



Agenda

- **Market Overview**
- **Product Positioning**
- **Product Overview**
- **New Additions and Roadmap**

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Market Drivers

- ATM is widely deployed in backbone
- Ethernet dominates the desktop and IP is the dominant protocol
- Multiservice is growing rapidly
- Bandwidth requirements are increasing
 - ATM: 155 > 622 > 2,488
 - Ethernet: 10 > 100 > 1000 Mbps
- L3 QoS is slowly replacing L2 QoS

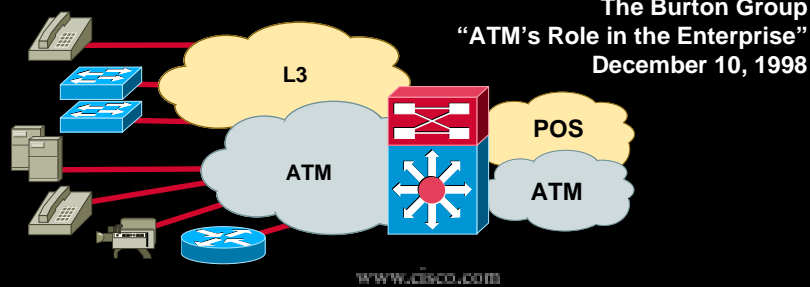
www.cisco.com

Catalyst 8500 Multiservice Switch Router

“

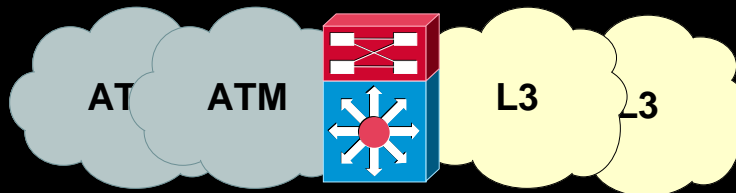
Enterprise customers who are unsure whether ATM or Ethernet will dominate their campus backbones several years down the road should purchase switches and routers that support both variable-length packets and fixed-length cells for the greatest investment protection.

”



The Burton Group
“ATM's Role in the Enterprise”
December 10, 1998

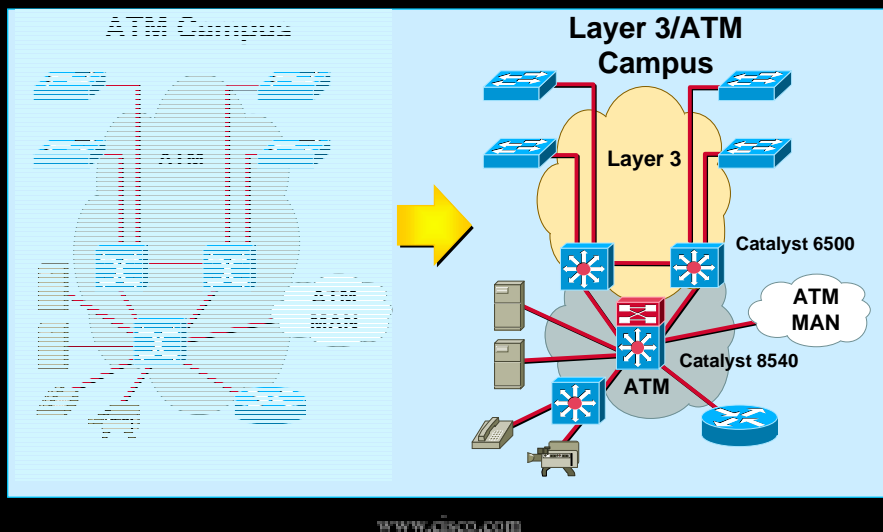
Introduction to L3eATM



- Layer 3/ATM integration/convergence
Layer 3 aware ATM platforms

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Introduction to L3eATM



Conclusions

- Cisco has the only true integrated Layer 3 and ATM solution available **today**
- The L3eATM market will grow rapidly with the uptake of Gigabit Ethernet
- Help you take advantage of the Layer 3 and ATM convergence

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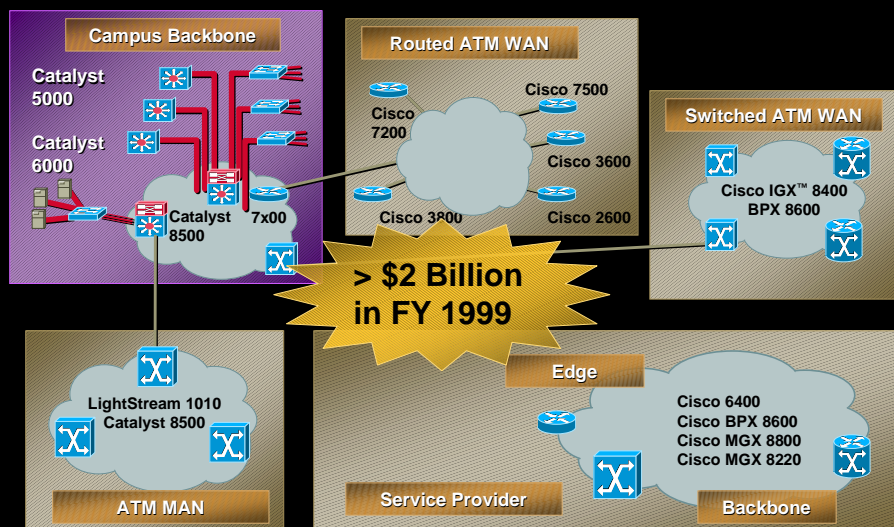
The ATM Equipment Market 1999–2001 (\$M)

	U.S.		Europe, Asia and RoW	
	1999	2001	1999	2001
Enterprise	\$817	\$1004	\$1098	\$1586
	\$242 WAN Access	\$395	\$127 WAN Access	\$329
Service Provider	\$989	\$1555	\$911	\$1856
	\$2048	\$2954	\$2136	\$3771

