Agenda

- Enterprise Application Delivery Challenges
- Introducing Cisco Wide Area Application Services
- Network Integration and Deployment
- In-Depth Examination of Optimizations
- Management and WAE Platforms
- “Live Demo”
- Summary, Q&A
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Key Issues Enterprises Face in the Branch

**EXISTING NETWORK DEMANDS**
- VoIP and other critical applications already tax the network
- Adding applications increases quality-of-service (QoS), security, and troubleshooting needs

**BRANCH INFRASTRUCTURE COST**
- Server, storage, and backup
- Limited IT resources
- WAN link costs

**APPLICATION / DATA ACCESS PERFORMANCE**
- WAN bandwidth/latency limits
- Application response time
- Global information access
I/T’s Application Delivery Problem

- Increasingly distributed workforce drives need for distribution of I/T resources to remote locations
  - Enable productivity
  - Drive revenue and profits

- Data protection, availability, compliance, and management drives need for consolidation
  - Fewer devices to manage
  - Fewer points to protect
The WAN Is A Barrier To Consolidation

- Applications are designed for LAN environments
  - High bandwidth
  - Low latency
  - Reliability

- WAN characteristics hinder consolidation
  - Already congested
  - Low bandwidth
  - Latency
  - Packet Loss
Bandwidth

- Bandwidth constraints keep applications from performing well
- Too much data and too small of a pipe causes congestion, packet loss, and backpressure
Packet Loss, Congestion, and Retransmission

- Packet loss and congestion cause retransmission which hinders application performance and throughput.
- Commonly caused by saturated device transmit queues in the network path.
Latency

- Latency impairs application performance in three ways:
  - Network latency – the amount of time necessary for a message to traverse the network
  - Transport latency – the amount of time necessary for the transport mechanism (TCP) to acknowledge and retransmit data
  - Application latency – “ chattiness” of an application protocol causing messages to be exchanged across the network

Round Trip Time (RTT) ~ many many milliseconds
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Cisco Vision: The Consolidated Branch

Current Branch

Consolidated Branch

Customer Objectives/Design Goals:
- Fewer local servers / no local storage + backup
- Continued LAN-level application performance
- Ability to leverage centralized applications
- Preserve services of existing network
Today: Branch Office IT Issues

- Application performance
  - Bandwidth & throughput limitations
  - Latency and packet loss
  - End user experience
- Infrastructure cost / complexity
  - File, print and email servers
  - Storage and backup
  - WAN bandwidth
- Data protection
  - Failing backups / lost data
  - Costly off-site vaulting
  - Compliance

Companies spend 6 Billion dollars per year on branch servers, storage, backup and management
Source: IDC, Gartner, Cisco Analysis

The average branch has 4-6 servers
Source: Nemerte Research
Cisco WAAS Enables Consolidation

- **Cisco Wide Area Application Services (WAAS)**
  - Transparent integration
  - Robust optimizations
  - Auto discovery
- **Infrastructure Consolidation**
  - Remove costly servers
  - Centralize data protection
  - Save WAN resources
- **Application Acceleration**
  - Application adapters
  - Advanced compression
  - Throughput optimizations
  - Policy-based configuration
## Addressing the WAN Challenges

