# DEPLOYING NEXT GENERATION MULTICAST-ENABLED APPLICATIONS

Label Switched Multicast for MPLS VPNs, VPLS, and Wholesale Ethernet



Vinod Joseph | Srinivas Mulugu



**Vivek Alwayn** 

**Deploying Next Generation Multicast-enabled Applications** Vinod Joseph, Srinivas Mulugu, 2011-07-15 Deploying Next Generation Multicast Enabled Applications provides detailed information on existing Multicast and MVPN standards referred to as Next Generation Multicast based standards Multicast Applications and case studies with detailed configurations This Week Deploying MPLS Tim Fiola, Jamie Panagos, 2011-04-22 **Next Generation Content Delivery** Infrastructures: Emerging Paradigms and Technologies Fortino, Giancarlo, Palau, Carlos E., 2012-06-30 This book delivers state of the art research on current and future Internet based content delivery networking topics bringing to the forefront novel problems that demand investigation **Guide to Disaster-Resilient Communication Networks** Jacek Rak, David Hutchison, 2020-07-22 This authoritative volume presents a comprehensive guide to the evaluation and design of networked systems with improved disaster resilience The text offers enlightening perspectives on issues relating to all major failure scenarios including natural disasters disruptions caused by adverse weather conditions massive technology related failures and malicious human activities Topics and features describes methods and models for the analysis and evaluation of disaster resilient communication networks examines techniques for the design and enhancement of disaster resilient systems provides a range of schemes and algorithms for resilient systems reviews various advanced topics relating to resilient communication systems presents insights from an international selection of more than 100 expert researchers working across the academic industrial and governmental sectors This practically focused monograph providing invaluable support on topics of resilient networking equipment and software is an essential reference for network professionals including network and networked systems operators networking equipment vendors providers of essential services and regulators The work can also serve as a supplementary textbook for graduate and PhD courses on networked systems resilience Modeling and Optimization of Cloud-Ready and Content-Oriented Networks Krzysztof Walkowiak, 2016-03-10 This book focuses on modeling and optimization of cloud ready and content oriented networks in the context of different layers and accounts for specific constraints following from protocols and technologies used in a particular layer It addresses a wide range of additional constraints important in contemporary networks including various types of network flows survivability issues multi layer networking and resource location The book presents recent existing and new results in a comprehensive and cohesive way The contents of the book are organized in five chapters which are mostly self contained Chapter 1 briefly presents information on cloud computing and content oriented services and introduces basic notions and concepts of network modeling and optimization Chapter 2 covers various optimization problems that arise in the context of connection oriented networks Chapter 3 focuses on modeling and optimization of Elastic Optical Networks Chapter 4 is devoted to overlay networks The book concludes with Chapter 5 summarizing the book and present recent research trends in the field of

network optimization Advanced Content Delivery, Streaming, and Cloud Services Mukaddim Pathan, Ramesh K. Sitaraman, Dom Robinson, 2014-09-19 While other books on the market provide limited coverage of advanced CDNs and streaming technologies concentrating solely on the fundamentals this book provides an up to date comprehensive coverage of the state of the art advancements in CDNs with a special focus on Cloud based CDNs The book includes CDN and media streaming basics performance models practical applications and business analysis It features industry case studies CDN applications and open research issues to aid practitioners and researchers and a market analysis to provide a reference point for commercial entities The book covers Adaptive Bitrate Streaming ABR Content Delivery Cloud CDC Web Acceleration Front End Optimization FEO Transparent Caching Next Generation CDNs CDN Business Intelligence and more Provides an in depth look at Cloud based CDNs Includes CDN and streaming media basics and tutorials Aimed to instruct systems architects practitioners product developers and researchers Material is divided into introductory subjects advanced content and specialist areas Handbook of Research on Redesigning the Future of Internet Architectures Boucadair, Mohamed, Jacquenet, Christian, 2015-05-31 As the volume of global Internet traffic increases the Internet is beginning to suffer from a broad spectrum of performance degrading infrastructural limitations that threaten to jeopardize the continued growth of new innovative services In answer to this challenge computer scientists seek to maintain the original design principles of the Internet while allowing for a more dynamic approach to the manner in which networks are designed and operated The Handbook of Research on Redesigning the Future of Internet Architectures covers some of the hottest topics currently being debated by the Internet community at large including Internet governance privacy issues service delivery automation advanced networking schemes and new approaches to Internet traffic forwarding and path computation mechanics Targeting students network engineers and technical strategists this book seeks to provide a broad and comprehensive look at the next wave of revolutionary ideas poised to reshape the very foundation of the Internet as we know **MPLS-Enabled Applications** Ina Minei, Julian Lucek, 2010-12-10 With a foreword by Yakov Rekhter Here at last is a single all encompassing resource where the myriad applications sharpen into a comprehensible text that first explains the whys and whats of each application before going on to the technical detail of the hows Kireeti Kompella CTO Junos Juniper Networks The authoritative guide to MPLS now in its Third edition fully updated with brand new material MPLS is now considered the networking technology for carrying all types of network traffic including voice telephony real time video and data traffic In MPLS Enabled Applications Third Edition the authors methodically show how MPLS holds the key to network convergence by allowing operators to offer more services over a single physical infrastructure The Third Edition contains more than 170 illustrations new chapters and more coverage guiding the reader from the basics of the technology though all its major VPN applications MPLS Enabled Applications contains up to date coverage of The current status and future potential of all major MPLS applications including L2VPN L3VPN pseudowires and VPLS A new chapter with up to date