Vertical Systems Group 1998 ATM and Frame Relay Industry Update Report

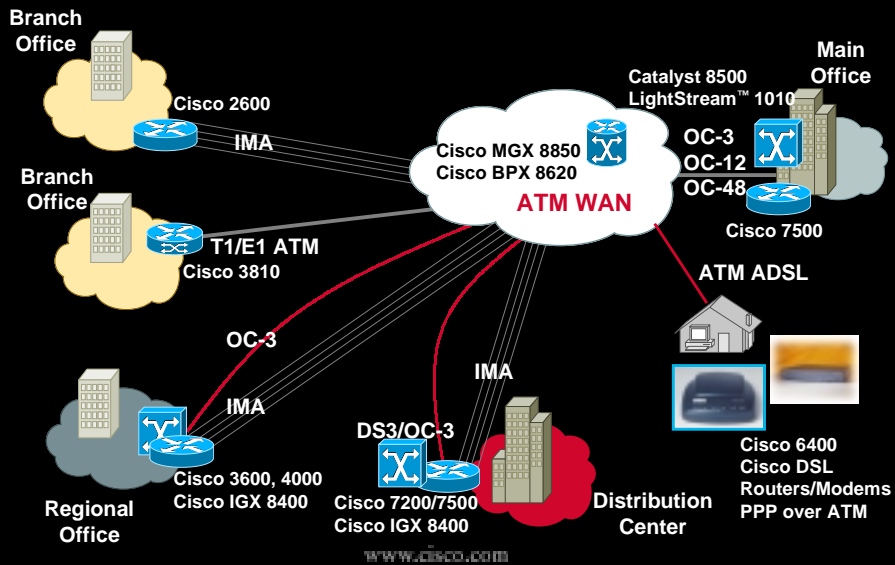
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Cisco ATM Portfolio

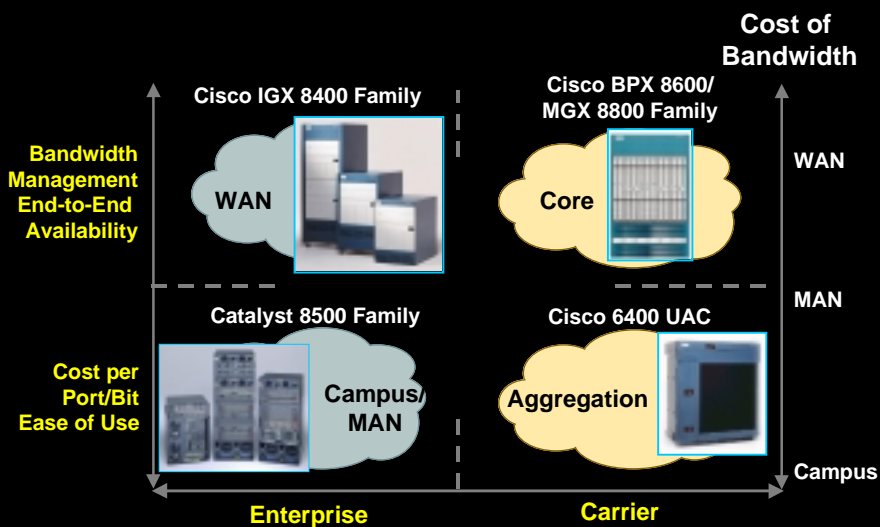


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The Cisco ATM Edge Portfolio



Cisco Backbone Switching Portfolio

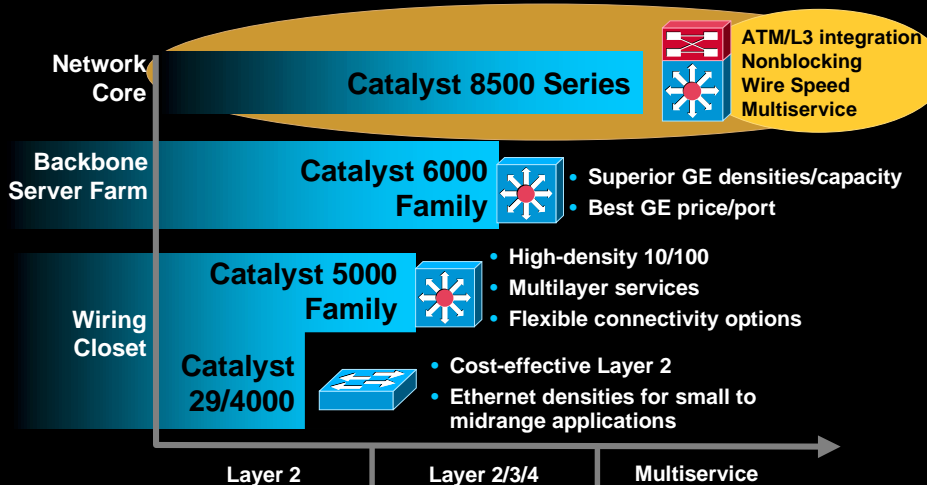


Agenda

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- **Product Positioning**
- Product Overview
- New Additions and Roadmap

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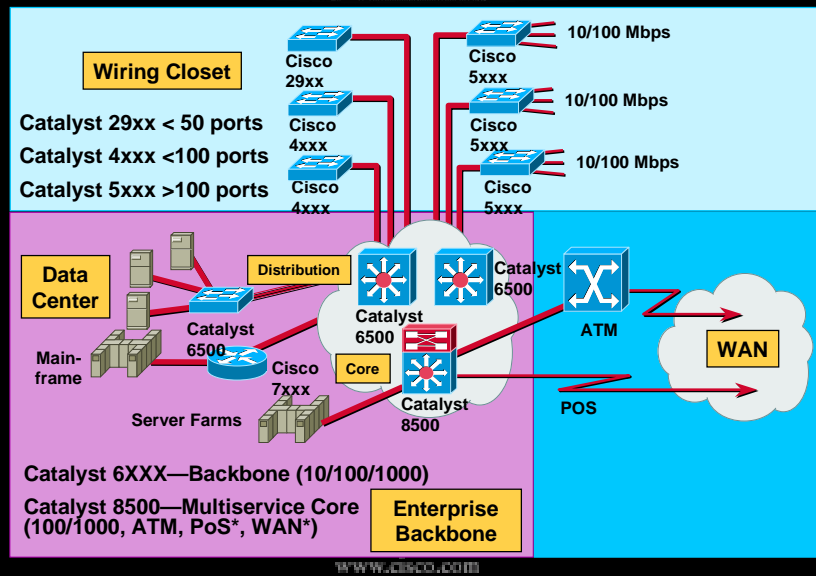
Scalable Catalyst Family