<table>
<thead>
<tr>
<th>Source</th>
<th>Need</th>
<th>Technology</th>
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<tbody>
<tr>
<td>Latency Mitigation</td>
<td>• Reduced number of network roundtrips from chatty application protocols</td>
<td>• Application Protocol Optimization</td>
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<tr>
<td></td>
<td></td>
<td>• Object/File Caching</td>
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<tr>
<td>Bandwidth Management</td>
<td>• Improve app response time</td>
<td>• Data Redundancy Elimination (DRE)</td>
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<td></td>
<td>• Reduce amount of data sent across the WAN</td>
<td>• Compression</td>
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<tr>
<td>Link Throughput Improvement</td>
<td>• Improve network throughput by overcoming TCP inefficiencies</td>
<td>• Transport Flow Optimizations (TFO)</td>
</tr>
<tr>
<td>Traffic Prioritization</td>
<td>• Prioritize selected traffic (e.g. VoIP, SAP) over the network</td>
<td>• Cisco IOS</td>
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<tr>
<td></td>
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<td>• QoS, NBAR, NetFlow</td>
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<tr>
<td>Local Services</td>
<td>• Replacement for services that branch office servers provide</td>
<td>• Centrally managed remote services interface</td>
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<tr>
<td>Application</td>
<td>Protocol</td>
<td>Typical Improvement</td>
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<tr>
<td>----------------------------</td>
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<tr>
<td>File Sharing</td>
<td>• MS Windows® (CIFS)</td>
<td>• 5X-100X</td>
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<tr>
<td></td>
<td>• UNIX (NFS)</td>
<td>• 2X-100X</td>
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<tr>
<td>Email</td>
<td>• MS Exchange® (MAPI)</td>
<td>• 2X-50X</td>
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<tr>
<td></td>
<td>• SMTP/POP3, IMAP</td>
<td></td>
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<tr>
<td></td>
<td>• Lotus Notes®</td>
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</tr>
<tr>
<td>Internet / Intranet</td>
<td>• HTTP, WebDAV</td>
<td>• 2X-50X</td>
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<tr>
<td>Data Transfer</td>
<td>• FTP</td>
<td>• 2X-50X</td>
</tr>
<tr>
<td>Software Distribution</td>
<td>• Microsoft SMS</td>
<td>• 2X-50X</td>
</tr>
<tr>
<td></td>
<td>• IBM Tivoli, Altiris</td>
<td></td>
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<tr>
<td>Database Applications</td>
<td>• SQL</td>
<td>• 2X-20X</td>
</tr>
<tr>
<td></td>
<td>• Oracle</td>
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<td>• Notes</td>
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<tr>
<td>Data Protection</td>
<td>• Backup Applications</td>
<td>• 2X-20X</td>
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<tr>
<td></td>
<td>• Data Replication</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>• Any TCP-based Application</td>
<td>• 2X-20X</td>
</tr>
</tbody>
</table>
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Seamless, Transparent Integration

- Integration into the network fabric with high availability, load-balancing, and failover regardless of interception mechanism
  - Physical inline
  - WCCPv2
  - Policy-Based Routing
  - CSM/ACE Modules
- Compliance with network value-added features
  - Preservation of packet headers
  - Classification - QoS, NBAR, Queuing, Policing, Shaping
  - Security - Firewall policies, Access Control Lists
  - Reporting - NetFlow, monitoring
Cisco WAE Physical Inline Deployment

- Physical inline interception
  - Physical in-path deployment between switch and router or firewall
  - Mechanical fail-to-wire upon hardware, software, or power failure
  - Requires no router configuration
- Scalability and high availability
  - Two two-port groups
  - Serial clustering with load-sharing and fail-over
  - Redundant network paths and asymmetric routing
- Seamless integration
  - Transparency and automatic discovery
  - 802.1q support, configurable VLANs
  - Supported on all WAE appliances

Cisco WAE 4-port inline card
Cisco WAE WCCPv2 Deployment

- **WCCPv2 interception**
  - Out-of-path with redirection of flows to be optimized (all flows or selective via redirect-list)
  - Automatic load-balancing, load redistribution, fail-over, and fail-through operation

- **Scalability and high availability**
  - Up to 32 WAEs within a service group and up to 32 routers
  - Linear performance and scalability increase as devices are added

- **Seamless integration**
  - Transparency and automatic discovery
  - Supported on all WAE platforms
Cisco WAE PBR Deployment

- **Policy-Based Routing (PBR)**
  - Out-of-path with redirection of flows to be optimized (all flows or selective via access-list)
  - WAE treated as a next-hop router

- **High availability**
  - Failover capability allows a secondary WAE to be used should the primary WAE fail
  - IP SLAs ensure availability by tracking WAE liveliness

- **Seamless integration**
  - Transparency and automatic discovery
  - Supported on all WAE platforms
Cisco WAAS Auto-Discovery

- Cisco WAE devices automatically discover one another and negotiate optimization capabilities
  - Performed per TCP connection
  - Flexible optimization configuration using Application Traffic Policies
  - Exchange of peer capabilities and limitations

![Diagram of Cisco WAAS Auto-Discovery](image)
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Application-Specific Acceleration

- Application and protocol awareness
  - Eliminate unnecessary chatter
  - Save WAN bandwidth
  - Pre-populate edge cache as necessary
  - Enable disconnected operations
- Intelligent protocol acceleration
  - Read-ahead, prediction, and batching
  - Safe data and metadata caching
  - Improves application response time
  - Provide origin server offload
- WAASv4.1 application adapters
  - CIFS (Windows File Services)
  - Windows printing
  - HTTP
  - MAPI
  - NFSv3
  - Windows Media (Video)
Cisco WAAS Print Services

- Centrally Managed Print Services
  - Print driver distribution
  - Client driver download repository
  - Status and health reporting
- Supports Any Printer
  - Full feature compatibility
  - Job control and status monitoring
  - Guest and disconnected printing
- Print Server Configuration
  - Network parameters (IP, name, etc)
  - Queue definition and ACLs
Networks Without Compression

