User Experience (UX) Design" report.
- Why are most organizations not achieving more with infrastructure virtualization? They just aren't ready to. Through more than 200 enterprise interviews, correlated with survey data, Forrester has identified four clear stages of infrastructure virtualization maturity that dictate readiness for various management and automation technologies, process improvements that must be made, and standardizations that have to be realized to achieve greater gains. Organizations progress from gaining acclimation with the technology, to strategically standardizing on it, through a period of chaotic VM sprawl that leads to process improvements, on to the point of pooling and policy-based automation. This last phase is akin to the processes followed by providers of cloud computing platforms. These improvements can't be fast tracked enterprises must go through each stage as they gain experience. But once you identify your stage of maturity there are clear steps you can take to move to the next stage. See the July 10, 2009, "Assess Your Infrastructure Virtualization Maturity" report.
- The explosive growth in mobile, video, cloud, and social technologies is creating a new movement that empowers individuals to solve customer challenges. Individuals who leverage these new powers are reshaping business, but their efforts are often hampered by manual and complex IT processes. Automation changes that. It presents an opportunity to empower infrastructure and operations (I&O) staff in a way that is proving to transform this IT entity from the stereotypical wasteful and sloppy band of geeks into a catalyst for business service. To make sure you empower your I&O staff with automation, you need to build a well-rounded automation portfolio and a business case that focuses on decreased skills costs, increased reliability, and enabling end user self-service. Next, you'll need to recruit automation champions from among the ranks of your most technical subject matter experts and avoid the common pitfalls of automating unrefined processes, starting with too large a project, and not implementing control points. See the October 22, 2010, "Empower I&O Staff With Automation" report.

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