

# Application

## Acceleration Challenge

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# Application Acceleration Challenge

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### THE CHALLENGE SERIES

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#### Editor/Publisher

Steven Taylor taylor@webtorials.com

#### Production Coordinator

Jacob Gregory

#### Design/Layout Artist

Debi Vozikis

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# Going Mainstream:

## Application Acceleration and WAN Optimization

Whether you use the term “Application Acceleration” or “WAN Optimization,” the important thing is that it works. The many recent customer implementation success stories and a recent test prove the point. Depending on the application, you can expect reduction in bandwidth of between 30% and 95% with 70% to 90% the norm, and, in addition, you can cut response time by a factor of three to five times. What this means is that application acceleration is ready to go mainstream and be deployed throughout the enterprise. The issue is shifting from “Does the technology work?” to “Which vendor provides the best solution that can be deployed in large scale throughout the enterprise?” The goal of the Challenge is to give each vendor a chance to tell you why their solution is the best one to deploy.

Before getting into the issues that are central to wide scale deployment, let's put the performance issue in terms that are easy to understand and that also demonstrate why performance, though important, is not the only issue.

Assume the link to the branch office runs at 35% utilization with a 25% per year growth rate. It would take only three years for the utilization to be near 70% and would require an upgrade by the end of the fourth year when the utilization reaches 85%. With WAN optimization the picture is radically different. Assume the acceleration equipment provides only a 70% reduction, a conservative value. The 35% initial utilization would drop to 10%. The growth rate would also go down to 8% rather than the 25% that was the rate without acceleration. An upgrade would now not be necessary for another 10 to 11 years.

What about response time? Let's get one fact out in the open: Acceleration may be the only way to improve response time. Just upping the line speed will not necessarily solve response time problems with HTTP applications and Microsoft's servers. The protocols and the way they work get in the way.

Don't worry. Acceleration can do a lot to make life better for end-users. Again, real enterprise stories and a recent vendor test in Network World confirmed that the vendors' solutions greatly improve response time. A Network World test of four vendors found that they improved response time for downloading a Microsoft file under different link conditions by a median factor of 5; the average was even better at 10. This means that if it took 30 seconds to send an unaccelerated file, then acceleration would reduce it to 6 seconds, making it appear as if the file was still coming from a server on the LAN. Application acceleration means there is no need to shelve data center consolidation plans because of concerns about user response time.

The performance improvements and utilization reductions provided by application accelerators are important, and they are one of the primary reasons for buying acceleration equipment. The tests reported that the range of reduction for file transfers was 26 to 85 times for the four vendors. Normally it would be clear that the vendor with the higher value is the best vendor, but it does not make as much of a difference as it appears. If the line utilization is 70% then the vendor that reduced the bandwidth requirements of the file transfer by a factor of 85 would result in a line utilization value of less than 1%. The vendor that only reduced it by a factor of 26 would result in a utilization value of less than 3%. What looks like a large difference results in an insignificant difference in the resulting utilization. If the vendors provide a reduction by a factor of 10 or more, then other factors should be used to select the vendor.

Response time is a little more complicated. Response time reduction will generally not be as high as the bandwidth reduction factor - more like 3 to 6 times - because of the way protocols work. There is a significant difference between an improvement of 3 times versus one of 6 times. If the file took 30 seconds to download before acceleration, then a reduction by a factor of 6 would reduce it to 5 seconds. This is a noticeable improvement over a reduction of 3 times with its 10 second response time. If large file transfers or emails with large attachments are a primary concern, then which vendor can provide the most reduction is still an important way to differentiate between the offerings.

That is less the case with smaller transactions, such as a Web page. A simple example shows why. Assume a Web page has an unaccelerated response time of 10 seconds. A reduction by a factor of 3 times brings the response time down to a little over 3 seconds. A reduction by a factor of 6 reduces it to less than 2 seconds, a difference that users may not notice. Even with response time reduction there is a limit after which performance increases don't matter. Anything more than 10 times means that the 10 second response time is now sub-second, and once it is below sub-second users will not notice the difference. So don't get carried away by one vendor's claim of a huge reduction factor. Just make sure they provide a reasonable reduction and then consider other factors.

An important caveat is that you should run your own tests to confirm that all the vendors you are considering provide the same range of performance improvements. The actual reduction varies widely depending on the protocols and applications within your network and the speed and characteristics of the links. Every vendor has concentrated on accelerating Microsoft's CIFS protocol and HTTP traffic, and the test results used above are about these protocols. But there is more to most enterprise networks than CIFS and HTTP. With other applications and protocols there could be big differences between the vendors. Make sure to ask how much the vendor accelerates and optimizes protocols that are critical in your network.

It is also important to distinguish between acceleration and optimization techniques that are "generic" (in that they apply to all TCP traffic) and protocol-specific optimizations. Many of the techniques, such as TCP optimization and compression, can be applied to all TCP/IP traffic. No special protocol knowledge is required. If accelerating a particular protocol is important, make sure you understand what protocol-specific acceleration is applied to it.

CIFS acceleration demonstrates this point. CIFS is accelerated by first applying generic optimization techniques including advanced compression. This accelerates the traffic, but, without applying CIFS-specific acceleration techniques, the gains reported in the test would not be achieved. All the vendors apply both generic and CIFS-specific acceleration techniques, but that is not true for all the protocols and applications found within a corporate network. If two vendors both say they provide acceleration for a particular protocol, have them explain how they achieve it and compare their explanations. Don't just compare their list of accelerated protocols.

## Mainstream Issues

If performance is not the only issue, maybe not even the most important, what is? "Going mainstream" means that there is a list of other issues that rise to the top. The questions to ask include:

- How does the vendor support consolidation of servers to the data center? What applications and server protocols do they accelerate and how much? What are the implications of deploying the vendor's solutions with functions such as DHCP and local printing? What are the tradeoffs with their implementations?

- Does the vendor support a wide range of protocols and applications that are found on your network? What type of acceleration does the vendor provide for less common protocols? Do they provide any acceleration for applications such as Oracle, SAP and SharePoint? Can they prevent non-business and recreational traffic from having an adverse impact on performance? How do they ensure that VoIP traffic is not adversely affected?
- Does the solution scale? Does the solution have enough throughput? Are there a wide range of solutions that fit all your branch offices? How hard is it to add additional accelerators? How does adding branch office accelerators affect resource usage in the central accelerator?
- How do you manage it? Will it fit within the existing management scheme? How easy is it to install? What level of support does the vendor provide?
- What effect does it have on the current network design?
- How are mobile workers and telecommuters supported? Does a software client provide the full range of functions?
- How does it handle encrypted traffic? Can it accelerate and optimize encrypted data within the packet?
- Are there security issues associated with deploying the solution?

