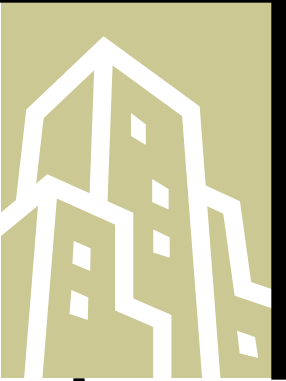


Cisco IOS Software and Multiprotocol Label Switching



The Challenges: The explosive growth of the Internet presents a serious challenge to service providers and equipment suppliers in terms of tremendous increases in traffic and the number of users. The demand for creating differentiated IP services and getting these new value-added services to market quickly is also increasing. Other challenges include additional costs of mapping IP over Layer 2 networks as well as difficulties in identifying better network utilization and fault handling. There is also a constant need to adapt to individual services in order to generate increased revenue streams.

The Solution: Cisco IOS® Multiprotocol Label Switching (MPLS) fuses the intelligence of routing with the performance of switching and provides significant benefits to networks with a pure IP architecture, as well as those with IP and ATM, or a mix of other Layer 2 technologies. MPLS technology is key to scalable virtual private networks (VPNs), end-to-end quality of service (QoS), enabling efficient utilization of existing networks to meet future growth and rapid fault correction of link and node failure. The technology also helps deliver highly scalable, differentiated end-to-end IP services with simpler configuration, management, and provisioning for both Internet providers and subscribers.

The MPLS standard, published by the Internet Engineering Task Force (IETF), evolved from the Cisco Tag Switching implementation. Cisco leadership and experience in the Tag Switching

and MPLS arena translates into a feature-rich implementation and a robust, proven platform for service-provider and business networks.

MPLS Technology

Based on label swapping, a single forwarding mechanism provides opportunities for new control paradigms and applications. MPLS Label Forwarding is performed with a label lookup for an incoming label, which is then swapped with the outgoing label and finally sent to the next hop. Labels are imposed on the packets only once at the edge of the MPLS network and removed at the other end. These labels are assigned to packets based on groupings or forwarding equivalence classes (FECs). Packets belonging to the same FEC get similar treatment. The label is added between the Layer 2 and the Layer 3 header (in a packet environment) or in the virtual path identifier/virtual channel identifier (VPI/VCI) field (in ATM

networks). The core network merely reads labels, applies appropriate services, and forwards packets based on the labels. This MPLS lookup and forwarding scheme offers the ability to explicitly control routing based on destination and source addresses, allowing easier introduction of new IP services.

Applications

Businesses rely on Cisco IOS Software for the delivery of the most complete MPLS feature set. The most common applications of Cisco IOS Software MPLS follow:

Traffic engineering is enabled through MPLS mechanisms that allow traffic to be directed through a specific path, which may not necessarily be the least-expensive path. Network managers can implement policies to ensure optimal traffic distribution and improve overall network utilization.

Guaranteed bandwidth is a value-added enhancement to traditional traffic-engineering mechanisms. MPLS lets service providers deliver guaranteed pipes and bandwidth allocations. Guaranteed bandwidth also allows bookkeeping of quality-of-service (QoS) resources to traffic engineer both premium and best-effort traffic such as voice and data.

Fast reroute (FRR) allows extremely quick recovery if a node or link fails. Such fast recovery prevents end-user applications from timing out and also prevents loss of data.

MPLS VPNs greatly simplify service deployment compared to traditional IP VPNs. As the number of routes and customers increases, MPLS VPNs easily scale, while providing the same level of privacy as Layer 2 technologies. In addition, they can transport nonunique IP addresses across a public domain.

MPLS class-of-service (CoS) capability ensures that important traffic is given the appropriate priority over the network and that latency requirements are met. IP QoS mechanisms can be seamlessly implemented in an MPLS environment.

Cisco IOS Software MPLS: Key Features and Benefits

Features	Benefits
Industry Standard	<ul style="list-style-type: none"> • Supports open, heterogeneous installations • Facilitates interoperability
New IP+ATM Network Model	<ul style="list-style-type: none"> • Offers reduced complexity as compared to IP over ATM • Provides increased IP scalability
Separated Control and Forwarding Planes	<ul style="list-style-type: none"> • (single forwarding mechanism) Provides opportunities for new control paradigms and applications
Explicit Data Forwarding—TE, GB, FR	<ul style="list-style-type: none"> • Offers ability to better control traffic and reroute packets • Enables explicit path forwarding of packets and bandwidth allocations for latency-sensitive applications • Offers fast fault-recovery times
Scalable VPN Services	<ul style="list-style-type: none"> • Provides a “build-once, sell-many-times” model • Provides highly scalable routing and optimal use of network resources
Developed from Cisco Tag Switching	<ul style="list-style-type: none"> • Offers most complete MPLS feature set • Features proven Cisco leadership and experience in MPLS

Protocol Support

Link Layer: Ethernet, ATM, Packet over SONET (POS), Dynamic Packet Transport (DPT), and point-to-point links

Platform Support

All Cisco IOS Software Release 12.1 versions and later include MPLS features.

For Additional Information

Additional information about the Cisco IOS MPLS technology can be found at www.cisco.com/go/mpls/ or by contacting your local Cisco representative.



Corporate Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA

www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters

Cisco Systems Europe
11, Rue Camille Desmoulins
92782 Issy Les Moulineaux
Cedex 9
France

www.cisco.com
Tel: 33 1 58 04 60 00
Fax: 33 1 58 04 61 00

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA

www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters

Cisco Systems Australia, Pty., Ltd
Level 17, 99 Walker Street
North Sydney
NSW 2059 Australia

www.cisco.com
Tel: +61 2 8448 7100
Fax: +61 2 9957 4350

Cisco Systems has more than 200 offices in the following countries. Addresses, phone numbers, and fax numbers are listed on the

Cisco.com Web site at www.cisco.com/go/offices.

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China • Colombia • Costa Rica • Croatia • Czech Republic • Denmark • Dubai, UAE
Finland • France • Germany • Greece • Hong Kong • Hungary • India • Indonesia • Ireland • Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The
Netherlands • New Zealand • Norway • Peru • Philippines • Poland • Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia
Slovenia • South Africa • Spain • Sweden • Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

Copyright © 2000, Cisco Systems, Inc. All rights reserved. Printed in the USA. Cisco, Cisco IOS, Cisco Systems, and the Cisco Systems logo are registered trademarks of Cisco Systems, Inc. or its affiliates in the U.S. and certain other countries. All other brands, names, or trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0010R)