WAN Router Product Update
The Intelligent Enterprise Edge
Session 2310
Agenda

- The Agile Enterprise
- WAN Requirements for Performance and High Touch Services
- Cisco 7500 and 7200 Solutions
- Interface Connectivity
- Services: Security and QoS
- Implementations: Broadband Termination, Multiservice, VPN, Data Center
- Catalyst 6000 Flexwan Module

How Business Is Changing

Old World
- Centralized
- Positional Power
- Factory
- Four Walls Mentality
- Vertical Integration
- Labor Vs. Management
- Predictability

New World
- Distributed
- Organizational Value
- Informational Power
- Customer Centric
- Extended Factory
- Core Competency Focus
- Employees and Partners
- Responsiveness and Flexibility
High Performance and High Touch Services at the Intelligent Network Edge

Edge Services
- Catalyst 6000 FlexWAN
- Cisco 7x00

WEB, AAA Servers
- Dial and ISDN
- Cable
- xDSL

Classic WAN and VPN

Edge Services
- QoS
- Security
- Address management (NAT)
- Etc.

Cisco 7500 Series Solutions
Cisco 7500 Series

- Ongoing new developments—performance, services, high availability
- Tried, known, and trusted
- Flexible, modular for multimedia, multiprotocol, multiservice connectivity
- Best in class for collapsed backbone, WAN edge, data center connectivity
- Investment protection for large installed base

Route Switch Processors

- Master RSP
- Slave RSP

Route Switch Processor (RSP) 8

- Improves system performance for edge and core service-enabled applications
- Increases switching performance by more than 40% over RSP4
- 8 MB SRAM (four fold increase over RSP 4) for packet buffering
- Supports all current PAs and VIPs

CEF and Optimal Switching (Kpps)
**RSP Overview**

<table>
<thead>
<tr>
<th>Product</th>
<th>CPU</th>
<th>Optimal Switching PPS</th>
<th>Process Switching PPS</th>
<th>Packet Memory (SRAM)</th>
<th>Program Memory (DRAM)</th>
<th>Boot Flash</th>
<th>PCMCIA Flash</th>
<th>ECC</th>
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<tbody>
<tr>
<td>RSP8</td>
<td>R7000</td>
<td>470+k</td>
<td>22+k</td>
<td>8MB</td>
<td>64 MB 128 MB 256 MB</td>
<td>16 MB</td>
<td>40 MB 110 MB</td>
<td>Yes</td>
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<tr>
<td>RSP4</td>
<td>R5000</td>
<td>345k</td>
<td>8k</td>
<td>2 MB</td>
<td>32 MB 64 MB 128 MB</td>
<td>8 MB</td>
<td>16 MB 20 MB</td>
<td>No</td>
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<tr>
<td>RSP2</td>
<td>R5000</td>
<td>220k</td>
<td>5k</td>
<td>2 MB</td>
<td>32 MB 64 MB 128 MB</td>
<td>8 MB</td>
<td>16 MB 20 MB</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: Items in Yellow Are Configurable Options

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**Versatile Interface Processor (VIP) Family**

VIP2-40
400 MB
65–90 kpps FDX

VIP2-50
400 MB
100–135 kpps FDX

VIP4-50
750+MB
150–210 kpps FDX

VIP4-80
750+MB
150–210 kpps FDX

**Features:**
- Very High Performance
- High Link Utilization
- High Availability
- Large–Scale CEF Applications
- Extensive Distributed IP Services
- Distributed Switching
- Distributed Services

**Benefits:**
- Increased Port Density
- Forwarding Performance
- Direct xIP Replacement
Announcing VIP4

- Designed for performance, high bandwidth applications
- Enabling technology for high bandwidth interfaces
  - ATM and POS OC-3, OC-12, GE
- Increased density—4xMCT3
- Distributed Cisco IOS® and network services

Cisco 7500 VIP4-50 and VIP4-80

- 750 Mbps+bandwidth
  - Dual, independent PCI buses
- New Memory Architecture
  - 256 MB program memory
  - 64 MB packet memory
- VIP4-50 MIPS RM5000-based
- VIP4-80 MIPS RM7000-based
  - 2x VIP4-50, 2-50 performance
    - For most demanding applications
- Cisco IOS 12.1 (=12.07T) and 12.0S
**VIP Family Options**

