

Solution Brief

**Juniper Networks
Delivers the Goods for
Manufacturers**

Manufacturers are undergoing massive architectural changes, shifting from vertically integrated organizations to companies that are working with a number of horizontal partners on a global basis. Even the definition of a customer-centric company is evolving. Traditionally, companies gather information about customers' demographics and then create products and services based on those stated preferences.

However, today's leading-edge manufacturers are collaborating closely with customers to create products and services that the customers themselves are intimately involved in specifying. By co-creating products with customers, manufacturers can increase profitability, reduce waste, and rapidly capitalize on market opportunities. Success in the ultra-competitive manufacturing industry means building a real-time supply chain to close the gap between customer orders and product delivery. It means streamlining the product management lifecycle and taking advantage of outsourcing and partnering to increase operational efficiencies. And of course, complying with an ever-increasing number of financial and manufacturing regulations is mandatory.

From an IT systems perspective, staying competitive in a global marketplace means more employees and business partners access key enterprise applications throughout the partnership, placing additional performance demands on the distributed network. As companies move to globalize their business processes, deploying centralized or web-enabled enterprise applications places additional performance demands on the distributed network. Data retention policies to meet regulatory requirements also place additional performance demands on the distributed network.

All of these IT initiatives must take into account the existing manufacturing systems. A cost-effective solution that increases the effective throughput of existing WAN resources as much as tenfold can go a long way toward enabling manufacturers to maintain global competitiveness.

Today's Requirements for Manufacturers

Success for manufacturers today is predicated on addressing key business challenges. Today's manufacturing companies must:

Build a real-time supply chain to respond more quickly to market opportunities

By heightening the efficiency of their supply chains, with tight links between customers and partners, manufacturers can speed inventory turns, reduce errors, and increase responsiveness to market opportunities. SAP, Oracle, and PeopleSoft provide a real-time view of the supply chain, but web-enabled versions of these applications incur a much greater WAN performance penalty than the client/server versions did – typically increasing bandwidth needs ten-fold. Such highly interactive applications are often constrained by the limited capacity and latency of a distributed network.

In addition, companies may deploy new applications, such as voice over IP (VoIP) and IP-based contact centers, to realize significant dollar savings and improve customer service. Time-sensitive voice traffic must not be clobbered by other applications and large file transfers.

IT systems, once internal to the enterprise, are now shared across a company's partners, making application performance and reliability more visible to customers and increasing the business criticality of the infrastructure. Distributed operations call for increased visibility into the WAN to ensure performance and prevent outages.

“Whether it's Vancouver or Vladivostok, everyone logs into the same deployment of SAP.”

Gunter Hagendorf
Head of Vendor Governance
JTI

Streamline product lifecycle management to increase global competitiveness

With competition emanating from every corner of the globe, manufacturers are under intense pressure to improve operational efficiencies. New applications and increased partnering enable manufacturers to compress the product lifecycle management – from market research to design to testing to production – enabling them to bring products and services to market more quickly.

When product designs are modified rapidly, an increasing volume of data is shared within and across manufacturers' partnerships. As virtual teams collaborate, the volume of large files – such as CAD/CAM and other engineering drawings, PowerPoint presentations, and e-mail attachments – increase, placing additional stresses on the WAN.

Outsource to increase operational efficiency

Increased pressure to squeeze pennies out of the supply chain forces manufacturers to embrace virtual manufacturing models. These teams of contract market researchers, designers, manufacturers, marketers, or distributors are not necessarily located in the same city or even country. Whether a manufacturer relocates employees to lower-cost geographies or to partners across the value chain, out-tasking, near-shoring, and off-shoring mean teams are collaborating across the world, increasing the amount of data distributed across the network.

Manufacturers often operate in or work with partners located in countries with underdeveloped telecommunications infrastructures. Satellite, wireless, and other low-bandwidth links may be the only options. Increasingly, manufacturers need the flexibility of having multiple connections into their locations, including a combination of private leased lines and public Internet connections.

Achieve and maintain regulatory compliance

Regulatory compliance has long been required for manufacturers, and the need to create transparency into financial operations has only intensified. Manufacturers must retain design documents, manufacturing records, and safety procedures. Factor in e-mail retention, increased security policing, and financial reporting, and the amount of data that must be backed up and replicated across the distributed network is staggering. Similarly, business continuity requirements have increased the volume of data that's replicated and stored across the distributed enterprise, further straining the WAN.

These kinds of bulk data transfers are essential, but they must not interfere with the response-sensitive applications used by employees, customers, and suppliers.