All of these questions are important but space doesn't allow detailed analysis on all of them. Thus, I have asked the vendors to concentrate on their key advantages – the ones that set them apart from their competitors.

I did not expect them to answer every question or address every issue. What I have asked them to do is address what they consider the most important issue and give you an idea on how they approach the problems. If you like one vendor's answers, use this information to challenge the other vendors to explain how they answer it and why their solution is just as good or better. The goal is to educate you so you can ask better questions. At the end of each section, the vendor's contact information is provided, and you can find more information about the technology and their solutions on their web sites.

This is just the first part of the challenge, the competitive part where I ask them to explain why they are the best. There is a complementary portion of the challenge that will allow you to learn more about application acceleration and the vendor's solutions via interviews with each vendor.



**If you have any comments about this Challenge you can contact me at [Robin@Layland.com](mailto:Robin@Layland.com)**

# Cisco Wide Area Application Services (WAAS)

## Enterprise-class WAN Optimization Solution Leader



by Feng Meng  
 Product Marketing Manager  
 Cisco Wide Area Application Services  
 Data Center Solutions, Cisco



This document describes some of the most important reasons that more than 1500 IT organizations have standardized on Cisco® Wide Area Application Services (WAAS) to dramatically improve WAN performance despite the fact that Cisco WAAS has been shipped for only 12 months. You will learn a set of best practices recommended by Cisco enterprise customers to ease long-term operation of WAN optimization, looking beyond raw performance.

### Cisco WAAS Optimization Performance

To maximize WAN optimization benefits, Cisco WAAS delivers market-leading performance with up to 99% bandwidth usage reduction and often 100-times faster application. The following Cisco customer and 3rd party testimonials validate some of these benefits:

“...Cisco's Wide Area Engine (WAE) appliances were by far the most effective at compression, using nearly 28 times less bandwidth than was used in our baseline, no-device test. In contrast, the bandwidth savings for other devices seeing data for the first time was usually less than a two-time reduction in bandwidth, according to measurements taken by a ClearSight Networks Network Analyzer.”

— David Newman, Clear Choice Tests, Network World, August 13, 2007





“Cisco WAAS accelerated our Web application by 60 times.”

—Paul Babcock, Manager of Network and Computer Operations, Bissell Homecare, Inc.

“The Cisco WAAS and data domain pre-integrated solution showed 282 times faster data replication over T1.”

—A Fortune 500 retail company

But Cisco customer feedback indicates that raw performance is not the only requirement. To ease long-term reliable operation of WAN optimization as a mainstream service across large, complex enterprise environments, Cisco recommends an interoperable, secure, and scalable approach to minimize disruption to organizations' existing network, security and application infrastructure:

<p><b>Interoperability and Reliability</b></p>	<p>“Cisco WAAS accelerated Microsoft Dynamics CRM application better than our incumbent solution, while offering better performance and <b>interoperability</b> with VoIP infrastructure.” <b>Dave Kizer, Director IT, Nanometrics</b></p>	
<p><b>Secure WAN Acceleration</b></p>	<p>“Providing both <b>acceleration and stateful protection</b> are critical WAN optimization requirements for our loan and retail application data.” <b>Barth Bailey, VP network infrastructure and security, Fulton Financial</b></p>	
<p><b>Scalability Performance</b></p>	<p>“WAAS offered us a <b>scalable</b> solution, accelerating all the applications including Exchange, SQL, file and printing services, SAP, and our freight-forwarding system accessed through Citrix.” <b>Bill Fraser, VP of Operations for Panalpina</b></p>	
<p><b>Total Cost of Ownership</b></p>	<p>“Cisco WAAS has proven to be an essential component for the success of our server centralization initiative. <b>Our OpEx and data integrity have appreciably improved.</b>” <b>Bill Waszak, CIO, Scotts Miracle-Gro Company</b></p>	

**Interoperability with Monitoring Eases Application Performance Management**

The unique Cisco WAAS transparent architecture and integration with the NetQoS performance management system allows organizations to quickly measure application response times, traffic flows, and WAN utilization and accurately report Cisco WAAS ROI benefits to business decision makers. Other WAN optimization devices cannot provide this capability. As illustrated in Figure 1, any WAN optimization technology divides a single TCP session into three segments and hence causes monitoring systems to measure LAN instead of remote-user response times; incorrectly reporting that the application response time was zero. The effect on long-term operations can be significant due to the difficulty of accurately quantifying the full benefits of WAN optimization.

The integration between Cisco WAAS and NetQoS enables organizations to accurately quantify Cisco WAAS response time improvements before and after optimization, and deliver consistent and optimized applications to end users.

**Reliably Reporting Application Response Time**

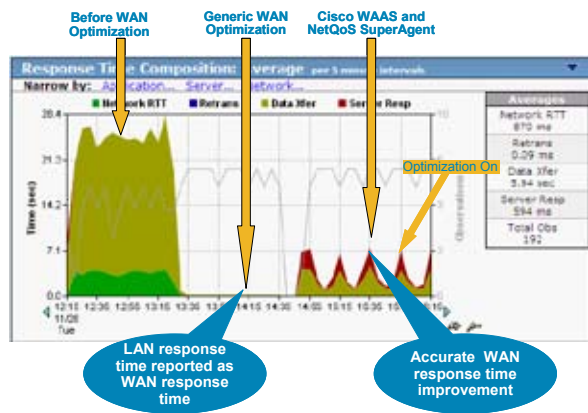


Figure 1: Reliably and Accurately Report Application Response Time

**Interoperability with Voice over IP Optimizes Call Quality**

Cisco WAAS is designed to be integrated with the router QoS. This integration allows the router to tag the VoIP QoS once correctly, rather than creating two sets of conflicting QoS policy. Thus, time-sensitive VoIP traffic will receive prioritization benefits from organizations' existing router QoS policy and investment and also avoid any processing delay caused by WAN optimization. The result is better VoIP quality and performance. This improvement is significant enough that a manufacturing company has switched from a non router-QoS transparent WAN optimization solution to Cisco WAAS. Organizations can avoid this cost up front: <http://www.networkworld.com/news/2007/062807-cisco-wan-gear-preserved-nanometrics-voip-quality.html>.

