Designing ATM MPLS Networks

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Jeremy Lawrence, Multiservice Switching Business Unit

Note on Versions

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Outline

Multiprotocol Label Switching (MPLS) extends the capabilities of IP routers and ATM Switches in several key ways:

- It fully integrates IP Routing control with ATM switches, providing native support of IP services such as IP Class of Service and IP Multicast on ATM switches as well as routers.
- It provides support for scalable and flexible IP Virtual Private Network (VPN) services on both switches and routers.
- It provides support for IP Traffic Engineering, which is the fine-grained adjustment of IP traffic flows according to the resources in a network.

This version of *Designing ATM MPLS Networks* concentrates on the fundamentals of ATM MPLS network design. These fundamentals apply to all ATM MPLS networks, irrespective of the services being offered on them:

- Choosing MPLS equipment
- IP+ATM concepts and equipment
- Designing and dimensioning ATM MPLS points of presence
- Dimensioning MPLS network links
- IP routing in ATM MPLS networks
- Dimensioning MPLS Label VC requirements
- Ongoing network design
- Migrating ATM networks to MPLS

Open Issues

Specific Comments & Errata

- 3.1: In Figure 4c it's not clear that the data flow is CPE — MGX — eLSR — MPLS cloud. A revised version of the diagram would make this clearer.
- 3.4: The equations are either correct or "safe" over-estimates. However some slightly tighter limits apply to the edge LSRs in networks with switches which use unpaired cross-connects, namely the LS1010, 6400 and 8540 MSR. These should be mentioned.

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M. R. Karim

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Advanced MPLS Design and Implementation Vivek Alwayn,2001 An in depth guide to understanding advanced MPLS implementation including packet based VPNs ATM based VPNs traffic engineering and quality of service Advanced MPLS Design and Implementation enables you to Understand MPLS through a detailed analysis of MPLS architecture and operationDesign and implement packet based MPLS Virtual Private Networks VPNs using label switching routers LSRs Design and implement ATM based MPLS VPNs using WAN switched ATM LSRsImplement MPLS traffic engineering on your core network and optimize traffic flows dynamicallyImplement MPLS QoS and provide hard service guarantees with multiple classes of serviceAcquire practical design and implementation knowledge of real world MPLS VPNs TE and QoS through case studies and configuration examples Multiprotocol Label Switching MPLS is a highly scalable high performance forwarding technology that has multiple applications in the service provider and enterprise environment This book is intended for internetwork engineers and administrators who are responsible for designing implementing and supporting service provider or enterprise MPLS backbone networks It contains a broad range of technical details on MPLS and its associated protocols packet based MPLS ATM based MPLS MPLS traffic engineering MPLS QoS MPLS design and advanced MPLS architectures This book contains MPLS theory design configuration and various case studies Use this book as a reference and guide for designing implementing and supporting an MPLS network Even if you re not using Cisco r equipment this book can increase your awareness and understanding of MPLS technology as well as provide you with detailed designconcepts and rules for building scalable MPLS networks Advanced MPLS Design and Implementation is your guide to understanding designing and implementing MPLS VPNs WAN switched MPLS VPNs MPLS traffic engineering and MPLS QoS   *Advanced MPLS Design and Implementation* Vivek #2995,2001 An in depth guide to understanding advanced MPLS implementation including packet based VPNs ATM based VPNs traffic engineering and quality of service Advanced MPLS Design and Implementation enables you to Understand MPLS through a detailed analysis of MPLS architecture and operation Design and implement packet based MPLS Virtual Private Networks VPNs using label switching routers LSRs Design and implement ATM based MPLS VPNs using WAN switched ATM LSRs Implement MPLS traffic engineering on your core network and optimize traffic flows dynamically Implement MPLS QoS and provide hard service guarantees with multiple classes of service Acquire practical design and implementation knowledge of real world MPLS VPNs TE and QoS through case studies and configuration examples Multiprotocol Label Switching MPLS is a highly scalable high performance forwarding technology that has multiple applications in the service provider and enterprise environment This book is intended for internetwork engineers and administrators who are responsible for designing implementing and supporting service provider or enterprise MPLS backbone networks It contains a broad range of technical details on MPLS and its associated protocols packet based MPLS ATM based MPLS MPLS traffic engineering MPLS QoS

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hardware manufacturers designers of network management systems customer network engineers and architects