Enhancing WAN Capacity and Performance with Juniper Networks

Manufacturers are at a competitive crossroads. Real-time supply chains, streamlining product lifecycle management, and outsourcing may require rolling out new applications or web-enabling existing ones for increased business partner access, consolidating data centers for greater operational efficiency, and meeting increased disaster recovery parameters and information retention for regulatory compliance.

With WAN costs routinely constituting the second largest IT expense behind staffing, most organizations are reluctant to invest more in their network infrastructure. Instead, manufacturers should look to WAN optimization platforms to resolve many of the IT challenges imposed by their business.

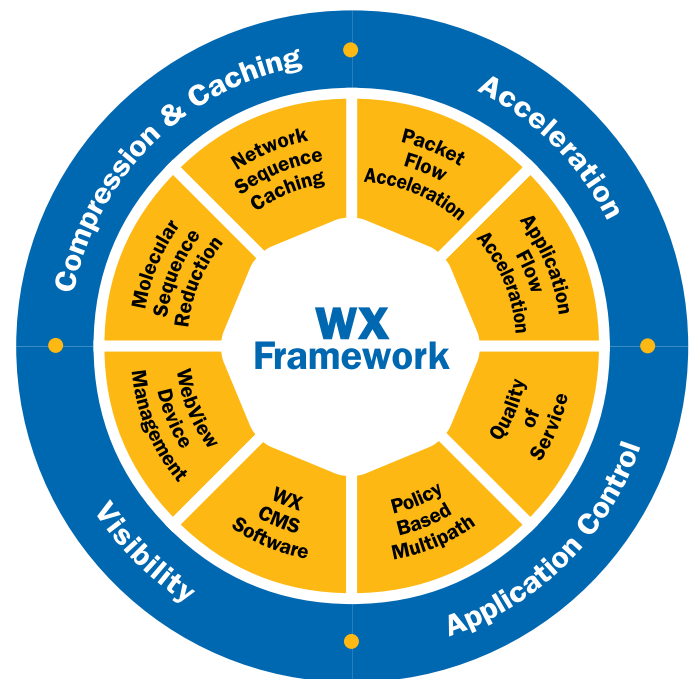
WX and WXC devices integrate seamlessly into existing network designs and can operate in a number of deployment modes.

Juniper Networks delivers a complete family of application acceleration platforms that improve application response times within central sites, to branch offices, and for remote users. Two members of that family – the WX™ and the WXC™ application acceleration platforms – enable IT to meet these critical business initiatives by improving the performance of applications running over wide-area links.

The WX and WXC platforms are based on the unique WX Framework™, which integrates a number of independent technologies that work together to deliver powerful compression and caching, acceleration, application control, and visibility capabilities. These technologies produce a whole that is greater than the sum of each part, providing manufacturers with a comprehensive and consolidated solution they can tailor to meet their specific WAN performance goals.

Elements of the WX Framework

Each element of the WX Framework addresses a specific challenge that impedes application performance over the WAN. Those elements are embodied in the Juniper Networks WX and WXC application acceleration platforms, which utilize the WX Framework technologies to improve business operations over wide-area links.



The WX Framework integrates key technologies that work together and influence each other, providing IT with distributed stateful intelligence about their WAN links and applications.

Compression and Caching Techniques

The WX Framework's compression and caching techniques include the Molecular Sequence Reduction™ (MSR™) and Network Sequence Caching technologies.

The MSR technology is the flagship compression algorithm for the WX and WXC platforms. The patented technology, which has enabled enterprises to realize as great as a tenfold increase in WAN capacity, has its roots in DNA pattern matching. MSR compression recognizes repeated data patterns and replaces them with labels, dramatically reducing WAN transmissions. MSR technology operates in memory, and its dictionary can store hundreds of megabytes of patterns.

MSR compression provides manufacturers with the ability to improve application performance across the WAN, making their real-time supply chain applications more responsive. With

MSR compression, manufacturers can move more traffic across the same links, making room for web-enabled applications, e-commerce transactions, and other bandwidth-hungry applications.

Sequence caching technology is the pioneering technique used by the WXC application acceleration platform. Sequence caching, like MSR compression, looks for repeated data patterns and replaces them with a label to reduce WAN traffic. Sequence caching relies on hard drives, rather than memory, for storing data patterns, so it can eliminate patterns seen days earlier.