<table>
<thead>
<tr>
<th>Product</th>
<th>CPU</th>
<th>Packet Memory (SDRAM)</th>
<th>Program Memory (SDRAM)</th>
<th>Dist. SW</th>
<th>Dist. Svcs.</th>
<th>Bandwidth</th>
<th>Packet Forward</th>
<th>Packet DSW</th>
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</thead>
<tbody>
<tr>
<td>VIP4-80</td>
<td>R7000</td>
<td>64 MB</td>
<td>64 MB 128 MB 256 MB</td>
<td>Yes</td>
<td>Yes</td>
<td>750+MB</td>
<td>≤ 170 kpps</td>
<td>~160 kpps</td>
</tr>
<tr>
<td>VIP4-50</td>
<td>R5000</td>
<td>64 MB</td>
<td>64 MB 128 MB 256 MB</td>
<td>Yes</td>
<td>Yes</td>
<td>750+MB</td>
<td>≤ 140 kpps</td>
<td>~135 kpps</td>
</tr>
<tr>
<td>VIP2-50</td>
<td>R5000</td>
<td>4 MB 8 MB</td>
<td>32 MB 64 MB 128 MB</td>
<td>Yes</td>
<td>Yes</td>
<td>400 MB</td>
<td>≤ 140 kpps</td>
<td>90~135 kpps</td>
</tr>
<tr>
<td>VIP2-40</td>
<td>R5000</td>
<td>2 MB</td>
<td>32 MB 64 MB</td>
<td>Yes</td>
<td>Yes</td>
<td>400 MB</td>
<td>≤ 105 kpps</td>
<td>50~90 kpps</td>
</tr>
</tbody>
</table>

Note: Items in Yellow Are Configurable Options

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**Cisco 7500 Series Distributed Services**

- **Basic Switching**
  - Cisco Express Forwarding
  - IP Fragmentation
  - Fast EtherChannel®

- **VPN**
  - ACLs—Extended and Turbo
  - Cisco Encryption
  - GRE Tunnels
  - IP Security **
  - L2TP Tunnels**

- **QoS**
  - NBAR**
  - Traffic Shaping
  - Policing (CAR)
  - Congestion Avoidance
  - Guaranteed Minimum Bandwidth
  - Policy Propagation
  - Policy Routing

- **Multiservice**
  - Low Latency Queuing
  - FRF .11/.12**
  - RTP Header Compression

- **Accounting**
  - Output Accounting
  - Flow Export
  - Precedence and MAC Accounting

- **Load Balancing**
  - CEF Load Balancing
  - Multilink PPP

- **Caching**
  - WCCP V1

- **Compression**
  - L2 SW and HW Compression

**Future**
MX-Enabled Chassis

- Multiservice interchange backplane
- Switches up to 3702 DS-0 timeslots
- Based on time-division multiplexing (TDM) technology
- Integrated into RSP8-based chassis configurations
- Available for Cisco 7507 and Cisco 7513

Cisco 7500 Series High Availability Program

- Now—dual processors, HSRP, OIR
- Under development—increased availability and reduced downtime for both planned and unplanned outages
- Single line card reload
  Minimizes hit to system from a single line card crash; only affected line card goes down—not all line cards on system require reload; reload time can be reduced by approximately 5 times
- Route processor redundancy
  50% faster switchover to redundant route processor achieved through “warm standby” where a full Cisco IOS image is at “suspended initialization” stage on the redundant RP
- Fast software upgrade
  50% faster reload time during Cisco IOS upgrade (planned downtime) using basis of “warm standby”
Cisco 7200 Series Solutions

Cisco 7204 VXR and 7206 VXR

Up to 6 High-Speed Port Adapters

1 Gbps Bandwidth

Scalable 175–300 kpps Switching Scalability

Multiservice Interchange-Based on TDM Technology
Cisco 7200 Scalable Processor
Price/Performance

High Level Services
Performance

OC-3 *

DS3-OC-3

NPE225

NPE200

NPE 175

NPE300

NSE-1

PXF

Price

* Average Estimated Performance with 256 Byte Packets

Cisco 7200 Series New Processor and Integrated I/O Options

- Integrated input/output port
  - Frees chassis slot for high performance LAN link
  - Autosensing 10/100
  - Double the PA-GE performance

- NPE 400
  - 400 kpps; 33% increased performance over NPE 300
  - 8 MB L3 cache provides faster process switching

I/O:- 2 FE/E or GE+E Option

CY Q3 '00

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Wire Rate Intelligent Services
NSE-1 for Cisco 7200 Series

- Delivers sustained performance for combined services
- Hardware acceleration using Parallel eXpress Forwarding (PXF) technology
- 300 kpps CEF switching
- QoS, NAT, NetFlow, and ACL’s at OC-3 wire rate now
- Software only upgrade for future hardware accelerated features, such as cRTP, LFI, IP multicast, etc.