Cisco Network Services

www.cisco.com

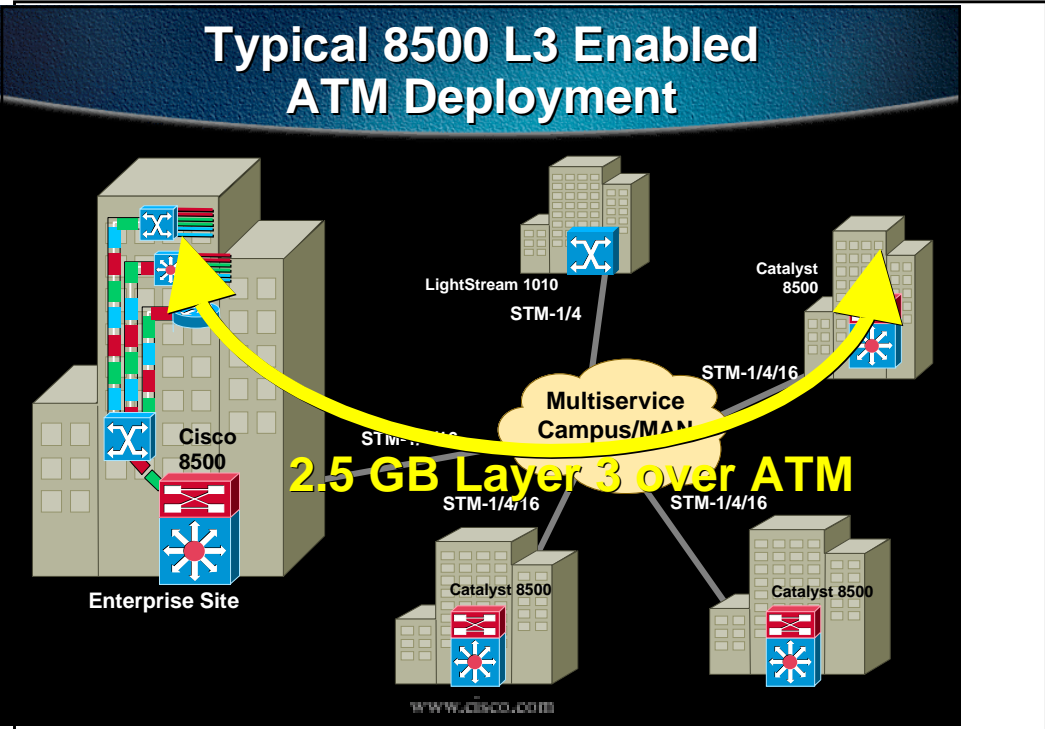
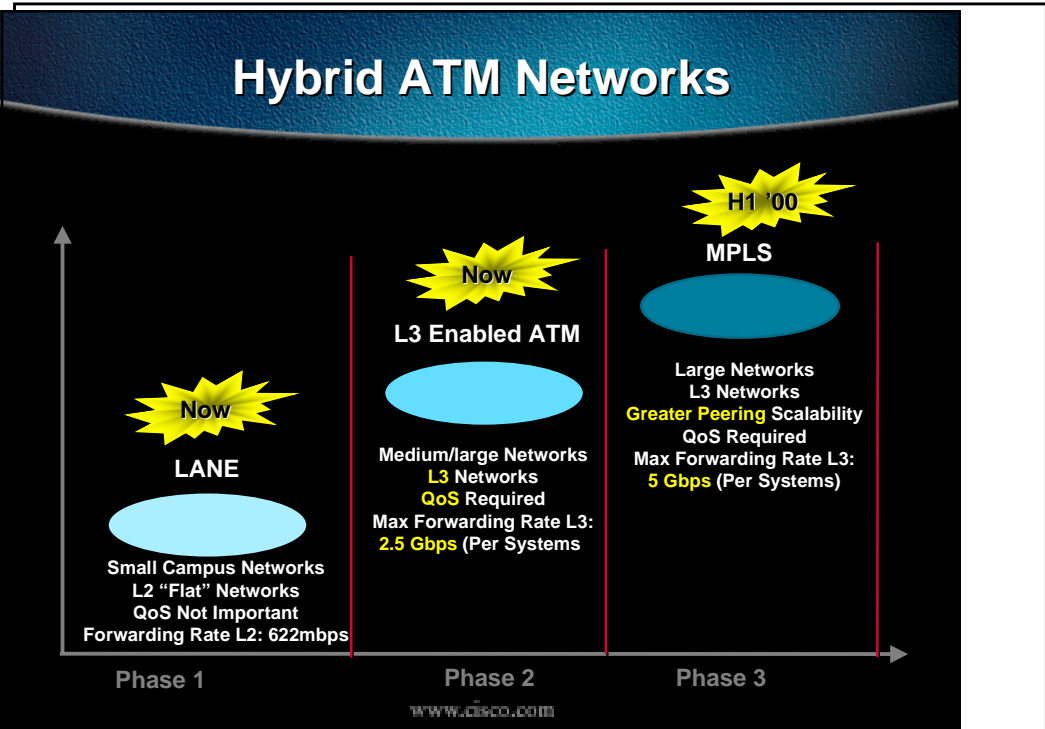
Cisco Enterprise Solutions



L3eATM Design Objectives

- Seamless Integration of L3 and ATM
- Build true multiservice MAN backbones
- Build large scalable, high performance networks

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Analyst Quote

“

ATM and TCP/IP will be the dominant backbone multiservice architectures over the next five years.

”

Source Dataquest 9/99

www.cisco.com

Analyst Quote

“

ATM in the LAN continues to grow, despite concerns that Gigabit Ethernet would quickly become the backbone of choice when standards were ratified in the middle of 1998.

”

Source Dataquest 9/99

www.cisco.com

Analyst Quote

“
The migration approach is clearly a natural for Cisco, because there are so many environments that started with ATM but now want to do something else, such as Gigabit Ethernet...”

The Yankee group

www.cisco.com

Analyst Feedback

“
This is amazing...you are really addressing migration in the enterprise space...”

Cahners Instat

“
The migration approach is clearly a natural for Cisco, because there are so many environments that started with ATM but now want to do something else, such as Gigabit Ethernet...”

The Yankee Group

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Catalyst 8500 Awards and Wins

Awards

- Network Magazine—
“Product of the Year”
- International Engineering Consortium—
InfoVision98 Award
- NetWorld/Interop—
ShowNet Backbone



Wins

- L3 backbones
Motorola
Hewlett-Packard
Nextel
- ATM/MSR
Johnson Controls (Nortel)
Caixa (Spain)
Illinois State Univ.
Sprint KC Campus



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Agenda

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Catalyst 8500 Switch Routers

Cisco IOS— “Bringing Internet Scalability to the Intranet”

Smooth Integration and **Investment Protection**

Wire-speed IP, IPX and IP Multicast Routing

Rich **Multiservice** Capabilities



Catalyst 8510
5 Slot



Catalyst 8540
13 Slot

Chassis

- NonBlocking Fabric
- Hot swappable line cards, fan trays, power
- Redundancy

Performance

- 10 Gbps to 40 Gbps switching fabric
- Wire speed throughput

Line Modules

- 10/100 , GE, FE/GE Channel
- OC-3, OC-12, OC-48c ATM switching

www.cisco.com

Catalyst 8510— 10 Gbps Switching

Investment Protection

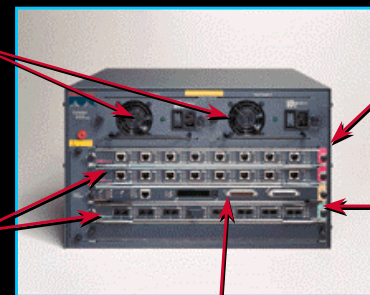
8510 SRP and Line Cards Enhance Catalyst 5500 Capabilities