With sequence caching, manufacturers can more easily collaborate with business partners, rapidly iterating engineering drawings, specifications, and even PowerPoint presentations without taking a performance hit on the WAN. Sequence caching dramatically reduces subsequent revisions of CAD/CAM drawings, for instance, achieving as much as 95 to 98 percent reduction. Because sequence caching technology is highly tuned to accelerate all large file transfers, including those sent during backup and replication, it can help manufacturers meet their regulatory compliance and business continuity requirements for data retention.

Acceleration Techniques

The acceleration techniques of the WX Framework include the Packet Flow Acceleration™ (PFA™) and Application Flow Acceleration™ (AppFlow™) technologies, which improve the performance of TCP and higher-layer protocols over the WAN.

The PFA technology speeds up TCP sessions over the WAN with techniques such as Fast Connection Setup™, Active Flow Pipelining™, and Forward Error Correction.

- Fast Connection Setup improves the performance of short-lived connections by eliminating one round-trip time from the TCP connection setup, speeding up applications such as HTTP.
- Active Flow Pipelining extends the TCP performance improvements by terminating the TCP connections locally and using a more efficient transport protocol between WX and/or WXC devices. This feature significantly benefits application performance on high-bandwidth or high-latency connections.

Customer Success Story:

Japan Tobacco International (JTI)

Business Benefits:

- Peak reduction rates of 90 %
- Sustained reduction rates of 60 %
- Increased performance for SAP, Citrix, web-based applications, and SQL
- Stayed within CIR, lowering costs and reducing risk of dropped traffic
- Four-month ROI

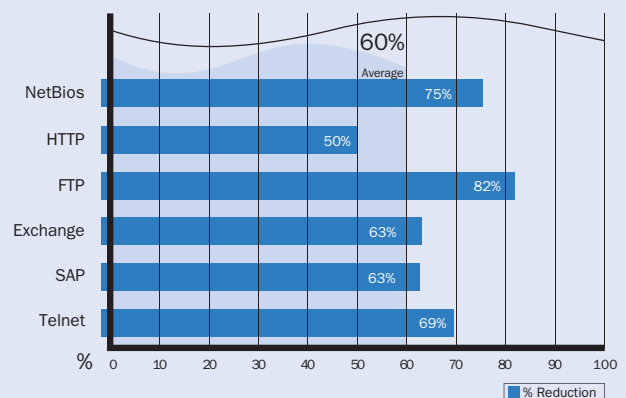
JTI, the world's third largest manufacturer of tobacco products, deployed Juniper Networks WX application acceleration platforms to 150 of its largest locations to improve performance of its SAP applications. Deploying a single instance of SAP across the world provided its business executives with a consistent view of worldwide operations and eliminated the need for consolidated reporting. However, the initial deployment of SAP called for a 500 percent increase in WAN capacity.

JTI considered a WAN upgrade, but the increased costs on just one of the manufacturer's links would have cost more than \$75,000. In addition, JTI was routinely sending traffic in excess

of its contracted committed information rate (CIR), putting that traffic at risk of being dropped.

“(The WX platforms were) initially deployed to solve a WAN pain,” says Gunter Hagendorf, head of vendor governance at JTI. “Now (they are) an important application enabler for us.”

With the WX platforms, the company accelerated the performance of SAP, web-based applications, Citrix, SQL database access, and VoIP, even over satellite and other low-bandwidth links. The WX platforms also increased the capacity of this manufacturer's global IP VPN nearly three-fold, while increasing complete network visibility and reliability – all without a costly upgrade of telecom links.



- Forward Error Correction limits the need for retransmissions on lossy networks, such as international IP VPNs or satellite links. It makes use of recovery packets, sent alongside data packets, which index those data packets, allowing for reconstruction of lost packets.

With Fast Connection Setup, manufacturers can accelerate the performance of TCP and web-based applications, such as e-commerce and XML transactions with partners. Active Flow Pipelining is particularly effective for bulk data transfers, such as in CAD/CAE files, backups, replications, and FTP file transfers, which are commonly transmitted across a manufacturer's distributed network. Active Flow Pipelining combined with Forward Error Correction is especially useful to manufacturers working with partners in countries where IP VPNs, satellite, or other high-loss transports are commonly used.

The AppFlow technology complements the PFA feature by accelerating higher-layer protocols used by Microsoft Exchange, Microsoft files services, and web-based applications. For Exchange and its underlying Messaging Application Programming Interface (MAPI) protocol, the AppFlow feature pipelines the hundreds or even thousands of sequential round trip times (RTTs) required to complete a single transmission, sending as many of them in parallel as needed to fill the available WAN capacity. As a result, users receive their messages at LAN speeds, boosting productivity and improving collaboration.

