WAN Accelerators

Overview HP(Riverbed) and CISCO

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Agenda

• Why Wan Accelerators?
• How does CISCO WAAS work?
• How does Riverbed WDS work?
• How to get more info?
• Other Players
Challenges Across the Extended Enterprise

Networking Problems
Ensure highly available and reliable application service from the data centre across the WAN

Application Problems
Improve slow application performance to all users across the extended enterprise

Storage Problems
Consolidate and secure applications and data for regulatory compliance

Overcome inefficient, unmanageable, and costly application deployments
Most applications are designed to work well on LAN’s:
- High bandwidth
- Low latency
- Reliability

WANs have opposite characteristics:
- Low bandwidth
- High latency
- Packet Loss

Round Trip Time (RTT) ~ 0mS
Client → LAN Switch → Server

Round Trip Time (RTT) ~ many many milliseconds
Client → LAN Switch → Routed Network → LAN Switch → Server

WAN Packet Loss and Latency = Slow Application Performance =
Keep and Manage Servers in Branch Offices ($$$)

Benefits of Centralized and Consolidated Branch Office Infrastructure:
- Lowers Capex and Opex through centralization of costly distributed IT capital resources such as servers and storage into the data center
- LAN like throughput and delivery of applications and application data to the enterprise edge
- Optimized efficiency and control bandwidth utilization for existing WAN connections
- Maintains remote-office user application performance expectations
- Maximizes compliance & data protection as all critical corporate data can now be stored and backed up in one place
WAN Accelerators
Benefits

• Increases user and IT productivity
• Accelerates Applications
• Saves Bandwidth
• Eliminates the need for remote Infrastructure

WAN Accelerators
How Do They Work?

• Remove All Redundant TCP Traffic on WANs
  – Files, Emails, Backup, Web Traffic, FTP, Applications
  – Store All TCP Traffic On Disk
  – Never Send The Same Data Twice
  – Reduce WAN Traffic By Up To 98%

• Optimize the Behavior of TCP
  – Reduce “Chattiness” in TCP
  – Implement Latest TCP Optimizations

• Optimize Application Protocol Behavior
  – Remove Most Round Trips for Chatty Apps Like Windows
  – Highly Effective for the Most Common Applications

• Up to 100 Times Faster Throughput
• No Data Redundancy improvements for interactive and encrypted traffic
Cisco’s Response:
ADBU and Application Networking Services (ANS)

ANS Product Overview
Cisco Approach to Total Application Delivery

- Branch Solutions: ACNS and WAAS on the WAE platform
- Data Centre Application Services: ACE, CSS, CSM, AVS, GSS

Key Enterprise Applications Addressed By Cisco WAAS

- Application Acceleration
  - Improving performance of CIFS/NFS
  - Web apps, email apps, and other business applications
  - Simultaneously reducing WAN bandwidth costs
- Branch Office File Server Consolidation
  - Consolidated storage and application environments, including file servers, local applications and backup solutions into the data center
- High-speed Access To Remote File Servers
  - Fast access to shared information and improved distributed collaboration
- WAN Link Optimization
  - Help WAN links deliver application data more efficiently thereby making better use of available WAN bandwidth
- Branch Office Print Server included in WAAS
WAAS Vision = Consolidated Branch

Consolidated Branch

Cisco WAAS = 10X WAN
Acceleration = Key Enabler

Data Center

Companies spend 6B dollars per year on branch servers, storage, backup and management
Source: IDC, Gartner, Cisco Analysis
2 Million branch file+ print servers are shipped per year
Source: IDC

Design Goals:
- Servers, storage and data protection centralized in data center
- Continued LAN-speed access to centralized applications
- Zero branch IT administration costs
- Seamless integration into Cisco packet networks

Achieved

Data Redundancy Elimination (DRE)

- Reduce overall WAN consumption based on redundancy
  - Maintain active database of previously sent and received traffic
  - Send database index on behalf of traffic that has been seen before
  - Realize 5x – 50x compression, minimize WAN bandwidth consumption
- Compress all outbound traffic with LZ compression
  - Additional 2x compression beyond data suppression
  - Very good compression for non-redundant data