Reliability

Redundant, Hot-Swappable Power Supplies

Line Cards

Hot Swappable Four Line-Card Slots



Switch Route Processor

1 Slot
10 Gbps Switch Fabric
Dynamic Shared Memory

Manageability

Same Chassis, Power Supply as Catalyst 5000, 5505 and LightStream 1010



Catalyst 5500

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Catalyst 8510 Line Cards

ATM

- All LightStream 1010 PAMs
- 4-port CE1 FR
- 4-port ATM25

L2/L3 Ethernet

16K Cards:

- 8-port 10/100 UTP
- 8-port FE Fiber
- 1-port GE Fiber(SX, LX)

64K Cards:

- 8-port 10/100 UTP
- 8 port FE Fiber
- 1-port GE Fiber (SX, LX)

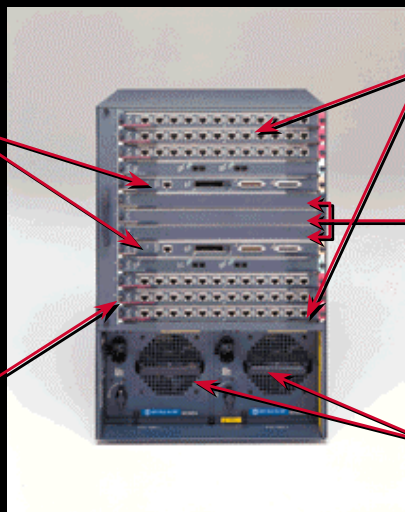


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Catalyst 8540—40-Gbps Switch

Route Processor
1:1 Redundancy
200 MHz R5000
based CPU for
CiscoIOS

**Hot Swappable
Fan Trays**



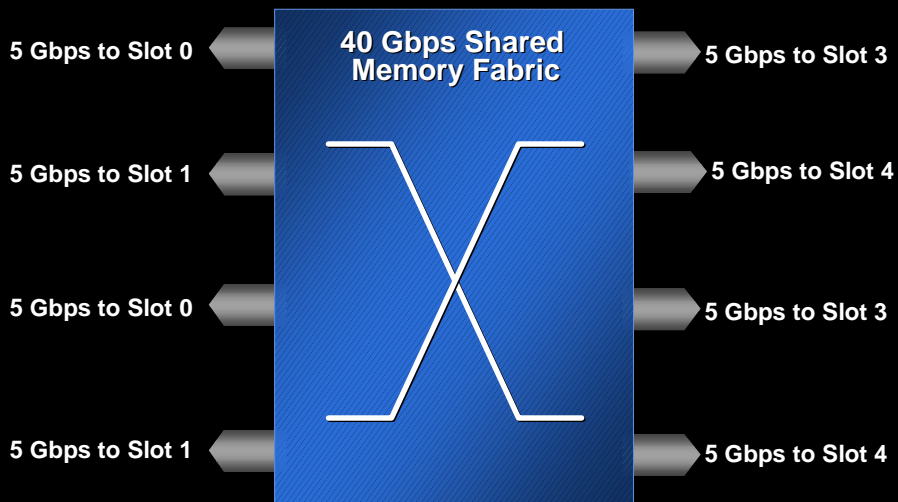
Line Cards
Hot Swappable
8 Line Card Slots