For Microsoft file services that use the Common Internet File System (CIFS) protocol, the AppFlow feature pipelines read and write operations, sending them in parallel to fully utilize WAN capacity. By the time a client requests the data blocks, they already reside on the nearby WX or WXC platform, which forwards them at LAN speeds, enabling users to access centralized files much faster.

For web transmissions over HTTP, which rely on a series of sequential and time-consuming requests to build a page, the AppFlow feature enables WX and WXC platforms to learn and cache objects associated with URLs and confirm their freshness or pre-fetch updated objects in advance of a client's request. As a result, clients receive objects at LAN speeds and web pages load much faster.

For manufacturers, the AppFlow technology enables large file transfers or web-page downloads to be accomplished much faster, saving precious time and improving user productivity. Work can proceed at LAN speeds, even if critical data or files are located on centralized servers at the other end of a WAN link.

Customer Success Story:

Essilor

Business Benefits:

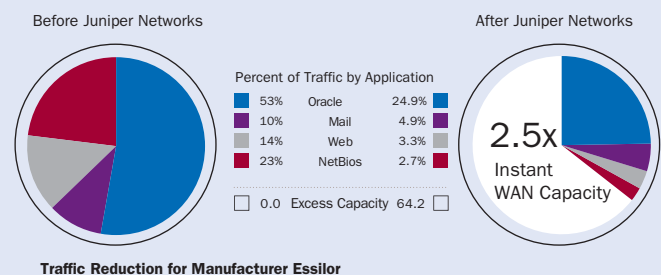
- 2.5x average increase in WAN capacity
- 6x peak increase in WAN capacity
- Cut response time in half for critical applications
- Enabled priority service of key applications
- Resolved network latency effects
- Increased WAN visibility

Essilor, a maker of progressive lenses, anti-reflective treatments, and other corrective-vision optics, reorganized its IT operations around its Paris headquarters. The company runs Oracle ERP, Oracle databases, and an SAS data warehouse. It has 8,000 PCs linked worldwide using AS/400, Unix, and Windows servers.

After the consolidation, one link from Paris was extremely underutilized, while another link was heavily congested. Its Bangkok site suffered from high latency and limited usable

bandwidth. This imbalance and the poor network conditions were seriously undermining the performance of key business applications.

To improve application performance, the optics maker installed WX application acceleration platforms at two sites in Paris and one site in Bangkok. The platforms streamlined the traffic exchanged between the WAN locations. As a result, the company enjoyed an average of a nearly three-fold increase in WAN capacity, with a six-fold peak increase. Essilor was also able to cut in half the response time of its critical business applications.



Application Control

The WX Framework's application control techniques include both Quality of Service (QoS) features and Policy-Based Multipath™ (Multipath™) capabilities.

The QoS features allow IT to assign priority status and bandwidth-allocation metrics to specific applications. The WX and WXC platforms allow IT to classify traffic by looking not just at IP header or TOS/DiffServ information but also inside the data payload to act on Layer 7 application information. It also preserves and can view QoS markings applied by other devices in the manufacturer's network and beyond.

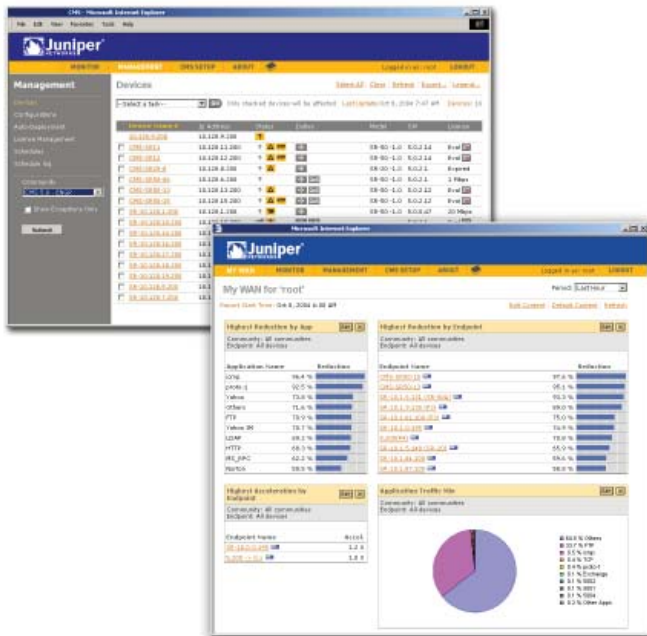
Equipped with these QoS bandwidth-management capabilities, manufacturers can be sure that business-critical applications such as ERP or CRM take precedence over e-mail, web surfing, or instant messaging traffic. QoS bandwidth management capabilities also enable manufacturers to deploy real-time applications such as VoIP. With VoIP and IP-based call centers, manufacturers can lower their operational costs while delivering a higher level of customer service. Since voice cannot tolerate significant delays, the QoS feature ensures that voice traffic gets the necessary priority.