ABCDEFHRIKLMNOP
QRSTUWXYZ

L1+“MNOP”+L2

IP Network

Label

Data
TFO Improves Application Performance

- TFO overcomes TCP and WAN bottlenecks
- Shields nodes connections from WAN conditions
  - Clients experience fast acknowledgement
  - Minimize perceived packet loss
  - Eliminate need to use inefficient congestion handling

Cisco WAAS TFO Implementation
Traditional WAN Optimization:
Not Seamless, but Disruptive to Existing Network

Traditional WAN Optimization changes header information

Result:
- Services may not work
- Extra integration required
- Risk of downtime due to dedicated links
- Read-ahead causes very heavy load on back-end servers

Cisco WAAS:
Seamless Network Integration, Service Preservation

Cisco WAAS
Full Preservation of IP and TCP Header Information

Robust Application Adapters to Offload WAN and Data Center Local Services
Transport Flow Optimizations
Data Redundancy Elimination
Accelerates ALL TCP Traffic
Data Center Scalability
Cisco WAAS: Per Flow Auto-Discovery
No Overlay Network, Easier to Integrate

Cisco WAAS

Traditional WAN Optim.

Cisco WAAS + IOS
Truly Integrated WAN Solution

- Acceleration
  Reduce response times
- WAN Optimization
  Minimize bandwidth / latency
- WAFS
  Consolidate file/print/storage
- NetFlow
  Reduce network costs
- AutoQoS
  Automatic QoS configuration
- IP SLAs
  End-to-end performance mgmt
### Cuts Deployment Time To Minutes

**In band**
- Much faster setup
- No WCCP required
- Setup = minutes
- Full transparency

**Out of band**
- WCCP required
- Maximum resiliency
- Full transparency

### 4.0.7 Features and Benefits

<table>
<thead>
<tr>
<th>New Feature</th>
<th>Description</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inline Deployment</td>
<td>Transparent, inline interception of traffic without having to change router or switch</td>
<td>Fast &amp; easy deployment, Easy POC, Attractive for commercial market</td>
</tr>
<tr>
<td>CIFS Auto-discovery</td>
<td>Automatic discovery of CIFS file servers</td>
<td>No manual configuration required to make CIFS file optimization work</td>
</tr>
<tr>
<td>Adaptive TCP Option Handling</td>
<td>Automatic detection and handling of upstream firewalls and servers</td>
<td>More robust auto-discovery, No manual configuration required</td>
</tr>
</tbody>
</table>
WAAS: Complete End-to-End Solution
From Data Center to Branch

Production-proven: 1 million+ ISRs, 10000s of WAEs, 10 years of load balancers

Cisco WAE
Availability through Cisco Distribution

<table>
<thead>
<tr>
<th>Platform</th>
<th>Hardware</th>
<th>Positioning</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>NM-WAE</td>
<td>• 1 processor; up to 1GB memory; up to 128GB SATA storage</td>
<td>• Router integrated branch services</td>
<td>now</td>
</tr>
<tr>
<td>WAE-512</td>
<td>• 1 Processor; 1-2 GB memory; 250 GB SATA disk storage (optional RAID-1)</td>
<td>• Branch Office Appliance</td>
<td>now</td>
</tr>
<tr>
<td>WAE-612</td>
<td>• 1 Dual Core Processor; 2-4 GB memory; 300GB SCSI disk storage (optional RAID-1)</td>
<td>• Large Branch Office Appliance • Small Data-Center /Hub Appliance</td>
<td>now</td>
</tr>
<tr>
<td>WAE-7326</td>
<td>• Dual Processor; 4GB of memory; up to 1.8TB SCSI disk storage</td>
<td>• Campus Appliance • Data-Center/Hub Appliance</td>
<td>now</td>
</tr>
</tbody>
</table>
HP / Riverbed WAN Accelerators
A multi-pronged approach

<table>
<thead>
<tr>
<th>Technology</th>
<th>What does it do?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto detection &amp; interception</td>
<td>Easy installation and configuration</td>
</tr>
<tr>
<td>Scalable Data Referencing (SDR)</td>
<td>Bandwidth optimization</td>
</tr>
<tr>
<td>Virtual TCP window expansion</td>
<td>TCP latency optimization</td>
</tr>
<tr>
<td>Transaction prediction</td>
<td>Application protocol latency optimization</td>
</tr>
<tr>
<td>Transparent pre-population</td>
<td>Improve performance for “cold” data</td>
</tr>
</tbody>
</table>

