Fuse Business Acceleration Technologies To Optimize User Experiences

by Andre Kindness, May 8, 2013

KEY TAKEAWAYS

**Mobility, Cloud, And The Empowered Employee Expand The Types Of Applications Traversing The Network**

Businesses and even application acceleration vendors were caught off-guard by this explosion. The delivery of applications into native mobile apps and mobile websites requires companies to manage, monitor, and optimize in a completely different way.

**I&O Pros Must Design And Deliver User Experience Networks**

A user experience network (uXn) is a network architecture that focuses on monitoring, controlling, and optimizing the quality of user experience. To deliver uXn, I&O teams must combine multiple business acceleration technologies, including ADC, WAN optimization, load balancing, FEO, security services, and CDN.

**Design For Workloads, Not Applications**

Applications and their particular traffic profiles come and go, but users and their workloads have staying power. Thus, if you apply the same workload-centric design principles that your counterparts are using to architect their data center service, you'll arrive at an optimal uXn design for your business.
Fuse Business Acceleration Technologies To Optimize User Experiences

Deliver Blazing-Fast Web, Mobile-Native, And Hybrid Applications

by Andre Kindness
with Laura Koetzle and Eric Chi

WHY READ THIS REPORT

Over the past decade, infrastructure and operations (I&O) teams have focused large amounts of resources on making their customer-facing websites blazingly fast because website experience had a direct correlation to customer satisfaction and revenue. The introduction of cloud, virtualization, and mobility has expanded the number of types of revenue-producing applications, which means that I&O teams need to optimize a much broader set of user experiences. The new business environment has narrowed the period between change; data, users, and applications are in constant motion; personal and business resources are no longer separate; and now there are mobile, web, traditional, and hybrid applications traversing the network. Thus, providing a network that can handle all of these elements is extremely complex. This report focuses on the networking technologies available to meet this challenge — principally application delivery controllers (ADCs), content delivery networks (CDNs), front-end optimizers (FEOs), load balancing, security services, and wide area network (WAN) optimization — and the best ways to deploy them to optimize the user experience.

Table Of Contents

2 Moving Beyond Blazing-Fast Websites

7 Business Acceleration Solutions Optimize User Experiences

11 Pitfalls To Avoid In Combining Acceleration Technologies

Notes & Resources

Forrester interviewed 14 vendor and user companies, including Akamai Technologies, Blue Coat Systems, Cisco Systems, Citrix Systems, Exinda, F5 Networks, Ipanema Technologies, and Riverbed Networks.

Related Research Documents

Virtual Network Infrastructure
December 12, 2011

Why I&O Must Design A WLAN To Provide The Best User Experience
June 21, 2011
MOVING BEYOND BLAZING-FAST WEBSITES

Some might theorize that enterprises — unintentionally — started a new business model when they leveraged websites to differentiate themselves. For example, Carfax and Expedia revolutionized their industries and tipped the scales of balance toward the consumer in the car and travel industry, Apple smashed the record retail market, and Amazon.com decimated the traditional book supply chain. Web applications allowed mass customization through the immediate deployment of a large and diverse range of applications to millions of global users. Ultimately, website technology enabled businesses to start shifting from high-volume, low-price/differentiation strategy to one of customized products and services.¹

Companies have shifted their employees out of headquarters and into locations closer to their customers. Mobile devices have become a core conduit for connecting users with content and the business. Gone are the days of users idling at their desks or in hotel lobbies, waiting patiently to connect to the virtual private network (VPN). Many of those same employees don’t log on anymore, because their mobile devices never disconnect. This means that today, I&O groups serve up:

- **Traditional applications.** Also known as native or desktop applications, traditional applications haven’t disappeared. Many legacy applications persist, and businesses still develop traditional applications to solve specific problems. Machine-to-machine conversations remain traditional. Native apps come with lots of elements preloaded and only need to fetch user data from the data center rather than the entire application, making them speedier.

- **Web applications.** I&O teams built many new web applications for their employees in order to reduce the number of lumbering desktop apps they needed to roll out and support. Because the heavy lifting in web applications happens on back-end application servers rather than in the web browser (thin client), web applications require a persistent connection and a lot of conversations between the client and server across the network.

- **Native mobile applications.** Mobile applications are fast, reliable, and optimized for the user’s experience, but they’re tied to a particular mobile platform. Although similar to traditional applications regarding some preloaded functions, mobile apps are lighter and perform smaller data transfers than traditional apps but have limited functionality, compared with traditional or web applications.