**Interoperability with Business Applications Helps Ensure Reliability**

Cisco WAAS offers high-performance acceleration for important business applications without the use of invasive and risky reverse engineering. For example, joint interoperability testing among Cisco, Oracle, and Microsoft showed significant acceleration benefits for Microsoft Office SharePoint Server 2007 and Oracle E-Business Suite (Figure 2). The combination of joint interoperability testing, appropriate licensing agreements and escalation support among the three industry leaders allows networking

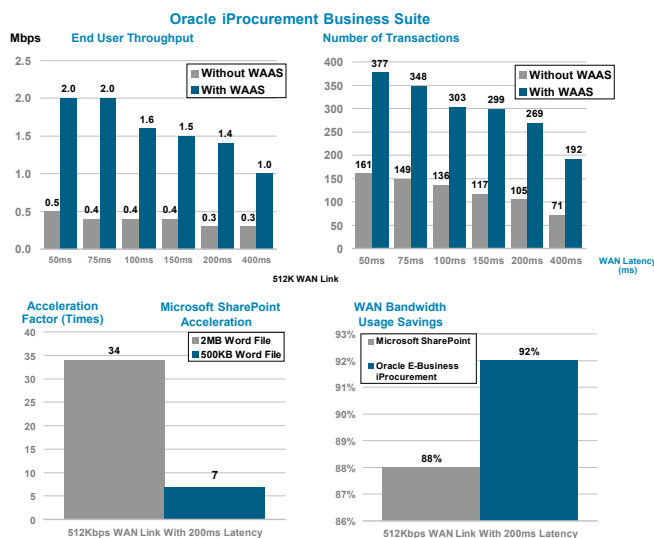


Figure 2 Oracle E-business iProcurement and Microsoft SharePoint Acceleration

and application groups within IT organizations to confidently deploy WAN optimization, and minimize the risk of difficult troubleshooting and collaboration.

**Secure WAN Optimization Minimizes Risks**

According to the market research firm Infonetics, the top IT trend in recent years has been the integration of security technologies such as firewalls, VPNs, and intrusion detection systems (IDSs) into routers. This assessment is validated by the rapid adoption of embedded security into more than 3 million Cisco integrated services routers shipped. Taneja Group confirmed this through its May 2007 Branch Office survey, in which 250 IT directors mandated that WAN optimization preserves their integrated branch security investment. Their top IT priority for a remote-office solution is data security, with WAN optimization the next priority. Cisco WAAS allows organizations to protect their branch security investments by offering these capabilities:

Protection of data at rest	Protection of data in transit
<ul style="list-style-type: none"> <li>• 256-bit AES disk encryption based on FIPS level 2 specifications</li> <li>• Centralized key management including automated backup and recovery, and robust failover support</li> <li>• Role-based Access Control interoperable with Microsoft Active Directory, RADIUS, and TACACS+</li> </ul>	<ul style="list-style-type: none"> <li>• Secure WAN acceleration – Stateful protection of accelerated traffic using Cisco firewall and IPS devices</li> <li>• PCI 1.1 compliance</li> <li>• Ongoing common criteria evaluation</li> </ul>

**Best Practices Enable Scaling with Simplicity, Reliability, and Performance**

Cisco has helped more than a dozen Fortune 500 organizations implement WAN optimization across several hundred sites using the following scalability best practices:

- Simplicity: 50,000 optimized sessions, with 1Gbps optimized WAN throughput, without the need for load balancing
- Reliability: 6 million optimized sessions, with 32Gbps optimized WAN throughput using your existing LAN switch WCCP for load balancing and with no single point of failure, without the need to buy an external load balancer
- Performance: 16 million sessions, 64Gbps optimized WAN throughput using an external load balancer such as Cisco Application Control Engine (ACE)

**Embedded WAN Optimization Minimizes Total Cost of Ownership**

While offering the flexibility of both appliance-based and router-integrated solutions, Cisco believes there is economic benefit to integrating WAN optimization within the router. In a brief 9-month period of shipping the Cisco Integrated Services Routers (ISR) with embedded WAN optimization, Cisco has helped more than 1500 organizations of all sizes to achieve additional OpEx savings beyond traditional WAN optimization benefits. In fact, more than 60% of all organizations’ branch devices were WAAS modules for the Cisco ISR. Norcraft Companies, a leader in the kitchen and bath cabinetry industry, has deployed WAN optimization to support its nationwide branch server consolidation initiative. Norcraft saw 68-84% acceleration for Microsoft SQL and print traffic. “Cisco WAAS minimizes our OpEx by allowing us to centrally pre-configure WAN optimization with routers and install them at remote offices without sending our limited IT staff onsite,” says Darin Wipf, director of IT at Norcraft. “Its similar management interface with the router required no new training for my IT staff.”

**Summary**

Cisco WAAS not only offers outstanding acceleration performance, but also provides the most interoperable, secure and scalable solution to ease long-term operation of WAN optimization.



# Delivery Any Application to Any Location



by Mark Urban  
Director of Product Marketing  
Packeteer, Inc.



Enterprises increasingly rely on applications to run their businesses. The breadth of what IT has to deliver is often daunting – ERP, CRM, manufacturing software, inventory, financial transactions, IP Telephony, document collaboration, communications, and numerous IT services that make it all work. Add recreational traffic and you can see how over 200 applications run on the average enterprise network, with upwards of 500-1500 applications in large, diverse enterprises.

And IT must deliver these applications to a distributed enterprise. WAN & Internet services connect offices, mobile users, suppliers, and customers. But performance of applications over the WAN can encounter many problems:

- Congestion
- Distance latency & protocol design
- Centralized delivery architectures
- Malicious traffic (worms, virus and DDOS) & recreational applications

There are many technology alternatives that solve various issues, including acceleration, QOS, compression, caching, local service delivery. But some technologies, left to their own, can actually exacerbate performance issues for critical applications. Do you want big file downloads to go faster? What if making file downloads go faster causes problems with SAP or IP Telephony? What if that file download is from iTunes? The truth is that acceleration-only tools can solve performance problems – but if applied with ‘brute force’ they can also cause problems.

## A Best Practices Approach to Performance Issues

So how do you sort through hundreds of applications, focus on the key issues, and determine what tools to employ to fix the problems? Packeteer’s Intelligent LifeCycle provides a guideline to answer those questions and steer you through WAN and Internet performance issues. The approach is a series of four simple steps that begins with Intelligence and leads to high performance application delivery.

**Assess:** Identify what applications are running on the network, what approaches to take to resolve issues, and then continuously monitor performance.