Switch Processor
40 Gbps switch fabric
2+1 Redundancy
Dynamic Shared
Memory

**Redundant
Power
Supplies
AC or DC**

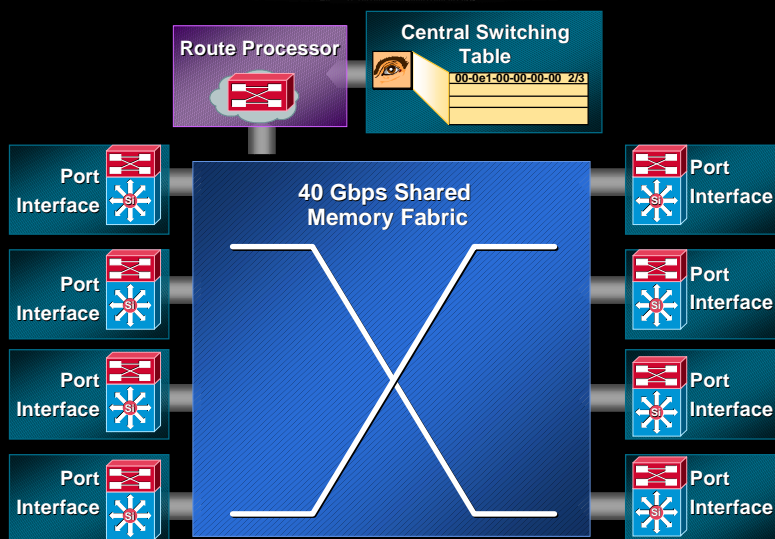
www.cisco.com

Bandwidth Allocation Per Slot



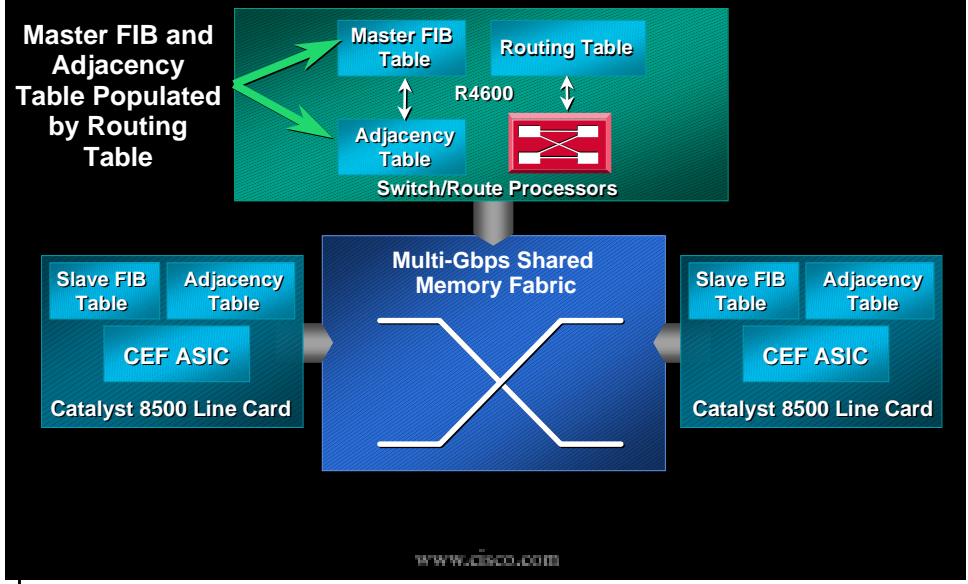
www.cisco.com

Catalyst 8540 Overview

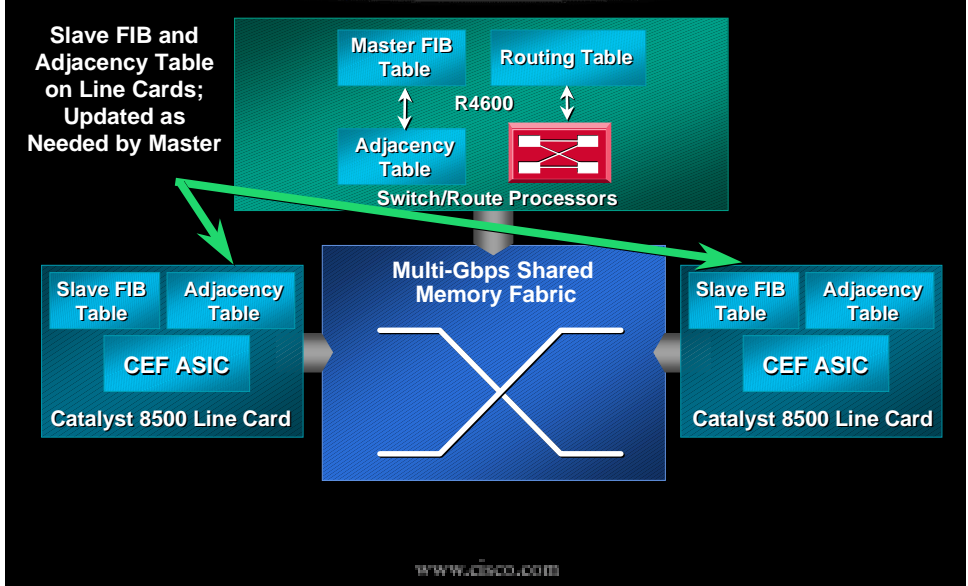


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CEF on the Catalyst 8500 SRP



CEF on the Line Cards



Catalyst 85XX Cisco IOS Highlights

Routing Protocols

IP—OSPF, IGRP,
EIGRP, BGP
IPmc—PIM-SM/DM

ATM Sig and Routing

UNI 3.X, UNI Sig 4.0
Hierarchical PNNI
E.164 <-> ATM NSAP

Rich QoS Features

Per-Flow Queuing
Per VC/VP Shaping
Strict, Rate Scheduling
Weighted Round Robin
Traffic Policing (UPC)

Reliability Features

High System Availability
HSRP and SSRP
PNNI Load Balancing

Management/Security

ILMI 4.0 Auto Discovery
ATM RMON,
TACACS+, RADIUS



Voice and Video

T1/E1 Circuit Emulation

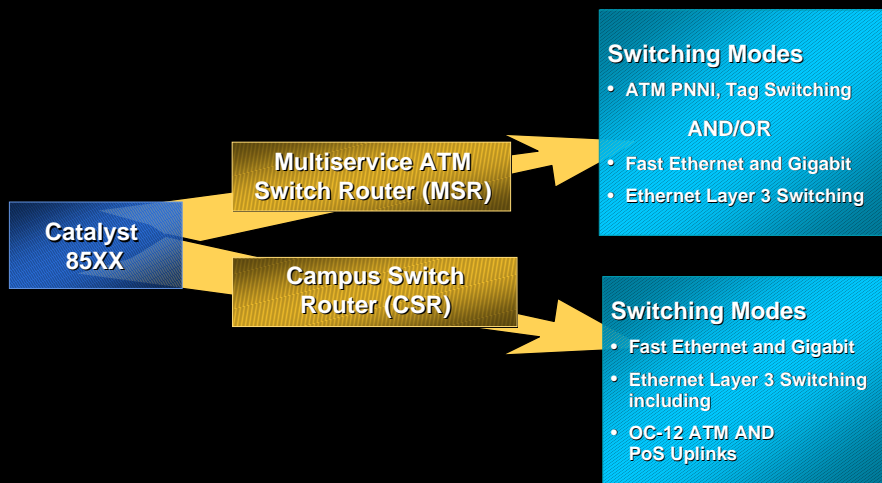
www.cisco.com

ATM Forum Quality of Service

Guaranteed Service	CBR	Constant Bit Rate Circuit Emulation, Voice
	VBR	Variable Bit Rate Real-Time VBR and Non Real-Time VBR
"Best Effort" Service	UBR	Unspecified Bit Rate No Guarantees, Adequate Buffering Needed
	ABR	Available Bit Rate

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Catalyst 8500 CSR and MSR



www.cisco.com

Catalyst 8540 Line Cards

ATM

- All LightStream 1010 PAMs except ATM25
- 4-port OC-12 SM
- 4-port OC-12 MM**
- 16-port OC-3 MM
- 4-port E1 FR
- 1-port OC-48SMIR +
- 4-port OC12 MM
- 1-port OC-48SMIR +
- 4-port OC-12 SM
- 2-port OC-48 SMIR
- 8 port IMA (Q2 CY '00)

L2/L3 Ethernet

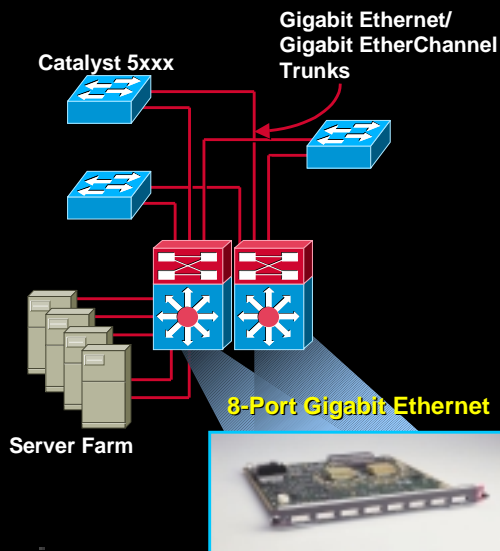
- 16-port 10/100, 16k
- 2-port GE 16kARM, 64k
- 16-port 10/100, 64k
- 16-port FE, Fiber, 64k
- 2-port GE, 64k
- 8-port GE, 64k



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Catalyst 8540 8-Port Gigabit Ethernet Application

- Applications
 - Server farm aggregation
 - Wiring closet aggregation
- Details
 - IntraVLAN traffic is locally switched
 - InterVLAN traffic is switched via main switch fabric
 - Supports L2 and L3 configuration on all ports