A few words to Riverbed

An overview of Riverbed

- The market leader in Wide-area Data Services
  - Deployed across the F500 and Global 1000
  - Delivers the speed, simplicity, and scale that corporations need

- Results to date:
  - More than 1000 enterprise customers deployed
  - Thousands of Steelhead appliances installed worldwide

- 250+ channel partners
- Offices throughout U.S., Europe and Asia
- Publicly traded corporation (NASDAQ: RVBD)

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1. The InfoPro, Wave 7 Storage Survey, March 2006. Riverbed was cited as the market leader in WAN/WDS among Fortune 1000 IT buyers.
One product, many solutions

Riverbed Steelhead™ Appliances

Application Acceleration
- Windows File Sharing
- Email
- Web
- ERP/CRM
- Lotus Notes
- NFS
- FTP
- Backup
- Replication
- Custom apps

File Consolidation
- File servers
- Email servers
- Filers
- Remote storage
- Tape backup equipment
- Off-site media management
- On-line backup
- Outsourced servers

Bandwidth Optimization
- Reduce WAN bandwidth
- Avoid WAN upgrades
- Expand narrow links
- Fill up LFNs
- Prioritize traffic
- Protect VoIP quality

HP EFS WAN Accelerators
The Most Complete Solution

EFS WAN Accelerator Appliances (V. 2.1-11)
V 3.0 comes within the next 2 weeks

- File
- Local/Storage (Hybrid)
- Email
- Static Web
- Dynamic Web
- Database
- SSL
- Fat Client
- ERP
- Backup and Replication
- Basic TCP Optimizations
- Advanced TCP Optimizations
- High-speed Transport Optimizations (for LFNs) for 5010 only
- Basic Network Compression
- Data Reduction
- Data Compression
- QoS

Application Specific Visibility and Management

Shipping since Spring 2006 with Version 2.1-13
Partial – Honors QoS Settings; Enables Admin to Set QoS Flags
With Version 3.0. Autumn 2006 Riverbed WADS, SSL with V 4.0 till End of April
Remote Office Infrastructure
Before HP EFS WAN Accelerators

After HP EFS WAN Accelerator Deployment
Simple Server Deployment Detail Options

In-Path Deployment

- WAN or VPN
- Router
- Firewall
- Sitehead Appliance
- L2 Switch

Out-of-Path Deployment

- WAN or VPN
- Router
- Firewall
- Sitehead Appliance
- L2 Switch

HP EFS WAN Accelerators
Auto Detection & Interception

Data

Client site

WAN

Data center
HP EFS WAN Accelerators
Scalable Data Referencing (SDR)

- The Riverbed optimizing system: SDR
  - redundant bytes are removed
  - inefficiency of transport protocols is eliminated
  - optimize WAN protocols
- TCP payload is cut into 43-450 byte pieces and written to the local disk (compressed), if one of these pieces can be reused later, only the name of the piece is transferred. Only TCP is used, transparent whether files or HTTP contents are transferred.
  - > 60-95% data reduction

HP EFS WAN Accelerators
VWE (virtual window expansion) TCP -- Normal TCP Packets

Send large file across the WAN (via WAN Friendly Protocol like FTP, HTTP, other)

With unlimited bandwidth and cross country latency, the data transfer would take **60 seconds** due to the TCP based round trips

Divide traffic and send 64KB at a time across the WAN
**HP EFS WAN Accelerators**

**High-Speed TCP Optimization—DL380-5010**

*Long Fat Networks (LFNs) are very high bandwidth links that are often difficult to "fill" due to existing TCP flow control*

- "T" represents the actual average throughput – often a fraction of the full bandwidth
- Caused by slow start & congestion control algorithms
- Blue line represents throughput after EFS WAN Accelerator appliance deployment
- Congestion Control Protocol Dynamics are Improved
- Slower fall back / faster ramp up