**Provision:** Create network resource policies to align network resources with the business and protect key applications, contain problematic traffic.

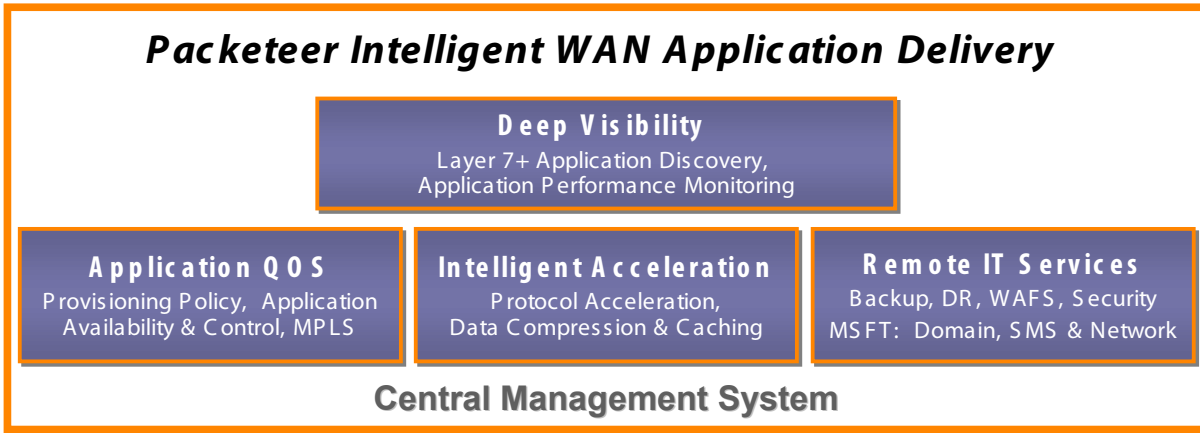
**Accelerate:** Overcome latency & protocol issues to enhance performance and capacity.

**Deliver:** Create an intelligent overlay that extends and adapts current infrastructures to new and emerging issues that cross server domains, networks and applications; deliver IT services locally without a server and enhance security & ensure performance across the network.



### The Packeteer Solution – Start with Intelligence

Packeteer is the only company to deliver an entire system that ensures performance of every application at every location. Whether it be acceleration, application QOS, or local services, our intelligent system discovers all the applications running on your network and allows you to apply the right technologies to the right problems. We combine application performance monitoring – visibility – so that you can not only solve problems, but keep on top of issues before they impact users. Packeteer provides a FULL suite of optimization tools to solve problems for every application, at every location.



### Delivering Any Application

There can be literally hundreds of applications running on an enterprise Wide Area Network. Packeteer is the only solution effective at delivering the broad spectrum of applications. Performance results may vary, but below are some example applications and the results that were achieved after employing Packeteer’s technologies:

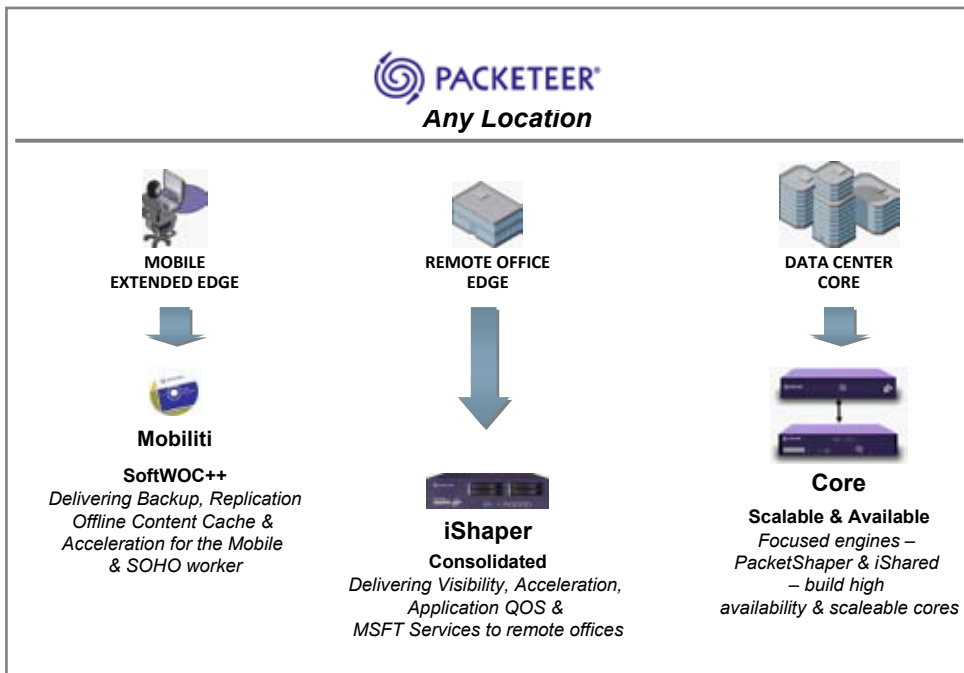
Application	Results	Primary Technologies Employed
<b>Convergence: IP Telephony &amp; Video Conferencing</b>	<ul style="list-style-type: none"> <li>Reduce jitter by 60%2</li> <li>Reduce video conference session setup by 70%3</li> </ul>	<ul style="list-style-type: none"> <li>IPT/VOIP Quality Monitoring</li> <li>Application Classification</li> <li>Per call Application QOS</li> </ul>
<b>ERP Applications</b>	<ul style="list-style-type: none"> <li>Accelerate performance by 75%2 -95%</li> <li>Reduce WAN bandwidth by 70-98%</li> </ul>	<ul style="list-style-type: none"> <li>Application QOS</li> <li>Compression</li> <li>TCP acceleration for higher latency links</li> </ul>
<b>Business Web</b>	<ul style="list-style-type: none"> <li>Accelerate performance by 50%2-90%</li> <li>Reduce WAN bandwidth by 60-90%</li> </ul>	<ul style="list-style-type: none"> <li>Application QOS</li> <li>Compression</li> <li>TCP &amp; HTTP acceleration for higher latency links</li> </ul>
<b>File Access (CIFS)</b>	<ul style="list-style-type: none"> <li>Accelerate file access by 98%</li> <li>Reduce bandwidth by up to 97%</li> <li>Reduce storage by 2 TB4</li> </ul>	<ul style="list-style-type: none"> <li>Wide Area File Services</li> <li>CIFS Acceleration</li> <li>Bulk caching</li> </ul>
<b>E-Mail</b>	<ul style="list-style-type: none"> <li>Reduce WAN Bandwidth by 90%+</li> <li>Accelerate access</li> </ul>	<ul style="list-style-type: none"> <li>Exchange acceleration</li> <li>Compression</li> </ul>
<b>Server Consolidation Services</b>	<ul style="list-style-type: none"> <li>Reduce WAN bandwidth by 80-95%</li> </ul>	<ul style="list-style-type: none"> <li>Local delivery of services: print, SMS, DNS/DHCP</li> </ul>