NEW
NOW SHIPPING!

Network Service Engine NSE-1

- Embedded PXF processor for service acceleration
- Services processed at high speed on micro-code-based Asic complex
- 128 MB default, to 256 MB SDRAM
Combined Services with Consistent Performance

Number of Services Added to the Network

NSE-1 with PXF Hardware Acceleration

Non-PXF Processing

50% to 300% Combined Performance Improvement

Cisco 7200 Series Accelerated Services

<table>
<thead>
<tr>
<th>WAN Edge</th>
<th>Multiservice</th>
<th>DSL</th>
<th>VPN</th>
<th>Other</th>
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</thead>
<tbody>
<tr>
<td>ACL</td>
<td>cRTP</td>
<td>PPoA</td>
<td>MPLS</td>
<td>WCCP</td>
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<tr>
<td>NAT</td>
<td>MLPPP</td>
<td>PPPoE</td>
<td>L2TP</td>
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<tr>
<td>CEF</td>
<td>VTMS</td>
<td>GRE</td>
<td></td>
<td></td>
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<tr>
<td>NETFLOW</td>
<td>FRF11</td>
<td>PPPoEoFR</td>
<td></td>
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<tr>
<td>WRED</td>
<td>FRF12</td>
<td>RBE+Unum</td>
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<tr>
<td>WFQ</td>
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<tr>
<td>LLQ</td>
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<td>CAR</td>
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</tr>
<tr>
<td>LFI</td>
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<td></td>
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<tr>
<td>IP Multicast</td>
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<td></td>
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</tr>
</tbody>
</table>

Now Shipping
Available Phase II
Available Phase III
Interface Connectivity

LAN
WAN
Uplink

Multimedia and Multiservice Connectivity

LAN
- Ethernet
- Fast Ethernet
- Gigabit Ethernet
- Token Ring
- FDDI

WAN
- Serial: HSSI, T1/E1, T3/E3, PRI
- Multichannel: T1/E1, T3/E3, STM-1/OC-3
- Packet over SONET (POS)—OC-3/STM1
- ATM: T3/E3, OC-3, OC-12, IMA
- Dynamic Packet Transport (DPT)

Service Adapters
- Encryption
- IPSec
- Compression
- Digital Voice
7x00 Gigabit Ethernet Family

- **Enhanced Gigabit Ethernet IP (GEIP+)**
  Provides over 800 Mbps performance
  Based on VIP4-80 technology
  Cisco 7500 only

- **GE IP**
  Moderate performance on Cisco 7500
  Based on VIP2-50 technology

- **GE Port Adapter on Cisco 7200**

- **GE+E I/O option on Cisco 7200**
  CY Q3 '00

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**DPT Enables Transport Flexibility and Evolution**

- DPT implements the spatial reuse protocol (SRP)
  - New media independent layer 2 MAC protocol
  - Uses SONET/SDH framing

- Bandwidth efficient

- Intelligent protection switching and service restoration

- Supports MPLS, multicast, and priority queueing

- OC-12 DPT available on 7xxx and 12xxx

- New extended reach optics

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OC-12c/STM4 ATM PA for Cisco 7500

- High-performance ATM connectivity
- Dual-wide 1 port SONET/SDH OC-12c/STM4 Port Adapter
- SM-IR (15 km) or multimode (500 m)
- Supports ATM forum TM 4.0 specification—UBR, nrt-VBR
- Per-VC and Per-VP traffic shaping
- Cisco IOS 12.1.(3)E
- Supported by VIP4-80 ONLY
- LANE supported in 12.1.(4)T

Services:
Security and QoS
Cisco IOS Firewall Feature
Set Cisco 7200 and 7500 Series

- For intranet, Internet, and extranet security
- Rich IOS feature set:
  - Stateful packet filtering via Context-Based Access Control (CBAC)
  - Java attack blocking
  - Intrusion detection
  - Denial of service detection and prevention
  - Authentication proxy
  - Real time alerts and audit trail
- New on Cisco 7500 Cisco IOS releases 12.1M, 12.1(1)T