Definitive MPLS Network Designs Jim Guichard,François Le Faucheur,Jean-Philippe Vasseur,2005-03-14 Field proven MPLS designs covering MPLS VPNs pseudowire QoS traffic engineering IPv6 network recovery and multicast Understand technology applications in various service provider and enterprise topologies via detailed design studies Benefit from the authors vast experience in MPLS network deployment and protocol design Visualize real world solutions through clear detailed illustrations Design studies cover various operator profiles including an interexchange carrier IXC a national telco deploying a multiservice backbone carrying Internet and IP VPN services as well as national telephony traffic an international service provider with many POPs all around the globe and a large enterprise relying on Layer 3 VPN services to control communications within and across subsidiaries Design studies are thoroughly explained through detailed text sample configurations and network diagrams Definitive MPLS Network Designs provides examples of how to combine key technologies at the heart of IP MPLS networks Techniques are presented through a set of comprehensive design studies Each design study is based on characteristics and objectives common to a given profile of network operators having deployed MPLS and discusses all the corresponding design aspects The book starts with a technology refresher for each of the technologies involved in the design studies Next a series of design studies is presented each based on a specific hypothetical network representative of service provider and enterprise networks running MPLS Each design study chapter delivers four elements They open with a description of the network environment including the set of supported services the network topology the POP structure the transmission facilities the basic IP routing design and possible constraints Then the chapters present design objectives such as optimizing bandwidth usage Following these are details of all aspects of the network design covering VPN QoS TE network recovery and where applicable multicast IPv6 and pseudowire The chapters conclude with a summary of the lessons that can be drawn from the design study so that all types of service providers and large enterprise MPLS architects can adapt aspects of the design solution to their unique network environment and objectives Although network architects have many resources for seeking information on the concepts and protocols involved with MPLS there is no single resource that illustrates how to design a network that optimizes their benefits for a specific operating environment The variety of network environments and requirements makes it difficult to provide a one size fits all design recommendation Definitive MPLS Network Designs fills this void This book comes as a boon to professionals who want to understand the power of MPLS and make full use of it Parantap Lahiri Manager IP Network Infrastructure Engineering MCI Includes a FREE 45 Day Online Edition This book is part of the Networking Technology Series from Cisco Press which offers networking professionals valuable information for constructing efficient networks understanding new technologies and building successful careers **MPLS** Bruce S. Davie,Yakov Rekhter,2000 Written by two of the foremost experts on the subject who illustrate concepts with practical examples of their application The most authoritative text on MPLS Highly

Recommended Daniel Awduche Distinguished Technical Member UUNET MCI Worldcom At last a comprehensive presentation of MPLS reflecting its development and usage this book is a MUST for any Network Engineering Manager contemplating the deployment of MPLS Monique Jeanne Morrow IP Engineering Manager Swisscom AG Davie and Rekhter provide a detailed and unbiased chronology of the evolution of MPLS Their scientific approach to decomposing various protocols into their fundamental elements is interwoven with a more pragmatic compilation of diagrams typical networking scenarios and applications Provides a solid knowledge base for researchers and operators dedicated to MPLS and its future Eric Dean Senior Director Internetwork Engineering Global One Multiprotocol Label Switching MPLS is now a widely deployed technology which addresses a variety of issues including traffic engineering Quality of Service Virtual Private Networks and IP ATM integration MPLS Technology and Applications is the first book that provides a detailed analysis of the architecture protocols and application of MPLS Written by experts who personally authored key parts of the standard this book will enable network operators and designers to determine which aspects of networks would benefit from MPLS It is also a definitive reference for engineers implementing MPLS based products Features Covers major applications of MPLS traffic engineering VPNs IP ATM integration and QoS Describes all the major protocols that comprise MPLS including LDP RSVP and CR LDP Goes beyond the RFCs to explain how and why key design decisions were made Provides a complete discussion of constraint based routing   *Rick Gallahers MPLS Training Guide* Syngress,2004-01-06 Rick Gallahers MPLS Training Guide introduces readers to mpls concepts installation migration operation inspection and troubleshooting It discusses specific router and switch platforms and includes such topics as frame mode mpls cell mode mpls label distribution protocol tag distribution protocol label distribution protocol migration mpls configuration traffic engineering mpls vpns mpls vpn deployment models mpls vpn routing protocol support multi protocol bgp mpls vpn configurations mpls vpn integration and mpls vpn management Readers will find complete ready to use configurations for routers Shows how to implement MPLS traffic engineering on a core network and optimize traffic Great for users studying for Cisco s Implementing Cisco MPLS exam 640 910 and written by a Cisco internetworking expert who knows everything about MPLS Includes coverage of Cisco Systems newly released October 7 2002 Multiprotocol Label Switching MPLS Bandwidth Protection software package The new architecture uses MPLS Traffic Engineering Fast Reroute and an offline application called Tunnel Builder Pro to increase resiliency at a network wide level Includes updated coverage of MPLS and GMPLS   Communications Networking : Atm & Mpls And Theory Application Foundations Of Multi-Service Networking, The Ultimate Reference David E. Mcdysan,Et.Al, Solve all your networking problems and improve overall performance using this detailed guide to ATM and IP technologies You ll get full coverage of circuits multiplexing switching frame relay bridging routing signaling and much more This practical guide also covers ATM hardware software and high layer protocols Tap into the power of ATM and MPLS technology with this definitive guide Focusing on practical application over theory this book combines background

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