<b>System Management Server (SMS)</b>	<ul style="list-style-type: none"> <li>• Reduce bandwidth by 70-95%</li> </ul>	<ul style="list-style-type: none"> <li>• Local SMS service delivery</li> <li>• Byte caching</li> </ul>
<b>Recreational traffic</b>	<ul style="list-style-type: none"> <li>• Contain to 0-10% during peak usage</li> <li>• Allow usage as excess bandwidth available</li> </ul>	<ul style="list-style-type: none"> <li>• Traffic AutoDiscovery &amp; Application Classification</li> <li>• Application QOS</li> </ul>
<b>Malicious Traffic</b>	<ul style="list-style-type: none"> <li>• Identify infected hosts</li> <li>• Protect critical apps during outbreak</li> <li>• Contain propagation traffic</li> <li>• Maintain WAN availability</li> </ul>	<ul style="list-style-type: none"> <li>• Application classification</li> <li>• Connection diagnostics</li> <li>• Application QOS</li> </ul>

- <sup>1</sup>Packeteer Testing
- <sup>2</sup>Inergy Automotive Case Study
- <sup>3</sup>Logitech case study
- <sup>4</sup>Nortel Case Study

### Reaching Any Location

Finally, with the enterprise workforce becoming increasingly more distributed, Packeteer’s products are designed to offer high performance WAN optimization for any location across the enterprise. Packeteer’s product suite addresses the highly distributed network enterprise with solutions that reach from high capacity data centers, to mobile and SOHO workers.



Packeteer provides a single, unified system for discovering applications in the network, monitoring their performance, accelerating and optimizing their delivery, as well as providing key Microsoft services to remote sites. Whether it’s file acceleration, server consolidation, convergence, MPLS or problem traffic, Packeteer is able to help you deliver any application to any location

**More info and general contact info:**  
**info@packeteer.com** for contact information, and  
**http://www.packeteer.com/company/moreinfo/**

# Riverbed: Market Leader

## with the best performance

The Riverbed logo features the word "riverbed" in a lowercase, sans-serif font. The "i" in "river" has a dot above it. The "b" in "bed" is significantly larger than the other letters. The logo is orange.

by Alan Saldich,  
VP of Product Marketing and Alliances  
Riverbed Technology



### Introduction.

Riverbed is the undisputed market leader of the fast growing Wide area Data Services (WDS) market. WDS is known by several other names and acronyms like WAN optimization, application acceleration, Wide Area File Services (WAFS) and Wide Area Application Services (WAAS). WDS includes any symmetric solution involving appliances or software on either end of a wide area network (WAN) connection that optimizes and accelerates application traffic using a variety of techniques.

### Business Drivers.

The trends driving Riverbed's incredible growth are actually quite straightforward. Globalization, IT consolidation and virtualization, business continuity and organizational flexibility all play into the equation.

- **Globalization.** Everyone knows that globalization is a mega-trend driving business in many ways. As Tom Friedman said in his book, "the world is flat."<sup>1</sup> Companies are now complex organizations with people, customers and suppliers all over the world. Building IT systems to support flat-world organizations is a tremendous challenge, and Riverbed can make it possible.
- **Consolidation and Virtualization.** While organizations are becoming more and more distributed, the CIOs of these companies are facing threats and challenges in managing the distributed IT infrastructure required to support global operations. In order to get a handle on costs and complexity, and to reduce the tremendous security and confidentiality risks they face, most CIOs today are looking at ways to consolidate, rationalize and virtualize their IT infrastructure. It's one thing to consolidate and virtualize within one data center, but when you're trying to do it across hundreds or thousands of sites around the world, Riverbed make a successful site consolidation project possible.
- **Business Continuity / Disaster Recovery (BCDR).** What do you do to prepare for disaster or severe operational disruption? Every CIO in the world has put a plan in place for BCDR – what's changing is the distances data must travel to meet the ever more stringent requirements (like the DR site must be connected to a completely different electrical grid which could be hundreds or thousands of miles away). Riverbed can make it possible to implement a global BCDR plan successfully.
- **Organizational Flexibility.** With companies serving customers in vastly different markets around the world, it's critical to be able to move resources quickly to the right place at the right time – of course in today's world, moving people means ensuring that they have access to the data, systems and applications they need to do their jobs. An employee without information is useless. When people are moved from one city to another, or even to a new continent, they expect their applications to continue working correctly and at the same level of performance.

<sup>1</sup> The World is Flat, by Tom Freedman, © 2005, Farrar Straus and Giroux

### Riverbed's Financial Background.

As of September 30, 2007 Riverbed had over 3,000 customers, far more than any other customer. Riverbed is on sound financial footing also – the company went public in the fall of 2006 (NASDAQ: RVBD), and had the most successful technology IPO of 2006<sup>2</sup>. We have over 500 employees, offices throughout North America, Europe and Asia, and 24 x 7 “follow the sun” support centers in six locations around the world. In Q3 of 2007, Riverbed had over \$63 million of revenue, up 17% over Q2 and 157% over Q3 of 2006, and over \$200 million in cash on hand.

### Products.

Our line of WDS products are based on a dozen different Steelhead appliances, plus Steelhead mobile software for laptops or remote desktops. Not only do we offer the widest range of sizes in the market today, from a client software version for one individual to our largest appliance-based model that supports ten thousand users in a single box (and up to hundreds of thousands in clustered configurations using the Riverbed Interceptor®).

### Performance.

According to the latest tests performed by *Network World* in September 2007, Riverbed comes out on top across the range of applications tested.<sup>3</sup> Riverbed has also won three back-to-back “Product of the Year” awards from *InfoWorld* magazine for best WAN accelerator, and virtually every other award given in the category over the last few years. In fact, in head-to-head competitive bake-offs against other vendors at customers, Riverbed continues to win over 90% of the deals, and added 500 customers during Q3 alone.

The performance of WDS products are typically measured along two primary axes: bandwidth and time. The former measures the percentage of traffic that can be removed, while the latter measures the response time reduction from the perspective of the end users. Both are important, and must be measured across the wide range of applications used by enterprise customers.