Integrated Services Adapter (ISA)
Scalable Encryption Acceleration

- Hardware acceleration for IPSec or MPPE encryption
- Full duplex DS-3 (90 Mbps) 3DES for site–to–site encryption
- Encryption offload enables large scale deployments with full range of VPN services
- Cisco IOS release 12.1(1)E and 12.1(3)T release (7200)
- Unrestricted license of Cisco secure VPN client available at time of order
Network-Based Application Recognition (NBAR)

- **Problem:** How to classify web-based applications
- NBAR provides intelligent classification by application type, URL
- Protocol discovery analyzes application traffic patterns in real time
- NBAR classifies network traffic using application information and enables downstream actions based on QoS policies
- New applications supported by loading packet description language modules

My Application Is too Slow!

Cisco 7100/7200 Now
7500/Others,
CY Q4 ’00

Mark Citrix as Gold Service and Police FTP

Guarantee Bandwidth for Citrix!

Link Utilization
- Citrix 25%
- NetShow 15%
- Oracle 10%
- FTP 30%
- HTTP 20%

New and Future QoS Services

- Classification and Coloring
- Traffic Shaping and Policing
- Congestion Avoidance
- Congestion Management (Queuing)
- Diff Serv Marking of 64 Classes
- Network-Based Application Recognition (NBAR)
- QoS for VPNs
- RSVP with Distributed Queuing
- IP to ATM QoS

Voice QoS Features:
- Low Latency Queuing
- Header Compression
- Link Fragmentation and Interleaving

Advanced Queuing for Virtual Circuits

Hierarchical QoS Features
**VPN End-to-End QoS**

- Content-aware classification
- Enables classification for encrypted and tunneled VPNs
- Classify traffic before or after it is tunneled
- Supports ISP differentiated services offerings
- Preserves QoS signaling end-to-end
- Released in 12.0(5)XE3 for Cisco 7100/7200

**Hierarchical QoS Services**

- Hierarchically apply QoS features for input and output traffic shaping with configurable thresholds and strict priority queues
- For example, guarantee minimum bandwidth within a shaped flow
- To be released in 12.1(2)E, 12.1(3)T, 12.0(11)S, April–June 2000
Voice QoS Features

Distributed Low Latency Queuing
- Priority queued packets always sent first
- 12.0(5)XE, 12.0(9)S
- To be released in 12.1(4)T with RSVP support

Distributed Link Fragmentation and Interleave (LFI)
- Fragment large packets and interleave with voice packets over WAN links, reassembled at other end of link
- Reduces voice delay and jitter
- FRF 11/12 for Frame Relay—to be released in 12.1(2)E, 12.1(4)T

Distributed RTP Header Compression (CRTP)
- Header is twice the size of voice data (40 Vs. 20 bytes)
- CRTP reduces header to 2–4 bytes
- Used hop-by-hop on slow links
- To be released 12.1(4)T or 12.2(1)T

Implementations/Applications

Broadband Aggregation
Multiservice
VPN
Data Center
Voice and Data Integration—
The Cisco 7xxx Integrated Gateway

- Replace external voice gateway
- Terminate voice directly to PBX/PSTN
- MIX-enabled for TDM migration
- Provide signaling transport and interpretation

TDM to VoX Migration—
MIX-Enabled Port Adapters

High performance
2T1/E1 ports for PBX or PSTN connectivity
60/120 channels of high/medium complexity voice
PA-VXC-2TE1

Moderate performance
2T1/E1 ports for PBX or PSTN connectivity
40/60 channels of high/medium complexity voice
PA-VXB-2TE1

MIX Enabled PA
2/4/8 T1/E1

NEW NOW SHIPPING!
CY Q3 '00
Flexible Connection Migration
MIX-Enabled Chassis

- TDM between video codecs via leased line channels (CT1/CE1)
- TDM Connection between PBX and PSTN
- H.323 video across WAN
- VoIP or VoFR connection between PBX
- Gateway to PSTN or PBX

Enterprise Edge
Site-to-Site VPNs

Access CPE—Remote Site
VPN-Optimized Routers—Cisco 800, 1700, 2600, 3600
Broadband Access VPN Appliances

Enterprise—Central Site
WAN Routers—Cisco 7500, 7200, 7100
Cisco Secure PIX Firewall Appliance

- Broadest VPN offering
- Rich IOS VPN services
- End–to–end networking
Cisco Mainframe Channel Connectivity

- Direct channel attachment (7500CIP and 7200CPA)
  - ESCON (15 Mbps)
  - Bus and tag (4.5 Mbps)
  - SNA and TCP/IP
- Enhanced CPA (7200)
  - Up to 2.5 times the performance of the CPA
  - Four times the memory of the CPA
  - Higher channel throughput, more TN3270 server sessions, TN3270 encryption

Catalyst® 6000 FlexWAN Modules
Bandwidth Trends in the WAN

Thousands of Fiber Route Miles, 1999

Source: IDC and Vendors

As Bandwidth Becomes Plentiful...