- **Hybrid mobile apps.** Leveraging Sencha, PhoneGap, or Titanium, these mobile apps offer a compromise between the performance of native mobile apps and the portability of web apps. Hybrid mobile apps ensure cross-platform compatibility and can access the mobile device’s local hardware elements (camera, GPS, user’s contacts). Since the hybrid application depends on the web browser, there is more traffic back and forth than in native mobile applications.
Time And Organic Growth Have Gummed Up Your Network

Businesses found that if their customer-facing website was not responsive, their customers would go elsewhere to read news, pay bills, buy electronics, trade stocks, find a date, watch videos, and do the myriad of other things people do on the Web. If they are “elsewhere,” then so are their eyeballs and their money. When I&O organizations started their consolidation campaigns, I&O professionals felt enormous pressures to ensure that nothing degraded the website’s performance or a user’s experience with a business application. Consolidation of applications, storage, and servers introduced new network stresses that could deform most traffic. Economic pressures also forced companies to consolidate and shed business units — which also altered traffic patterns and loads. I&O professionals responded by solving each problem as it arose: They changed link bandwidths, procured CDNs, deployed WAN optimization controllers (WOCs), and/or installed ADCs.

The effectiveness of these tools depends on traffic patterns remaining pretty constant, since they are deployed manually with certain assumptions about users’ location and their needs. For example, most business acceleration appliances' interfaces have input cells to prioritize applications. The appliances don’t have any business logic that examines the context of the application. I&O teams can't afford to solve these problems in this manner or piecemeal solutions together any more. Here’s why:

- **VM and data mobility.** You can’t count on data and apps staying within single data centers; business economics require active-active data centers. I&O organizations have to design the infrastructure to allow applications and data to migrate to any location depending on the prevailing needs of the business and its users. (see Figure 1).

  **Why this affects your network:** Networks will need to be agile and sophisticated to interweave the right data for the right user with the most appropriate piece of a multitiered application based on business policies.

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

  **Why this affects your network:** Besides the variety of access profiles that I&O professionals need to set up, mobile applications will share the network with traditional and web applications. Thus, IP addresses and transmission control protocol (TCP)/user datagram protocol (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 network — from the virtual machine port all the way to the client port.
■ **Distributed and mobile employees.** To meet their customers’ demands, employees — today — work anywhere and anytime they need to in order to be close to customers. Gone are the days of sales owning the branch office; campus offices will shrink, and marketing, human resources, engineering, and other teams will move into the branches to create heterogeneous branch offices.

**Why this affects your network:** Connections will shift from large pipes hosting a few thick threads to intricate brocades consisting of interwoven fabrics of applications, locations, policies, and users. To optimize the right services and deploy the right controls, your infrastructure will need to understand where the user is located, what devices he has, and where the data and applications he needs are located.

■ **Cloud.** Your employees are using X-as-a-service (XaaS) and consumer web services to get their jobs done. For example, many employees run into email attachment size restrictions and open accounts with Dropbox to share documents. Thus, one of your sales reps could be downloading a file from Dropbox, entering customer information into salesforce.com, and watching a new sales training video — all at the same time (see Figure 2).

**Why this affects your network:** With applications and services originating from inside and outside the infrastructure, network policies can’t be black and white: employee versus guest, business application versus recreation application, active versus standby, etc. A composite of network components (routers, load balancers, firewalls, and others) will connect that salesperson to the closet point of presence (PoP) site for salesforce.com and optimize that traffic over a streaming video from Netflix (see Figure 3).
Figure 1 Data And Applications Moving From Data Center To Cloud Or Another Data Center
Figure 2 Users Leveraging Multiple Devices And Applications (Internal And External)
BUSINESS ACCELERATION SOLUTIONS OPTIMIZE USER EXPERIENCES

I&amp;O professionals can’t think about optimizing traditional, web, native mobile, or hybrid application experiences in a vacuum and can’t look to one tool to optimize experiences across two or more types of applications. Many of these tools — on their own — struggle with the unique deployment and device delivery requirements of native mobile apps, because native mobile apps often require deployment to multiple device types and need to be delivered from different app stores or enterprise app deployment systems. Furthermore, it is extremely difficult to analyze and understand native
mobile app performance because the traffic will traverse company, external, and carrier networks. Thus, I&O teams must combine these business acceleration technologies to design and build a uXn. Forrester defines a uXn as:

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

User experience networking is critical to ensure that I&O is solving business issues, not technology issues. There are two steps to this process: staging the components and then weaving them together.