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Bandwidth</th>
<th>RTT Latency</th>
<th>Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Baseline</td>
<td>622 Mbps</td>
<td>15 ms</td>
<td>36 Mbps</td>
</tr>
<tr>
<td>With DL380-5010 WAN Accelerator</td>
<td>622 Mbps</td>
<td>15 ms</td>
<td>600+ Mbps</td>
</tr>
<tr>
<td>B Baseline</td>
<td>622 Mbps</td>
<td>100 ms</td>
<td>5 Mbps</td>
</tr>
<tr>
<td>With DL380-5010 WAN Accelerator</td>
<td>622 Mbps</td>
<td>100 ms</td>
<td>600+ Mbps</td>
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**HP EFS WAN Accelerators**

**Product Offerings**

*For deployment estimate 6 connections per active user*

**EFS WAN Accelerator and WAN Accelerator Manager SKUs**

- **DL320G4-520**
  - 1Mbps, 300 TCP connections, 74GB SDR cache
  - Proxy file service Capacity 100 GB
- **DL320G4-1020**
  - 2Mbps, 625 TCP connections, 74GB SDR cache, 100GB PFS capacity
- **DL320G4-2020**
  - 10Mbps, 2000 TCP connections, 150GB SDR cache, 210GB PFS capacity
- **DL320G4-3010**
  - 10Mbps, 2400 TCP connections, 250GB SDR cache, 210GB PFS capacity
- **DL320G4-5010**
  - 45Mbps, 4500 TCP connections, 512GB SDR cache, 210GB PFS capacity
- **DL320G4-M25 (AE198A)**
  - Central management for up to 25 appliances; 80GB raw storage

*All SKU support and 24x7 h/w uplift*
5 Reasons to Buy WADS

1. Improved application response times
2. Reduced cost through consolidation of remote server & storage infrastructure
3. Cost savings from reduced WAN bandwidth
4. Improved compliance & data protection
5. Best WAN optimizer in the market today – Gartner Magic Quadrant leader

## Voice of the customers

### The value of Steelhead appliances

**Application acceleration enables better collaboration**

- **Gensler**
  - "Our files and data now move more than 70 times faster between offices, giving us the ability to complete projects more quickly."
  - "Previously unusable applications can now be used around the world."

**Site consolidation simplifies administration**

- "Riverbed Steelhead Appliances have allowed us to eliminate redundant technology. We can now support many of our remote offices."

**Bandwidth reduction saves money**

- "Steelhead appliances have reduced network traffic by 80 percent, while remote users are getting LAN-like speed over the WAN."

### Some Criterias of Cisco and Riverbed

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Cisco WAAS</th>
<th>Riverbed Steelhead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility regardless of router IOS version</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Inline Auto Discovery</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Out of Path Auto Discovery</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Inline Network Transparency</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Out of Path Network Transparency</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Transaction Prediction</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Latency optimization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inline Clustering (W/o SLB)</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Out of Path Clustering (W/o SLB)</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
More Info/ Whom to contact? Cisco

- Wilfried Gross wigross@cisco.com
- Bernd Sagolla bsagolla@cisco.com

Check the websites
- WAAS www.cisco.com/go/waas
- ACE www.cisco.com/go/ace
- Data Center www.cisco.com/go/datacenter

More Info/ Whom to contact? HP/Riverbed

- Ulrich Rüggen ulrich.rueggen@hp.com (Germany)
- Stephan Lelleck stephan.lelleck@hp.com (Germany)
- Roger Meyer Roger.Meyer@hp.com (Switzerland)
- Wolfgang Berg Wolfgang.Berg@hp.com (Austria)
- Mark Lewis mark.lewis@riverbed.com (marketing director)
- HP EFS WAN Accelerator Product Marketing Manager dirk.kunselman@hp.com
- HP EFS WAN Accelerator Architect gary.thunquest@hp.com
  - Product information / FAQs
  - Product specs / Datasheet
  - Solution whitepapers
Other Players (no guaranty for completeness)

- Juniper Networks
- Packeteer
- Expand Networks
- Streamcore Systems
- F5 Networks
- Blue Coat Systems
- Citrix Systems
- Ipanema Technologies
- Converged Access
- Silver Peak Systems
- Intelligent Compression Technologies
- Stampede Technologies
- Certeon
- Exinda Networks