coverage of the MPLS transport profile MPLS TP MPLS in access networks and Seamless MPLS the new architecture for extending MPLS into the access discussed in depth for both the unicast and the multicast case Extensive coverage of multicast support in L3VPNs mVPNs explaining and comparing both the PIM GRE and the next generation BGP MPLS solutions and including a new chapter on advanced topics in next generation multicast VPNs A new chapter on advanced protection techniques including detailed discussion of 50 ms end to end service restoration Comprehensive coverage of the base technology as well as the latest IETF drafts including topics such as pseudowire redundancy VPLS multihoming IRB and P2MP pseudowires MPLS Enabled Applications will provide those involved in the design and deployment of MPLS systems as well as those researching the area of MPLS networks with a thoroughly modern view of how MPLS is transforming the networking world Essential new material for those trying to understand the next steps in MPLS Adrian Farrel IETF Routing Area Director MPLS Enabled Applications takes a unique and creative approach in explaining MPLS concepts and how they are applied in practice to meet the needs of Enterprise and Service Provider networks I consistently recommend this book to colleagues in the engineering education and business community Dave Cooper Chief IP Technologist Global Crossing Ltd

This Week Deploying MBGP Multicast VPNs Antonio Sánchez Monge, 2011-04-15 MPLS Technology and <u>Implementation</u> Richard Johnson, 2025-06-18 MPLS Technology and Implementation MPLS Technology and Implementation offers a comprehensive methodical exploration of Multiprotocol Label Switching MPLS guiding readers from foundational architecture and core principles to advanced innovations and real world deployments. The book meticulously unpacks the MPLS protocol stack elucidating the design philosophy that merges Layer 2 and Layer 3 transport and clarifies key concepts such as label switching forwarding mechanisms label distribution and protocol operations across varying network scenarios Through detailed technical breakdowns readers gain a solid understanding of MPLS components control and data plane separation scalability optimizations and packet forwarding logic laying a robust groundwork for both new learners and seasoned network professionals Building on these fundamentals the book examines essential MPLS applications spanning Layer 3 and Layer 2 VPNs Ethernet VPN EVPN multicast services and advanced traffic engineering In depth discussions on dynamic label signaling protocols resource reservation strategies hierarchical forwarding and protection switching equip practitioners to implement performant resilient and scalable MPLS solutions The book also presents contemporary MPLS advancements including segment routing SDN integration service function chaining and deployment in modern data centers and virtualized network environments offering a future proof perspective for evolving networking needs A dedicated focus on operational excellence and security rounds out this authoritative work covering network automation OAM real time monitoring troubleshooting high availability and compliance Real world deployment case studies spanning service provider enterprise 5G IoT and multi cloud networks provide invaluable insights into MPLS design patterns lessons learned and common pitfalls Concluding with a forward looking view on protocol evolution the book positions itself as an indispensable

resource for network architects engineers and decision makers architecting the next generation of MPLS enabled Deploying IP Multicast in the Enterprise Thomas Maufer, 1998 All readers need to know to deploy IP infrastructures Multicasting now and optimize it tomorrow is found within these pages This is one of the first books to closely examine the protocols which make Multicasting possible and the thorny routing issues that arise in enterprise Multicasting 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 The MPLS Primer Sean J. Harnedy, 2002 An introduction to Multi Protocol Label Switching MPLS and related technologies for the network administrator It provides the key definitions and terminology relating to MPLS and explains the technologies that have come together to create MPLS Building Switched Networks Darryl P. Black, 1999 Building Switched Networks provides a comprehensive technical survey of the networking technologies that comprise the core of evolving LAN and WAN infrastructures This book gives you essential background information clear descriptions of relevant technologies and an understanding of how those technologies will be employed throughout networks in the near future In particular the text focuses on developments that support our increasing demand for network bandwidth multilayer switching delivery quarantees and multicasting and examines performance issues resource allocation network policy and network services 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 dynamically Implement 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 Label Assignment and Failure Recovery Approaches for IP Multicast Communication traffic engineering and MPLS OoS in MPLS Networks Omar Qasem Banimelhem, 2005 Multiprotocol Label Switching MPLS is an Internet Engineering Task Force IETF framework that provides for the efficient designation routing forwarding and switching of traffic flows through the network MPLS is widely used for multicast traffic engineering However integrating MPLS with IP multicast