Staging The Components: ADC, CDN, FEO, Security, And WOC Services

In optimizing the user experience for the business, I&O professionals should start with:

- **Balancing network flows to the best compute and storage resources.** Initially, appliances were developed to help with server load balancing within a single data center. Today, they have transformed into ADCs with a more sophisticated role that enhances server efficiency and provides asymmetrical functionality to accelerate the delivery of applications from the data center to individual remote users. In particular, the ADC can allow a number of compute-intensive functions, such as secure sockets layer (SSL) processing and TCP session processing, to be offloaded from the server. In addition to global load balancing, F5’s Ether IP technology enables cloud bursting for rapid activation at the remote cloud site or possibly the transfer of instances among cloud sites.

- **Reducing the distance.** There are certain restraints technology can't overcome, and one of them is distance — because the speed of light is finite. If you have performance challenges with key content, such as video streaming, charting, or large Flash applications, consider rerouting it to a CDN’s private networks or using route optimization technologies that can fast-track key content. A CDN is a collection of web servers distributed across multiple locations to deliver content more efficiently to users. The CDN will typically select a server to deliver content to a specific user based on a measure of network proximity — such as the server with the fewest network hops or the server with the quickest response time. Most firms can’t afford to maintain their own CDNs, so I&O pros can contract with CDN service providers like Akamai Technologies, Mirror Image Internet, or Limelight Networks.

- **Tuning enterprise transport to optimize the traffic between data, compute, and users.** By using a combination of compression and quality of service (QoS) techniques, 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. I&O pros can purchase WAN optimization controllers
from traditional providers like F5 and Riverbed and from niche players like Nasuni and Panzura, and Amazon also offers its own solution for Amazon web services customers.

- **Building out the paths to cloud storage.** Cloud gateways act as a seamless broker to marry existing applications to an abundant supply of storage from storage-as-a-service providers. Much like traditional private storage infrastructures, gateways parse out data to multiple providers to help with costs and increase resiliency. The features vary from offering to offering, but they generally include data caching, WAN optimization, data encryption, synchronization, de-duping, and automation.

- **Optimizing the content before it hits the network.** Web optimization solutions or FEO solutions focus on analyzing each page of a site from the browser's perspective. These solutions dynamically rewrite any given web page to reduce the number of resources that the client needs to download — without breaking any of its elements. For example, FEO solutions combine JavaScript files (which reduces overall download time), optimize the order of the scripts, and rewrite HTML so that the browser can display the page more quickly.5

### Transforming Business Acceleration Technologies Into A User Experience Network

Applications and application types will come and go. To accelerate business services, your network must be optimized for the user and not the specific application. Internal personnel, customers, vendors, and partners will leverage internal and external resources to get their jobs done. Don't try to fit the user into a particular acceleration solution just because a product segment has historically done one thing well. Today's WOCs, ADCs, firewalls, etc., have a lot of similar capabilities (see Figure 4). Don't align yourself to the product, but think how caching, compression, QoS, and other services support optimizing user experience. Thus, building a uXn for users leveraging mobile, traditional, and web applications requires:

- **Designing to workloads, not apps.** Data centers aren't the only place workload designs are emerging.6 Users are workload-centric — like account managers — and leverage different apps to get their jobs done. For example, sales teams will use the internal network to demo a product and enter the sales order an hour later into a cloud-hosted customer relationship management (CRM) solution. Infrastructures should not only optimize the packets before hitting the network but also connect the user to the data and application at the closest location. Cisco's Cloud Connected solution does both by merging routing, WAN optimization, and Websense content filtering products to optimize internal traffic and by preventing hairpinning of external traffic.7

- **Getting the most out of SaaS.** Microsoft Office 365, NetSuite, SuccessFactors, and others have gained in popularity with enterprises. However, these services exist outside of I&O's network domain, and users can run into poor user experiences when accessing them across the Internet.8 Public networks and private networks must be interwoven and seamless to the users. One
solution to this problem is to combine WOC technology with CDN offerings. For example, Akamai embeds Riverbed WOC solutions at its PoP sites to optimize software-as-a-service (SaaS) traffic by caching, compressing, de-duplicating packets, enforcing QoS, accelerating protocols like HTTP, and predicting application calls. Not only can users get a better response from resources that are closer but also those CDN PoPs can get their updates quicker too.