### Scalability.

For large companies, scalability is a critical issue, and Riverbed leads the pack in this regard. From the Steelhead Mobile client for one individual, all the way to the Steelhead 6120 with over 3 TB of data store capacity, Riverbed has the most scalable solutions on the market. The Riverbed Interceptor, a connection load balancer for Steelhead appliances, can be used to deploy many appliances in a virtual in-path high availability configuration. The Interceptor makes it possible to do this deployment which is physically out-of-path, without having to use WCCP or Policy Based Routing (PBR); that makes large scale deployment much more manageable. With the Interceptor, Steelhead appliances can be clustered to support up to 1,000,000 simultaneous TCP connections (enough for about 200,000 distributed users), and up to 4 Gbps of optimized WAN traffic.

Disk size and connections are not the only dimensions of scalability. All Steelhead appliances can auto-discover each other, and automatically mesh with up to 4,100 other Steelhead appliances with no tunnels or other overlay configuration required. They can be deployed in a variety of HA configurations including serial or parallel clustering. All Steelhead appliances support asymmetric routes, and they all include a “fail to wire” feature which ensured continued connectivity in the event of hardware, software, power or disk failure.

Furthermore, since Riverbed's products were designed from the ground up to solve the issues surrounding WDS, they are the most transparent when it comes to deployment in complex IT environments. That simplicity also makes Steelhead appliances the best choice for small and mid-size businesses as well. Companies with little to no IT staff can't afford to buy complex products that require lots of branch office support.

<sup>2</sup> Wall Street Journal, December 31, 2006

<sup>3</sup> [http://www.networkworld.com/reviews/2007/081307-test-wan.html?ts0hb=&story=ab5\\_wantest](http://www.networkworld.com/reviews/2007/081307-test-wan.html?ts0hb=&story=ab5_wantest)

**Protocol Support.**

Riverbed offers the widest range of application level acceleration. In addition to accelerating anything running over TCP, Steelhead appliances have built-in QoS features which can be used to optimize VOIP or live video by prioritizing those packets, if desired. Riverbed's Data and Transport Streamlining features remove all redundant bytes from the WAN and enhance the performance of TCP, and those two optimizations apply to all TCP traffic. In addition, Riverbed offers application level latency optimization to reduce round trips generated by the following applications: Windows file sharing (CIFS), UNIX file sharing (NFS), Microsoft Exchange, MS-SQL, HTTP/HTTPS, backup / replication and Oracle 11i,

**Summary**

Riverbed is the fastest growing public technology company in the world, and for very good reasons. Not only are our Steelhead appliances the best WDS products available, they help CIOs address virtually their top strategic initiatives with one simple-to-deploy solution.

# Certeon<sup>®</sup> S-Series<sup>®</sup> Application Acceleration Appliances

## Securely Accelerating Today's Web-based Businesses

**certeon**<sup>®</sup>  
Accelerate Your Business

by Shawn Cooney  
Founder and Director of Research  
Certeon Inc.



Global enterprises are increasingly leveraging the ubiquitous presence of the network to transact business and enable business-critical functions over the Web. Unfortunately, businesses have quickly discovered that globally deployed Web applications offer their own set of challenges, specifically in application performance and security. Many WAN optimization vendors make claims of alleviating the performance degradation of both unencrypted (HTTP) and encrypted (HTTPS) traffic over the WAN through a variety of application and protocol optimization techniques, including support for the Secure Sockets Layer (SSL) protocol. However, as demonstrated in the recent Network World WAN acceleration test results,<sup>1</sup> just supporting the SSL protocol does not mean that a WAN optimization solution is truly accelerating encrypted traffic and unencrypted traffic equally.

Last year, SSL usage within the enterprise grew more than 20% over the previous year. Certeon<sup>®</sup> has seen this same growth in secure servers within the businesses it supports and understands the issues these enterprises face around securely accelerating information over the WAN. Certeon's S-Series<sup>®</sup> Application Acceleration Appliances was the first, and remains the only solution on the market, to significantly erase the negative effects of the WAN for both secure and un-secure content, dramatically improve application performance, and ensure end-to-end security.

### Certeon's S-Series Application Intelligent Networking

Certeon's S-Series' Application Intelligent Networking<sup>™</sup> techniques accelerate a variety of protocols and applications over the WAN by using knowledge of protocols and application objects to identify, difference, reduce, and accelerate traffic over the network without compromising data integrity or security. The results are more than 90% improvement in overall application response time. The S-Series is deployed without having to make any modifications to servers, clients, or application software. Certeon's S-Series appliances address the acceleration and security of various types of unencrypted and encrypted traffic in two ways: accelerating generic WAN traffic and accelerating application-specific traffic. The result is unprecedented acceleration of encrypted and unencrypted data and applications over the WAN.

### Generic WAN Traffic

The S-Series applies techniques to generic WAN traffic to reduce the amount of traffic going over the network and improve response times. Protocols such as HTTP, TCP/IP, WebDav, RPC, XML, and CIFS experience response time improvements of more than 90%. The S-Series accelerates WAN traffic using techniques such as:

- Whole object differencing and fingerprinting
- History-based compression (also known as dictionary compression)
- Byte caching
- Packet compression and aggregation

<sup>1</sup>David Newman, "WAN acceleration offers huge payoff," *Network World*, Aug. 13, 2007.

- Bandwidth allocation
- Forward error correction

The net effect is more responsive access to data and more efficient WAN utilization.

## Application Specific Acceleration

The S-Series with its Application Acceleration Blueprints maximize the performance of application access and Web page rendering response times for Web-environments such as Microsoft SharePoint (including MOSS), EMC eRoom, and SAP NetWeaver. In addition to accelerating Web applications, the S-Series also turbo-charges applications such as Microsoft® Office™, EMC® Documentum®, SAP®, Oracle® and UGS® Solid Edge™ over the WAN by more than 90%.