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Access Control Lists (ACL)



- Acls today:
 - Route filtering, SAP filtering
 - IP precedence based QoS
 - Source MAC filtering
- Static input and output ACLs for IP/IPX®
 - Standard ACLs (1-99)
 - Extended ACLs (100-199)

Problem:

- IP and IPX networks require controls to enable fast access to secure resources

Solution:

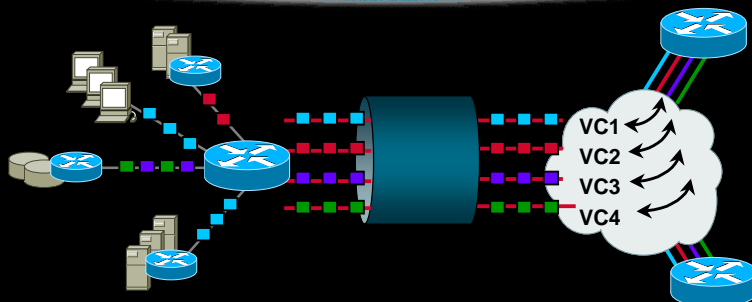
- Hardware based look-ups for high speed performance

Applications

- Provides a scalable, high-speed access and QoS mechanism for thousands of users

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ATM/IP QoS Internetworking

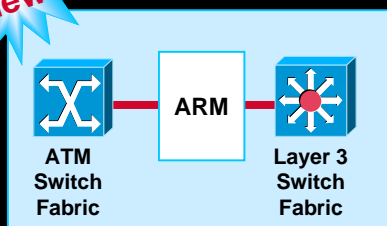


- Integrates IP precedence to ATM PVCs
- Supports multiple VCs for each source/destination and separate VCs for each IP CoS
- Enables use of any Cisco IOS classification engine
- Uses RED (WRED) or WFQ
- Enables mapping of IP precedence to CLP bit for intelligent discard in congested ATM networks



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Catalyst 8540 ATM Router Module (ARM)



**Bridging and routing
Internetworking**

ATM to Ethernet
ATM to ATM

Supports

64 K routes
64 LAN emulation clients
RFC1483 (Q4CY99)

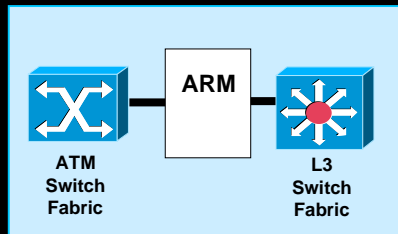
Catalyst 8540

F A N T R A Y	Interface Slot 0
	Interface Slot 1
	Interface Slot 2
	Interface Slot 3
	Primary CPU
	Switch Fabric Slot 0
	Switch Fabric Slot 1
	Redundant Switch Fabric
	Redundant CPU
	ARM
	Interface Slot 5
	Interface Slot 6
	Interface Slot 7
	Power Supply 1
Power Supply 2	

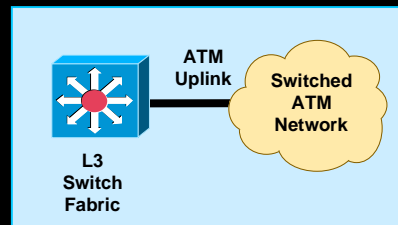
ATM Router Module
Slot 0-3, or 4-7

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ATM and L3 Interworking



Campus Internetworking
 ATM to Ethernet
 Inter-VLAN ATM to ATM



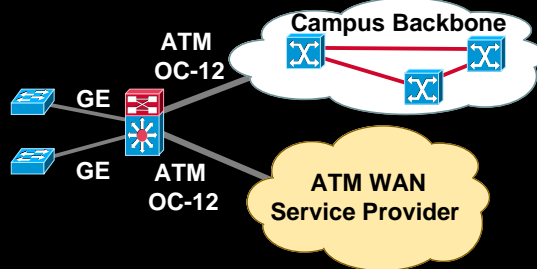
WAN Internetworking
 Uplink to switched ATM network
 Traffic Shaping

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Cisco 8500 ATM Uplink Module

Problem:
 Layer 3 networks need to be inter-connected using a WAN/MAN technology

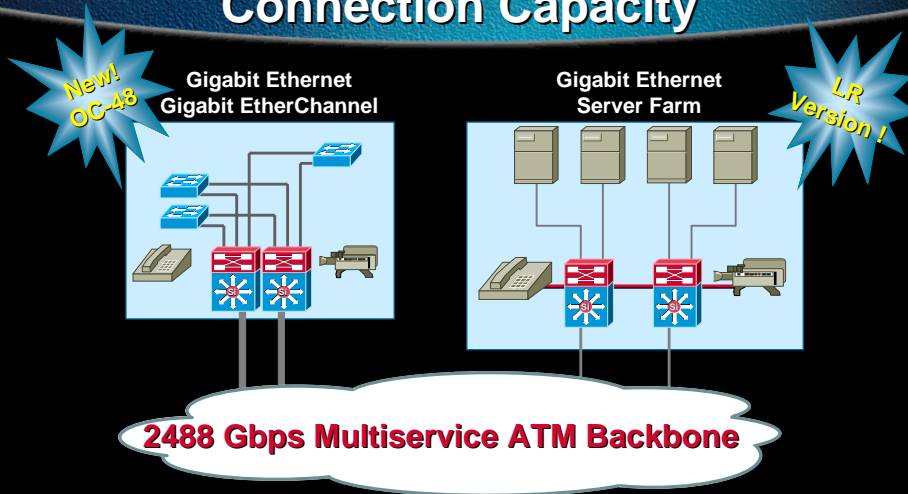
Solution:
 ATM Routed Uplink provides routed interworking between Layer 3 and ATM



- Routed ATM connectivity: Layer 3 to ATM network
- 1 port OC-12c (SMF-IR/ MMF) + 1 port GE
 64K or 256K routing table
- 1 port OC-3c (SMF-IR or MMF) + 1 port GE
 64K routing table

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Industry-Leading 2.488 Gbps Connection Capacity



- For large enterprise and metropolitan networks
- ATM Forum compliant, industry standard UNI interfaces

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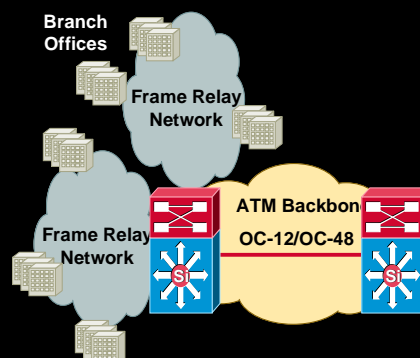
Interworking Frame and ATM Networks

Problem:

- Integrating existing Frame Relay with high capacity ATM networks

Solution:

- FRF5 Standard
- Frame Relay to ATM Network allows transparent frame-relay access across ATM Backbone
- FRF8 Standard
- Provides interworking between Frame Relay and ATM Services



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E1 Frame Relay Interworking

Problem:

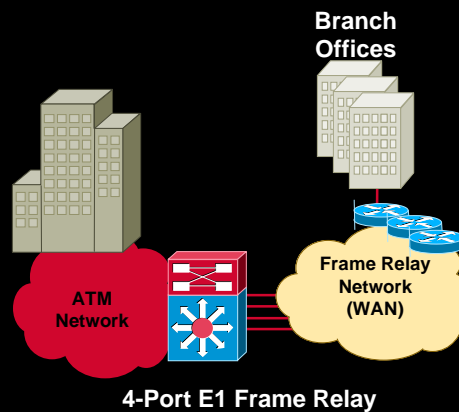
- High-capacity, economical Interworking for Frame Relay and ATM networks

Solution:

- 4-port E1 capacity with 64 Kbps aggregation and interworking

Applications:

- Service Providers offer cost-effective Frame Relay services over their high capacity ATM backbones
- Enterprise customers can connect remote frame-relay sites onto corporate ATM backbone



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Catalyst 8500: IMA in the WAN

Problem:

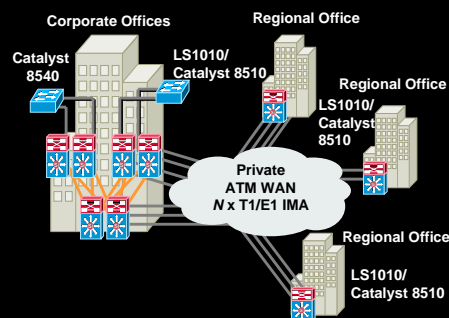
- No leased line ATM solutions between T1/E1 and T3/E3
- Need more bandwidth but no fiber available

Solution:

- IMA: Modular bandwidth in T1/E1 aggregates
- Bundling of N x T1 or E1 lines to create a single logical ATM link

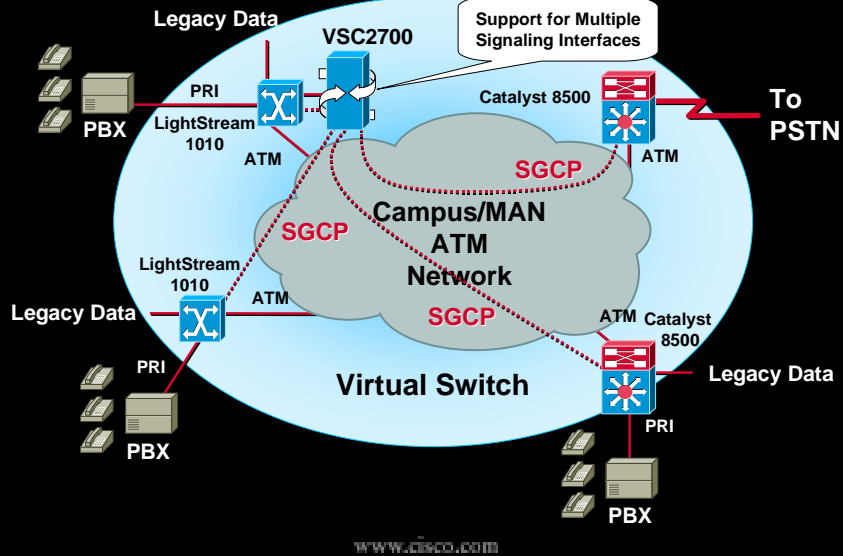
Benefit:

- Bandwidth and performance at the right price



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Catalyst 8500 CES with VSC Integration



VTOA Solutions

- 4 T1/E1 AAL2 PAM
 - Echo cancellation
 - Voice compression (G.711, G.729, G.729A, G.723.1)
 - CCS support with D-channel termination Signaling backhaul to VSC
 - MGCP/SGCP control
- Single infrastructure for data, voice, and video
 - Cost savings:
 - No Tandem PBX
 - Lower bandwidth required
 - Compressed voice calls
 - Bandwidth on demand

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Catalyst 8500 Accomplishments 1999

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Catalyst 8510 Line Cards

- **ATM**
 - All LS1010 PAMs
 - 4-port CE1 FR
 - 1-port CDS3 FR
 - 4-port ATM25
 - 8-port T1 IMA
 - 8-port E1 IMA

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Catalyst 8540 Cards

ATM

- All LS1010 PAMs except ATM25
- 4-port OC-12 SM
- 4-port OC-12 MM
- 16-port OC-3 MM
- 4-port E1 FR
- 1-port CDS3 FR
- 1-port OC-48SMIR
- 4-port OC-12 MM
- 1-port OC-48SMIR
- 4-port OC-12 SM
- 2-port OC48 SMIR

L2/L3 Ethernet

- 16-port 10/100, 16k
- 2-port GE 16k
- ARM, 64k
- 16-port 10/100, 64k
- 16-port FE, Fiber, 64k
- 2-port GE, 64k
- 8-port GE, 64k

ACL Daughter Card

- 16-port 10/100 UTP (16k/64k)
- 16-port FE Fiber (16k/64k)
- 2-port GE (16k/64k)
- SPARE

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Catalyst 85xx Layer 3 Support

8510 Platform

- EIGRP Optimization
- 802.1Q bridging
- IP multicast optimization

8540 Platform

- AppleTalk
- EIGRP Optimization
- ACL support
- 64K line cards
- 8 port GE
- Bridge group optimization
- IP multicast optimization (ph 1)
- BGP
- 802.1Q bridging
- Redundancy—L3

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Catalyst 85xx ATM Support

- Redundancy and availability
- Frame Relay network/service interworking
- 12-bit VPI support
- PNNI explicit paths
- PNNI alternate link selection and overflow
- Network clock distribution protocol
- Simple gateway control protocol (SGCP)
- MPLS/TAG COS
- 8510 T1/E1 IMA (ATMF v1.0)
- E1 IMA PAM (8510)
- ATM router module (8540)—LEC only
- ATM oversubscription
- AESA gateway