- **Increasing resiliency and improving performance.** Multiprotocol label switching (MPLS) and the Internet are by far the two most heavily used WAN services today and get used depending on availability of the service and size of the office. Instead of having one link, businesses would be served if multiple types of links attached to each site — e.g., some combination of MPLS, digital subscriber line, cable, and 3G/4G services. Not only can bandwidth be saved by dumping Internet traffic straight to the Internet but also enterprises should consider split-tunneling/bonding links. For example, European carriers like BT use Ipanema’s Smart Path technology to push packets down the most efficient link while leveraging traditional WAN optimizers to compress and coalesce the packets.

- **Wrapping security around untrusted users, networks, applications, and data.** In zero trust, all network traffic is untrusted, but maintaining business efficiencies prevents organizations from sending all of the traffic to one super security zone. I&O should take a page from manufacturing and the total quality management philosophy. Basically, each area in the packet’s travel should be participating in verifying, limiting, enforcing, inspecting, and logging traffic. Citrix’s NetScaler embeds application firewall security right in the path of packets to and from servers while encrypting/de-encrypting data.

- **Improving operational efficiency.** Technology, solutions, and services are converging. Instead of running out and adding another vendor to their portfolio, I&O professionals should look at what they have internally and evaluate if their current vendor’s portfolio has the ability to meet the expanding business requirements. For example, CDN companies like Level 3 offer other optimization capabilities, and your hardware vendors may offer multiple acceleration technologies that you’re not yet using. For example, CDN and FEO services are highly complementary, since caching the optimized page elements can increase performance further. Level 3 is offering Strangeloop’s FEO technology as a service called CDN Site Optimizer.
**Figure 4** Application Acceleration Technologies Merging Into Business Acceleration Services

![Diagram showing the merging of Application Delivery Controller (ADC), WAN Optimization Controller (WOC), Security, Load Balancing, Firewall, Packet Coalescing, Compression Caching, Asymmetrical, Symmetrical, Cloud Gateway, and Front End Optimizer (FEO).](source-board.png)

**Recommendations**

**PITFALLS TO AVOID IN COMBINING ACCELERATION TECHNOLOGIES**

I&O teams need to coordinate infrastructure elements such as ADC, CDN, FEO, security, and WOC services to create the best user experience of the business’ applications. Here are some common pitfalls that I&O teams need to watch out for:

- **Don’t forget to invite the networking team to the new app kickoff party.** The networking team might not be the coolest group in I&O, and its habit of saying, “It can’t be done,” doesn’t tend to make the team members very popular party guests, but you’ll need them.
With data, compute, and users spread all over the world, your network probably isn’t ready to weave them all together seamlessly. This is why Forrester Leadership Boards — consisting of CIO — have placed networking at the top of their priority list.11

- **Avoid throwing darts blindly at the board.** When exhaustion sets in from firefighting, it can be tempting to buy into the latest marketecture offering double- and triple-digit performance improvements for users accessing web services. Forrester has found through client inquiries that most organizations really do have good understanding of what is causing the issues. The lack of visibility tools and knee-jerk assumptions means that I&O likely hasn’t completed a deductive failure analysis, like fault tree analysis.12 According to Forrester’s Forrsights Business Decision Makers Survey, 63% of IT executives and technology decision-makers have intelligence and decision support tools at the top of their priority list. The business side understands that the information and visibility are fundamental concepts in business and should be in I&O.

- **Do not deploy new apps without knowing where their users and resources are located.** Historically, I&O professionals bought based on the most-power product, looked for the biggest set features, or asked Forrester about the best-in-class product. I&O organizations should look for the best solution for their business and not the best in the market. For example, Limelight, Akamai, and Level 3 offer some of the largest CDN infrastructures, but it makes no sense to pay for their global reach if your business only serves customers in Germany, Austria, and Switzerland. As an alternative, OnApp works with 400 service providers (with more than 90 PoPs in 34 countries) to create customized CDN services based on buying unused capacity.

- **Resist the urge to choose the best-of-breed product for each area.** The ability to orchestrate the right services to meet a user’s expectations requires an infrastructure that has a set of interwoven components, with each adding a unique value but working together as a unit. As a technologist, it’s far too easy to get stuck on a particular technology or solution. In the same vein, it’s also too easy to assume that there’s only one way to solve a problem. F5, Riverbed, Cisco, and Level 3 have expanded their capabilities well beyond their original core competencies.