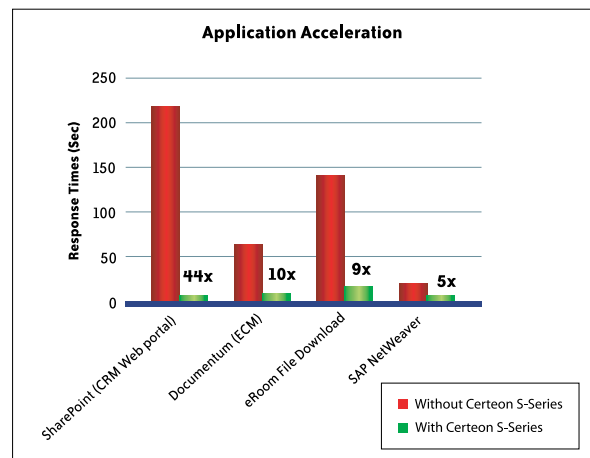
The S-Series uses unique Application Acceleration Blueprints™ and an Object Differencing Engine™ (ODE) to identify whole application objects and changes in those objects and then accelerate only those changes over the network. The S-Series' Application Acceleration Blueprints and ODE data-reduction techniques work at the application object level and offer a number of benefits that cannot be achieved by conventional packet-level optimization approaches. These techniques include:

- Simplified historical search for improved application object pattern matching efficiency for better scalability.
- Active pre-fetch of application objects to avoid disk I/O latency and improve throughput.
- Whole-object differencing for improved encoding efficiency and consistent high data-reduction performance.
- Type-specific differencing enabling the acceleration of specifically encrypted or pre-compressed traffic.

An example of how optimizing whole application objects, rather than packets, can benefit throughput, scalability, and ultimately application response time is in accessing files through Microsoft SharePoint using the HTTP protocol. As file sizes get bigger – going from 10KB to 10MB, the S-Series enables greater throughput because it is optimizing specific application objects, rather than random data packets. Whereas, with packet differencing, the throughput performance can degrade more than 50% as the files being accessed get larger. Whole object differencing allows the S-Series to scale response time performance along with increasing file sizes.

## Performance Results

Figure 1 illustrates application performance tests performed by Certeon customers. Overall, the S-Series improves application performance by more than 90 percent. For a mission critical application such as EMC Documentum, that could mean a difference in response time between 124 seconds and 7 seconds.



Source: Certeon Customers

Figure 1. Application Acceleration Performance Improvements

## Secure Acceleration

Enterprises today are increasingly concerned about the security of information, especially in remote-office locations. For this reason, enterprises are adopting SSL to ensure privacy between authorized users and corporate servers. In Web-based portals and applications, this takes the form of HTTPS as a transport protocol.



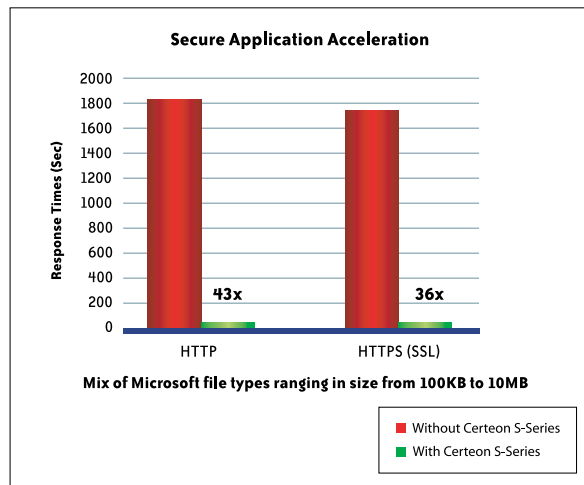
SSL presents a fundamental problem for products that accelerate application or file traffic between remote offices and data center servers. With SSL, all session-layer data is encrypted and is not compressible. Because SSL uses cryptographic keys that vary by time of day and individual user session, no two sessions' traffic streams look the same; thus differencing of this encrypted data is not possible. In order to overcome these problems, Certeon has implemented a patent-pending Secure Application Technology™ (SAT) within its S-Series appliances.

The SAT achieves the following two key goals:

- Transparency – The S-Series utilizes native server certificates for SSL session initialization, eliminating the cost and complexity of managing certificates on individual acceleration devices.
- Security – Private server keys never leave the secure data center.

By achieving these goals, S-Series appliances are able to inspect and accelerate SSL-encrypted traffic over the WAN securely and with no additional management of certificates and private keys. Unlike other solutions that are limited to just optimizing the TCP/IP protocol to improve throughput – the S-Series goes a step further and optimizes and accelerates the encrypted data. The S-Series also supplements its secure application acceleration with support for IPsec and SMB, within Virtual Private Networks (VPNs). All stored content and databases on the S-Series are encrypted at both the server and client sites. Because the S-Series keeps the origin server's private security key on the device that is physically co-located with the server, no enterprise data or keys are at risk, even if the remote S-Series is compromised.

The S-Series makes use of distributed *HTTP/HTTPS offload* techniques to ensure that the centralized servers are not overburdened with CPU-intensive SSL processing. The S-Series proxies HTTP and HTTPS connections, performing SSL setup with the client without the numerous WAN round-trips required to set up an SSL connection directly from client to server. Figure 2 illustrates The Tolly Group tests of the acceleration of HTTP and HTTPS traffic and how the S-Series enabled a 43x improvement in response times for HTTP traffic and a 36x improvement in response times for HTTPS traffic.



Source: The Tolly Group, 2006

Figure 2. Certeon S-Series Acceleration of HTTP and HTTPS Traffic

## Summary

Certeon customers have seen significant improvements in their ability to access encrypted and unencrypted files, applications, and Web pages over low-performing WANs. Customers realize greater employee productivity and satisfaction by having better application, file, and Web page access. Certeon accelerates all WAN traffic, optimizes mission critical applications, and is the only company to accelerate WAN traffic securely.

**For more information on how Certeon can securely accelerate file, application, and Web access over the WAN, visit [www.certeon.com](http://www.certeon.com).**

# Meeting the Challenges of Today's Distributed Enterprise



by Bob Yee  
Senior Manager,  
WAN Acceleration Product Marketing  
Juniper Networks



The goals of today's enterprises—from increasing customer loyalty to new product or service innovations—cannot be met without viewing IT investments as critical to success. We call these innovative enterprises High-Performance Enterprises, since they invest in IT not only to maintain their existing services through growth and change, but also to create new services that help reach business goals and differentiate them from the competition.

Besides employees, High-Performance Enterprise network users can include contractors, business partners, customers, and suppliers. Each type of user plays their own role in achieving business goals, yet each of them has many of the same requirements as employees. In order to be productive workers, they expect business information to be available in a timely fashion.

## Challenges

Network users in High-Performance Enterprises expect reliable and consistent performance from their business applications, whether they're sitting in their office or halfway around the world. That assurance isn't always easy to provide, since enterprise network bandwidth is often shared between mission-critical business applications, less critical business applications, and casual web browsing. It's even more difficult if users are situated on different networks, far from corporate data centers where business applications and data reside. For example, public networks can wreak havoc on certain applications that expect quick response times.