communication is difficult This thesis proposes solutions for two problems label assignment and failure recovery When a set of multicast flows sessions is deployed in an MPLS network each multicast entry for the sessions consumes an MPLS label However MPLS labels are significant resources in MPLS networks as the 20 bit field of the MPLS header limits the number of available labels It is advantageous if different multicast sessions can share the same multicast tree in the network and re use the MPLS label In the first part of the thesis we propose two algorithms to do this The first one is called State Encoding SE in which a code is calculated for every tree built in an MPLS network The second algorithm is called Tree Numbering TN where a number represents each tree If the IP packets of different multicast sessions are delivered over the same tree all those packets are then classified to the same Forwarding Equivalence Class FEC and only one label is used instead of using a number of labels equal to the number of those sessions The second part of this thesis contributes to this area To trade off between the large amount of bandwidth required for reserving backup paths in local recovery and the large recovery time taken in global recovery a new tree division approach is proposed In this approach a multicast tree is divided into several domains where each domain represents a local stand alone sub tree of the original one Two MPLS based methods are then proposed to set up the backup paths inside the domains A comparison is made among the local recovery approach the global recovery approach a method that sets up the backup paths between the branching points and the proposed approach The comparison is based on three metrics the total backup capacity the maximum and the average notification times and the average number of the notification messages that are produced as a result of a failure In terms of the reserved capacity the results have shown that our architecture consumes backup capacity close to that consumed by the global recovery Primer of Multicast Routing Eric Rosenberg, 2012-01-18 Whereas unicast routing determines a path from one source node to one destination node multicast routing determines a path from one source to many destinations or from many sources to many destinations. We survey multicast routing methods for when the set of destinations is static and for when it is dynamic While most of the methods we review are tree based some non tree methods are also discussed We survey results on the shape of multicast trees delay constrained multicast routing aggregation of multicast traffic inter domain multicast and multicast virtual private networks We focus on basic algorithmic principles and mathematical models rather than implementation level protocol details Many historically important methods even if not currently used are reviewed to give perspective on the evolution of multicast routing Multicast Networking and Applications C. Kenneth Miller, 1999 A tutorial and complete description of the core concepts and real world applications of IP multicast one of the most effective solutions alleviating network congestion The author one of the key technologists in multicasting describes a series of multicast applications and shows how they can be used to improve business processes and information dispersal without causing network infrastructure overload Multicasting on the Internet and its Applications Sanjoy Paul, 2012-12-06 IP Multicast 29 4 29 4 1 Reverse Path Forwarding 4 2 Internet Group Management Protocol 31 Truncated Broadcasting 32 4

3 4 4 Distance Vector Multicast Routing Protocol DVMRP 34 4 5 Summary 35 5 Multicast Extensions to Open Shortest Path First MO SPF 39 5 1 High level Description 39 Architecture 40 5 2 5 2 1 Design Goals 41 Protocol Data Structures 41 5 2 2 5 3 Protocol 44 52 5 4 Summary 6 Protocol Independent Multicast PIM 53 6 1 High Level Description 53 54 6 2 Architecture 6 2 1 Design Goals 54 6 2 2 Components and Functions 55 6 3 Protocol 57 6 3 1 Creating the PIM framework 58 6 3 2 Creating a specific multicast tree for a group 59 6 3 3 Multicast data forwarding 64 6 3 4 Operation in a multi access network 65 6 3 5 List of PIM messages 68 6 3 6 A complete example 69 6 4 Summary 69 7 Core Based Tree CBT 73 7 1 High level Description 73 7 2 Architecture 74 7 2 1 Design Goals 

Multimedia Multicast on the Internet Abderrahim Benslimane, 2013-03-01 This book examines multicast technology and will be a key text for undergraduate engineering students and master students in networks and telecoms However it will be equally useful for a wide range of professionals in this research field Multicast routing was introduced with the advent of multiparty applications for example videoconferencing on the Internet and collaborative work for example distributed simulations It is related to the concept of group communication a technique introduced to reduce communication costs The various problems of multicast routing on the Internet are examined in detail They include group membership management quality of service reliability safety scalability and transport Throughout the text several protocols are introduced in order to analyze compare and cover the various aspects of multicast routing

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