- **Don’t forget to monitor.** I&O teams usually spend far more resources on new networking solutions than they do on monitoring — and now more than ever, that’s a mistake. Optimizing a user’s experience requires information about what the user is doing, where the data is located, and where the devices are connecting from, etc. The fluidity of data, users, and applications makes it impossible for I&O teams to effectively manage this world with manual controls, tools, and resources; it is time to have automation take over, which requires fault, configuration, traffic, security, and performance information.
ENDNOTES

1 Businesses are demanding that IT departments respond by helping them achieve goals such as embedding themselves into their customers’ lives. This is causing a business metamorphosis of organizations, ranging from those with a few large locations to those with multitenancy in a lot of locations. For example, banks are closing large branch offices and creating smaller boutique locations in places such as grocery stores so that they can be part of people’s everyday flow and remain in their minds. Traditional big-box stores like Target, JCPenney, and Toys R Us are filling mall vacancies and walkways with pop-ups. The goal is to test out new product lines or to offer more locations for shoppers to get the hottest products at a fraction of the cost of traditional retail models. See the June 21, 2011, “Why I&O Must Design A WLAN To Provide The Best User Experience” report.

2 Due to the massive growth of smartphones shipping with native app stores and to the plethora of companies boarding the app bandwagon, uptake of apps has increased, with 42% of European and 44% of US online smartphone users ages 18-plus downloading apps at least monthly. See the May 18, 2012, “The Mobile Application Life Cycle” report.

3 Already, 15% of the global information workforce is anytime and anywhere, and we expect that number to triple by 2016. Smartphones and tablets break the shackles of PC-bound productivity tools and allow employees to carry their office everywhere. See the December 18, 2012, “The Business Impact Of Mobile Engagement” report.

4 For more information on the new network strategy around user experience application delivery, see the February 17, 2011, “Focus Your Network Strategy On User Experience, Not Application Delivery” report.

5 For example, a web content optimizer solution reduces HTTP requests; compresses page resources; increases caching; optimizes image combining and in-lining multiple images, packing multiple JavaScript files into a single instance; maintains browser and search engine compatibility; supports common JavaScript frameworks; and supports dynamic content. For a complete list of these best practices, refer to High Performance Web Sites: Essential Knowledge for Front-End Engineers by Steve Souders. Source: Steve Souders, High Performance Web Sites: Essential Knowledge for Front-End Engineers, O’Reilly Media, 2007.

6 To deliver better business results over the next decade, the next wave of IT infrastructure computing in the data center is what Forrester calls the “workload-centric” era. Put simply, Forrester defines workload-centric infrastructure as: designing your server, storage, network, and facilities IT infrastructure in your data center around what matters most — your workloads — and not the other way around. And what exactly do we mean by workloads? Basically, a workload is a category of applications or unstructured data that have common tools to optimize the provisioning, management, data protection, and other disciplines associated with making them work and can be consolidated into an optimized technology architecture. See the September 7, 2012, “Optimize IT Infrastructure Around Key Workloads” report.

7 Hairpinning is the use of an MPLS network that connects branch offices to data centers for Internet traffic. In essence, Internet traffic travels from branch office to data center, only to be forwarded to Internet access within the data center, consuming MPLS bandwidth for public cloud services. Hairpinning is not sustainable as more applications are being moved to the public cloud at speed; it’s only a matter of time that
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hairpinning will be a major cause of poor user/application experience as it consumes a greater percentage of traffic flowing over the MPLS branch/data center network.

8 WAN optimization is a symmetrical solution, and SaaS providers don’t offer customers the ability to host a WAN optimization solution on their premises.

9 For more information on applying zero trust to the extended enterprise, see the August 5, 2011, “Applying Zero Trust To The Extended Enterprise” report.

10 One useful metaphor for planning a software portfolio is the shopping mall. Shopping malls have developed a common model based on a few anchor stores, such as JCPenney and Macy’s, augmented by many boutiques, such as Radio Shack, Foot Locker, specialty clothiers, and at least one pizza shop. Management tool portfolios can benefit from a similar model. This doesn’t mean that you grant the anchor an unfettered monopoly over your purchase decisions. You must maintain an open mind to competitors, because it keeps your anchor honest and because your options require flexibility to anticipate changing conditions.

11 This is based on a questionnaire of top concerns for 2012.

12 Fault tree analysis (FTA) is a top-down deductive failure analysis in which an undesired state of a system is analyzed using Boolean logic to combine a series of lower-level events.
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