According to Information Week, enterprise executives view boosting network performance as one of the most effective ways to increase productivity. It's easy—and tempting—to throw more money and equipment at the problem. Unfortunately, aside from the obvious cost, more equipment just adds complexity. More complex networks increase operating expenses and simultaneously decrease network agility.

Another enterprise IT challenge affecting application performance is the webification of client-server applications. While these improve application access for far-flung enterprise network users, they require additional security, which often impacts application performance. Web-enabled applications place an unpredictable load on networks, resulting in inconsistent user experiences, particularly from remote locations or branch offices. According to Gartner, 50% of newly designed business processes will suffer from end user performance problems.

## Meeting the Challenge

To keep pace with these evolving needs, IT managers around the world are working feverishly to evolve and optimize their WAN infrastructures to provide high-performance application delivery that keeps workers working, servers serving, and businesses productivity growing.

WAN application acceleration solutions, sometimes referred to as WAN optimization solutions, are playing a critical role in this effort. Such solutions help businesses make more efficient use of their WAN resources and deliver LAN-like response times to globally distributed users of centralized applications.

However, all WAN optimization and application acceleration solutions are not created equal. According to a report by the Burton Group\*, the basic WAN optimization technologies are compression, which squeezes out repeated sequences in a dataflow; caching, which stores frequently requested files; and protocol modification, which improves the performance of protocols over high-latency WAN links. These techniques, says the report, are often coupled with quality of service (QoS) capabilities to provide a level of control for prioritizing application traffic.

Juniper Networks, a premier provider of high-performance networking solutions, takes this definition a step further. Juniper contends that a truly complete WAN optimization and application acceleration solution must integrate these capabilities — and more — on a single platform to address the bandwidth, latency, contention and manageability issues posed by the WAN environment. Working together, these attributes — detailed in Table 1 — not only address the most pressing needs of today's distributed enterprise, but also helps position customers to meet continuously evolving needs in the future.

Problem	WAN Optimization & Application Acceleration Requirements
Limited WAN bandwidth	Reduce the amount of traffic traversing WAN links through a combination of <b>compression and caching</b> features that make the most efficient use of existing resources while reducing contention for a limited amount of bandwidth.
WAN latency	<b>Accelerate</b> a broad set of applications that make up the majority of WAN traffic and deliver technologies that compensate for the inefficiencies of certain chatty protocols over the WAN. These include TCP (used by most client-server applications), MAPI (used by Microsoft Exchange), CIFS (used by Microsoft file services) and HTTP (for web-based traffic).
Application contention	Deliver <b>application control</b> capabilities such as Quality of Service (QoS) that allow users to prioritize specific applications or traffic flows to guarantee performance and ensure sufficient bandwidth is available for critical business operations.
Management	Provide <b>visibility</b> into application performance so users can understand, anticipate and predict application behavior, enabling users to make informed deployment, rollout and capacity planning decisions.

Table 1: WAN Problems and Associated Requirements

In addition to these integrated capabilities, businesses demand that WAN application acceleration solution providers have an eye to the future, providing a foundation that not only addresses today's needs but also considers future developments and provides a path for meeting those challenges as they arise.

## The Juniper WAN Optimization and Acceleration Platforms

This is precisely the approach Juniper Networks has followed in its WAN optimization and application acceleration solutions. The products — the Juniper WX and WXC WAN application acceleration platforms — are based on a unique WAN acceleration (WX) Framework that outlines the attributes defined above and describes how specific features of the WX and WXC platforms meet those requirements.

**Compression and Caching:** To satisfy the compression and caching component, the WX Framework integrates memory-based Molecular Sequence Reduction™ (MSR™) compression technology, which increases WAN throughput up to 10 times by eliminating repeated data patterns from traffic flows traversing the WAN. MSR compression is complemented by Network Sequence Caching, which uses hard disks to recognize and store larger repeated patterns last seen days or even weeks earlier to significantly increase throughput by up to 50 times.

**Acceleration:** Acceleration is delivered in the form of Packet Flow Acceleration™ (PFA™) and Application Flow Acceleration™ (AppFlow™) technologies, two Juniper-specific features of the WX Framework that distinguish the WX and WXC platforms. The PFA techniques — including Fast Connection Setup and Active Flow

Pipelining — combat the effects of TCP latency by accelerating connection setup and substituting a more efficient transport protocol across the WAN to dramatically improve performance. For lossy networks, an additional PFA feature — Forward Error Correction — makes use of recovery packets to reconstruct lost data, eliminating the need for retransmissions.

Application-specific acceleration is delivered via the AppFlow technology, which augments PFA by accelerating applications that are constrained by the performance of their underlying protocols — specifically MAPI (used by Microsoft Exchange), CIFS (used by Windows file services) and HTTP (used by Web-based applications). The AppFlow feature compensates for the chatty nature of these protocols by pipelining multiple data blocks and web objects across the WAN simultaneously, rather than sequentially, providing users accessing these applications over the WAN a more LAN-like experience that dramatically reduces wait times and improves productivity.

**Application Control:** The WX Framework delivers application control capabilities via Quality of Service (QoS) and Policy-based Multipath capabilities. QoS is combined with bandwidth-management tools that allow users to prioritize flows to ensure sufficient bandwidth is always available for critical traffic or delay-sensitive applications such as voice over IP (VoIP). Policy-based Multipath complements QoS by enabling users to assign designated application flows to a specific WAN link when more than one path is available, ensuring critical traffic is sent over more reliable private links, for instance, while less sensitive traffic is relegated to the Internet.

**Visibility:** Finally, the WX Framework integrates visibility and reporting functions that arm IT with a set of tools for monitoring, understanding and controlling application performance over WAN. The WX Central Management System™ (WX CMST™) software provides unprecedented systemwide visibility into application performance while WebView device management enables IT to configure and manage individual WX and WXC platforms from a central location.

Working together in the WX and WXC platforms, each of these elements defined by the WX Framework interact to dynamically adjust and improve each other's capabilities and deliver the industry's most complete WAN optimization and application acceleration solution.

**For more information about the Juniper application acceleration platforms, visit <http://www.juniper.net/products/appaccel/wan/> or call Juniper at 866.298.6428 (inside the U.S.) or 978.589.0500 (outside the U.S.).**

\* "Optimizing WAN Performance: Accelerating Market Growth" by Eric Siegel, January 2006