Thousands of Fiber Route Miles, 1999

Source: IDC and Vendors

As Bandwidth Becomes Plentiful...

Monthly Service Price, 1999

Source: The Yankee Group

...Prices Drop Dramatically...

Enterprise Internet Requirements

Source: Forrester Research and Cisco Internal

...and High-Speed Internet Access Use Skyrockets

High-Speed Enterprise WAN
Bandwidth Migration

TODAY

Enterprise WAN/MAN will Migrate Toward Higher Bandwidth Services
Centralized Applications Drive Bandwidth Growth

Future

ISP or Enterprise WAN

T1

T3

Enterprise WAN/MAN

OC-48

OC-192

OC-12

OC-3

OC-48

OC-192

OC-12

OC-3

ISP or Enterprise WAN/MAN

Outsourced Applications
Serverless Buildings

T1/T3

FT1
Catalyst 6000 Family
FlexWAN Module

- WAN/MAN functionality for the Catalyst 6000 family of switches
  - Flexible media support
    - T1/E1, T3/E3, HSSI, OC-3
  - Flexible protocol support
    - Frame Relay, PPP, HDLC
    - ATM, Packet over SONET
- Support for two Cisco 7200/7500 WAN port adapters per module
- Common IOS software services
- Intelligent network services
  - Distributed Quality of Service
  - Wire-speed security access lists

NEW NOW SHIPPING!

FlexWAN Architecture

- Dual processor architecture
  - Dedicated R7000 RISC CPU per PA
- Dedicated memory architecture
  - Up to 128 MB of ECC SDRAM per PA
- Wire-speed forwarding
  - 200 Kpps per port adapter
  - 400 Kpps aggregate per module
- Distributed QoS services
  - Distributed packet classification and policing (CAR)
  - Distributed packet marking (DiffServ, IP Precedence)
  - Distributed congestion avoidance (WRED)
  - Distributed packet queuing (per–VC queuing, CB-WFQ, LLQ)
  - Distributed traffic shaping (GTS, FRTS)
Intelligent Enterprise Solutions
Cisco 7500 and Catalyst 6000

Cisco 7500 Series
- High density DS0 to OC-3 WAN aggregation
- Extensive LAN/WAN Interfaces
- Data center solutions
- Integrated enterprise WAN and VPN solutions

Cisco Catalyst 6000 family
- Scalable LAN/WAN/MAN bandwidth
  - T3 to OC-192
  - 10/100 to 10 Gigabit Ethernet
- Wire-speed network services
- Web server services
- Integrated LAN/WAN

Intelligent Enterprise WAN
Design Flexibility

Cisco 7500 and Catalyst 6000 Family Design Separation
- Scalable design
- Simplified change mgmt.
- Organizational policy
- Separation application: Security policy dictates separation of VPN/Firewall from campus backbone

Catalyst 6000 Family Design Integration
- Ease of service implementation
- Decreased operational costs
- Simplified element management
- Integration application: "E-Commerce POP-in-a-box" with WAN and GigE and server load balancing

Service Consistency
Flexible Network Design
Smooth Migration to Optical Networks
For More Information: Additional Related Sessions

- Cisco 7000 family Hardware Configuration and Performance Optimization: Session 2805
- Traffic Management and QoS Technologies: Sessions 2300 to 2302
- Advanced Routing Technologies: Session 2200
- Router Switching Performance Characteristics: Session 2203
- Introduction to WAN Protocols: Session 2303
- Deploying WAN Technologies: Session 2304
- Content Networking Product Update: Session 2605
- Introduction to VPNs: Session 2400
- VPN Product Update: Session 2404
- AVVID Product Update: Session 2008
WAN Router Product Update

Session 2310

Please Complete Your Evaluation Form

Session 2310