Congestion!
Data Transfer Without Compression
Networks With Compression

No Congestion or Less Congestion
Data Transfer With Compression
Data Redundancy Elimination (DRE): application-agnostic compression eliminates redundant data from TCP streams providing up to 100:1 compression

Persistent LZ Compression: session-based compression provides up to an additional 10:1 compression even for messages that have been optimized by DRE

Cisco WAAS Advanced Compression
• Analyze incoming data streams using a sliding window to identify “chunks”
• Each chunk assigned a 5-byte signature
• Single-pass used to identify chunks at multiple levels
  □ Basic chunks
  □ Chunk aggregation (nesting)
• After chunks are identified, DRE will begin pattern matching
  □ First look for largest chunks
  □ Look for smaller chunks if necessary
Each chunk is assigned a 5-byte signature
Without TCP Proxy

TIMEOUT! RESEND

X

?
TCP Proxy and TFO

Window Scaling
Large Initial Windows
Congestion Mgmt
Improved Retransmit
TCP Sawtooth

Return to maximum throughput could take a very long time!
Comparing TCP and TFO

Cisco TFO provides significant throughput improvements over standard TCP implementations.
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WAAS Intuitive Central Management

- Comprehensive Management
  - Central configuration
  - Device grouping
  - Monitoring, statistics
  - Alerts, reporting
- Easy-to-use Interface
  - Graphical U/I, Wizards
  - IOS CLI
  - Roles-based administration
- Proven Scalability
  - 1000’s of nodes
  - Redundancy and recovery
<table>
<thead>
<tr>
<th>Platform</th>
<th>Hardware</th>
<th>Positioning</th>
<th>Pricing and Availability</th>
</tr>
</thead>
</table>
| NM-WAE  | • Up to 2 GB RAM  
• Up to 160 GB storage | • Router integrated branch services  
• Targeted for Majority of Branch Offices | • Pricing: Starts from $3,750  
• Availability: Immediate |
| WAE-512 | • 1 or 2 GB RAM  
• 250 GB storage | • Edge deployments at small and medium-sized branch offices | • Pricing: Starts from $5,200  
• Availability: Immediate |
| WAE-612 | • 2 or 4 GB RAM  
• 300 GB storage  
• Hot-swap hard disk drive (HDD) replacement supported with Cisco WAAS | • Edge deployments at medium-sized and large enterprise branch offices  
• Core deployments at small and medium-sized data centers | • Pricing: Starts from $11,000  
• Availability: Immediate |

Note: All prices are USD list prices.
# WAAS Platforms

## Appliances & Network Modules

<table>
<thead>
<tr>
<th>Platform</th>
<th>Hardware</th>
<th>Positioning</th>
<th>Pricing and Availability</th>
</tr>
</thead>
</table>
| WAE-674  | • 4 or 8 GB RAM  
• 600 GB storage  
• Redundant, hot-swappable power supplies as an upgrade option  
• Hot-swappable HDD replacement supported with Cisco WAAS | • Edge deployments at medium-sized and large enterprise branch offices  
• Core deployments at small and medium-sized data centers. | • Pricing: Starts from $16,000  
• Availability: Immediate |
| WAE-7341 | • 12 GB RAM  
• 900 GB Storage  
• Redundant, hot-swappable power supplies  
• Hot-swappable HDD replacement supported with Cisco WAAS | • Core deployments at large to very large data centers | • Pricing: Starts from $53,000  
• Availability: Immediate |
| WAE-7371 | • 24 GB RAM  
• 1.5 terabytes (TB) storage  
• Redundant, hot-swappable power supplies  
• Hot-swappable HDD replacement supported with Cisco WAAS | • Core deployments at large to very large data centers | • Pricing: Starts from $129,000  
• Availability: Immediate |

Note: All prices are USD list prices.
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Cisco Wide Area Application Services Demo Configuration

WAN Simulator
Speed = 1.544Mbps
Delay = 80ms
Loss = 2%

Switch Port/Vlan Definitions
IP Address - 10.10.20.2

- VLAN 20: FAO/1 - 8
- VLAN 40: FAO/9 - 12
- VLAN 10: FAO/13 - 20
- Trunk: FAO/24 (VLANS 20 and 40 only)
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Cisco WAAS Benefits: Broad & Significant

- Improved response times for business-critical applications
- Savings from consolidation of servers, storage and backup
- Less infrastructure = lower OPEX
- Maximizes compliance & data protection
- Cost savings from reduced WAN bandwidth
- Full integration with Cisco data center + branch infrastructure
Thank You