Multipath path optimization enables IT to select which applications should flow over which WAN links when multiple connections are available between sites. IT can then apply business policies and performance parameters, defining the conditions under which an application should move to the alternate path if performance degrades.

This feature enables manufacturers to continue sending mission-critical traffic over their leased lines while simultaneously making use of alternative connections such as DSL or other Internet-based services. For instance, manufacturers can specify that e-mail, backup, and web traffic flow over a DSL link while SAP, Siebel, and VoIP run over the leased line. If the performance on the DSL connection becomes unacceptable, the WX or WXC platform can automatically move the application traffic to the leased line, enforcing QoS policies as needed to deal with additional traffic.

“From a business perspective, the benefit is a consolidated view of all operations. From a technology perspective, the benefit is the management of the systems.”

Gunter Hagendorf
Head of Vendor Governance
JTI



Networkwide Visibility

The WX Central Management System (CMS) software provides unified, intelligent insight into application acceleration, compression performance, WAN utilization, QoS, and bandwidth allocation across manufacturers' networks.

Visibility

The WebView device management and WX™ Central Management System (CMS™) software comprise the WX Framework's visibility component.

WebView device management provides a simple, integrated tool for configuring and managing individual WX and WXC application acceleration platforms

When more powerful management capabilities are required, the WX CMS software provides a unified view of the enterprise's applications and WAN links, simplifies software upgrades and other management tasks, and integrates with existing management systems. The WX CMS software generates reports that help IT pinpoint problems with dropped sessions, poorly performing applications, or contention. Such end-to-end visibility and packet capture are especially critical for a manufacturer's far-flung operations. The WX CMS software provides IT with the information needed to quickly identify, diagnose, and resolve problems, even in remote offices that lack any IT staff or management tools.

WAN Infrastructures that Manufacturers, Partners, and Customers Can Build On

With increased competition from across the globe, manufacturers that want to succeed must build a real-time supply chain, streamline product lifecycle management, outsource projects to partners, and meet compliance regulations. To compete, manufacturers may deploy web-enabled enterprise applications, collaborate more heavily with business partners, and invest

in real-time applications such as VoIP – all placing additional stresses on the WAN. At the same time, the increase in data retention needed for financial and manufacturing requirements places an additional burden on the WAN.

The integrated WX Framework addresses the critical bandwidth, latency, and contention issues, ensuring optimal application flows and performance across the real-time networks of manufacturers.



CORPORATE HEADQUARTERS
AND SALES HEADQUARTERS
FOR NORTH AND SOUTH AMERICA

Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, CA 94089 USA
Phone: 888-JUNIPER (888-586-4737)
or 408-745-2000
Fax: 408-745-2100

www.juniper.net

EAST COAST OFFICE

Juniper Networks, Inc.
10 Technology Park Drive
Westford, MA 01886-3146 USA
Phone: 978-589-5800
Fax: 978-589-0800

ASIA PACIFIC REGIONAL
SALES HEADQUARTERS

Juniper Networks (Hong Kong) Ltd.
Suite 2507-11, Asia Pacific Finance Tower
Citibank Plaza, 3 Garden Road
Central, Hong Kong
Phone: 852-2332-3636
Fax: 852-2574-7803

EUROPE, MIDDLE EAST, AFRICA
REGIONAL SALES HEADQUARTERS

Juniper Networks (UK) Limited
Juniper House
Guildford Road
Leatherhead
Surrey, KT22 9JH, U. K.
Phone: 44(0)-1372-385500
Fax: 44(0)-1372-385501

Copyright 2005, Juniper Networks, Inc. All rights reserved. Juniper Networks and the Juniper Networks logo are registered trademarks of Juniper Networks, Inc. in the United States and other countries. All other trademarks, service marks, registered trademarks, or registered service marks in this document are the property of Juniper Networks or their respective owners. All specifications are subject to change without notice. Juniper Networks assumes no responsibility for any inaccuracies in this document or for any obligation to update information in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.