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CY 2000

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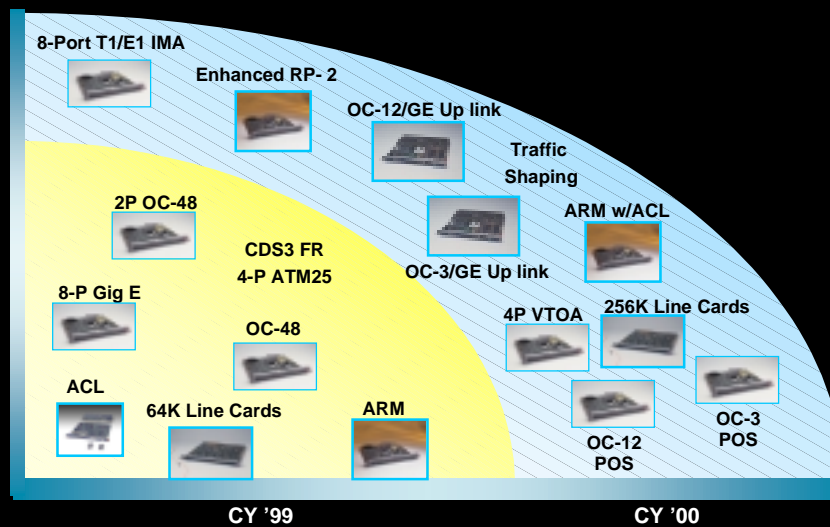
Catalyst 8500 FY '00 Focus



- L3eATM
- Multicast
- MPLS/VPN
- Voice over ATM

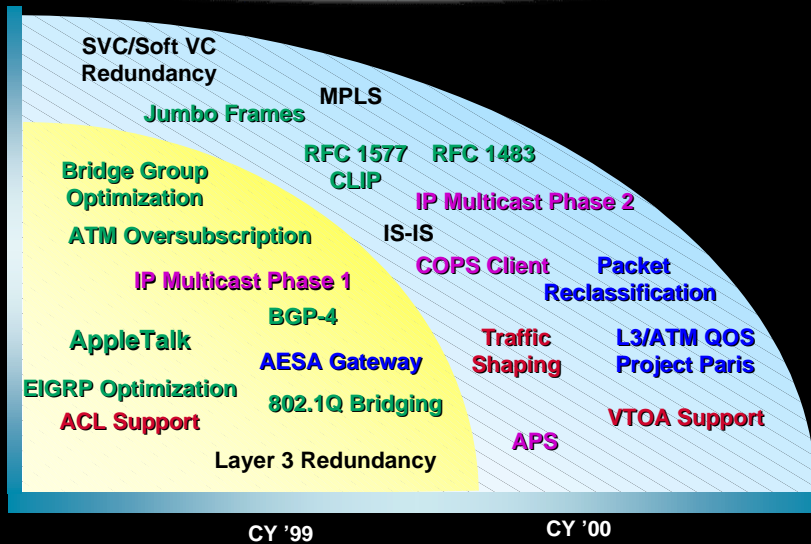
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Catalyst 8500 Hardware Roadmap



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Catalyst 8500 Software Roadmap



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Road Map CY '00

- Three releases

Millennium release : April/May '00

12.1(4)E Release: July/Aug '00

12.1(6)E Release Nov/Dec '00

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Millennium Release

- 2-port gigabit Ethernet line card (256k, integrated ACLs, XPIF)
- OC-3, OC-12 ATM uplinks (RFC 1483, traffic shaping)
- OC-12 POS uplink
- 8-port T1 and E1 IMA
- RFC 1483 support on ARM (IP, IPX, bridging, multicast)
- APS for ATM line cards
- OC-48c LR modules
- Catalyst 8510 ARM with RFC 1483 support
- Catalyst 8510 ACL support

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12.1(4)E Release

- ARM 2 with integrated ACLs and RFC 1577
- MPLS
 - LSR and LDP support for GE, POS and ATM
 - LER, MPLS VPN and LDP support for enhanced Gigabit Ethernet and POS
- Multicast MBGP and MSDP support
- Svc/soft VC redundancy support
- ACL on FEC, GEC and BVIs
- Policy-based routing support

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12.1(4)E Release

- **Power-on diagnostics**
- **APS support on OC-3/OC-12 ATM
OC-12 POS uplink**
- **L3 QoS for enhanced 2-port GE line card**
 - Baseline diff serv support
 - Class based CAR
 - Packet reclassification
- **L3/ATM QoS (project paris)**
 - VC bundles on ATM uplinks
- **Enhanced fault detection and isolation for RP, SP
and line card redundancy**

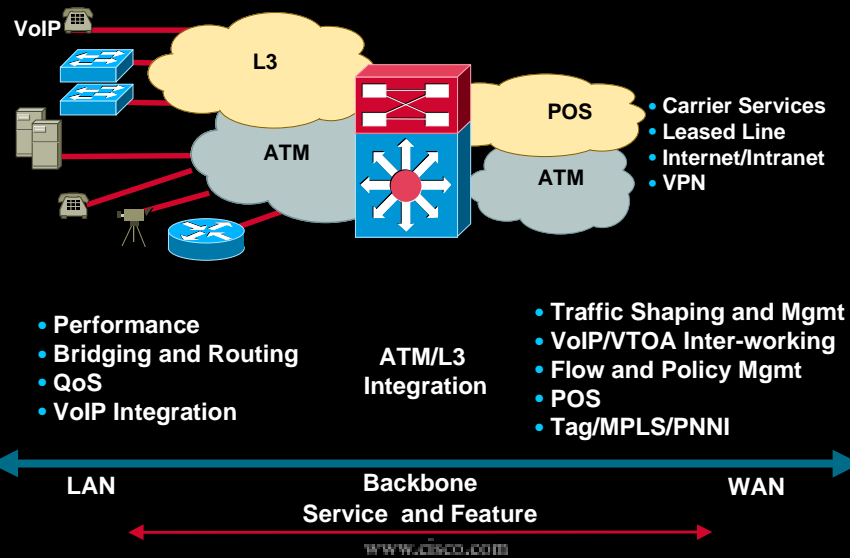
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12.1(6)E Release

- **MPLS LER, VPN, LDP and COS support on ARM 2
and ATM uplinks**
- **Multicast with bidirectional PIM support**
- **VTOA AAL2 card for LS 1010, Catalyst 8510
and 8540**
- **QOS for enhanced 2-port GE line card**
 - COPS client/QDM support
 - 802.1p/diff serv mapping
- **ATM traffic shaping on LS1010, 8510 and 8540
platforms**
- **2 port OC-3 ATM uplink module with APS**
- **4 port OC-3 POS uplink with APS**

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Catalyst 8500 Evolution



Conclusion

- Catalyst 8500 is well positioned in the new and emerging ATM/L3 space
- Leverage Cisco IOS advantage
- We are making progress....

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Catalyst 8500 WWW Resources

- Catalyst 8500 homepage

<http://www.cisco.com/warp/public/cc/cisco/mkt/switch/cat/8500/index.shtml>

- LS1010 Homepage

<http://www.cisco.com/warp/public/cc/cisco/mkt/switch/ls1010/index.shtml>

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CISCO SYSTEMS



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