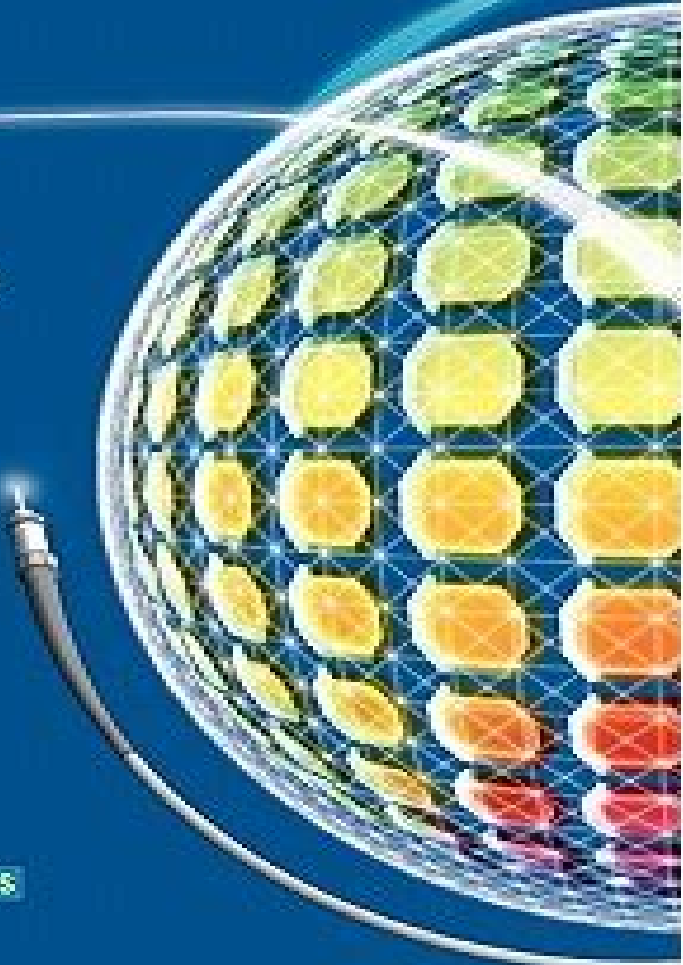




Traffic Grooming in Optical WDM Mesh Networks

Keyao Zhu
Hongyue Zhu
Biswanath Mukherjee

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Traffic Grooming In Optical Wdm Mesh Networks Optical Networks

Mohammad Ilyas, Hussein T. Mouftah



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Optical networks based on wavelength division multiplexing WDM technology offer the promise to satisfy the bandwidth requirements of the Internet infrastructure and provide a scalable solution to support the bandwidth needs of future applications in the local and wide areas. In a wavelength routed network an optical channel referred to as a lightpath is set up between two network nodes for communication. Using WDM technology an optical fiber link can support multiple non overlapping wavelength channels each of which can be operated at the data rate of 10 Gbps or 40 Gbps today. On the other hand only a fraction of customers are expected to have a need for such a high bandwidth. Due to the large cost of the optical backbone infrastructure and enormous WDM channel capacity connection requests with diverse low speed bandwidth requirements need to be efficiently groomed onto high capacity wavelength channels. This book investigates the optimized design provisioning and performance analysis of traffic groomable WDM networks and proposes and evaluates new WDM network architectures. Organization of the Book Significant amount of research effort has been devoted to traffic grooming in SONET WDM ring networks since the current telecom networks are mainly deployed in the form of ring topologies or interconnected rings. As the long haul backbone networks are evolving to irregular mesh topologies traffic grooming in optical WDM mesh networks becomes an extremely important and practical research topic for both industry and academia.

Traffic Grooming for Optical Networks Rudra Dutta, Ahmed E. Kamal, George N. Rouskas, 2008-08-06 The objective of this book is to provide timely and comprehensive coverage of the principles, technology, practice and future of traffic grooming in optical networks. Traffic grooming considerations are already shaping new switch designs and standards including next generation Synchronous Optical Network Synchronous Digital Hierarchy SONET SDH and Generic Framing Procedure GFP are affecting future optical network technologies and are creating new business opportunities. Yet information on the topic is scattered and there is a shortage of technical sources where relevant material can be accessed in a single location. The motivation for this book was to bridge this gap by providing a single authoritative point of reference to the traffic grooming state of the art. Traffic grooming is a complex subject involving a number of interrelated concepts, standards and technologies. It is also a rapidly growing field of study making it difficult for a single book to cover all aspects in detail. To cope with this scope and complexity this book provides appropriate background information followed by an in depth study of a few key issues and challenges. It has been our intention to bring together a broad range of perspectives from preeminent researchers in both academia and industry. We believe that these multiple diverse points of view add considerable value and make the contents more interesting to the reader. *Traffic Grooming in Optical WDM Mesh Networks* Zhu Keyao, Hongyue Zhu, Biswanath Mukherjee, 2008-11-01 Optical networks based on wavelength division multiplexing WDM technology offer the promise to satisfy the bandwidth requirements of the Internet infrastructure and provide a scalable solution to support the bandwidth

needs of future applications in the local and wide areas In a wavelength routed network an optical channel referred to as a lightpath is set up between two network nodes for communication Using WDM technology an optical fiber link can support multiple non overlapping wavelength channels each of which can be operated at the data rate of 10 Gbps or 40 Gbps today On the other hand only a fraction of customers are expected to have a need for such a high bandwidth Due to the large cost of the optical backbone infrastructure and enormous WDM channel capacity connection requests with diverse low speed bandwidth requirements need to be efficiently groomed onto high capacity wavelength channels This book investigates the optimized design provisioning and performance analysis of traffic groomable WDM networks and proposes and evaluates new WDM network architectures Organization of the Book Significant amount of research effort has been devoted to traffic grooming in SONET WDM ring networks since the current telecom networks are mainly deployed in the form of ring topologies or interconnected rings As the long haul backbone networks are evolving to irregular mesh topologies traffic grooming in optical WDM mesh networks becomes an extremely important and practical research topic for both industry and academia

Optical Networks and Components Partha Pratim Sahu, 2022-07-30 Intended as an undergraduate post graduate level textbook for courses on high speed optical networks as well as computer networks Nine chapters cover basic principles of the technology and different devices for optical networks as well as processing of integrated waveguide devices of optical networks using different technologies It provides students researchers and practicing engineers with an expert guide to the fundamental concepts issues and state of the art developments in optical networks Includes examples throughout all the chapters of the book to aid understanding of basic problems and solutions

Traffic Grooming in Next-generation Optical WDM Mesh Networks Wang Yao, 2005

Optical Network Design and Modeling Ioannis Tomkos, Fabio Neri, Josep Solé-Pareta, Xavier Masip-Bruin, Sergi Sánchez-López, 2007-07-21 This book constitutes the refereed proceedings of the 11th International IFIP TC6 Conference on Optical Network Design and Modeling ONDM 2007 held in Athens Greece in May 2007 The 41 revised full papers presented together with 14 invited papers address all recent advances in the design modeling and implementation of optical networks

Dissemination of Information in Optical Networks: Subir Bandyopadhyay, 2007-10-24 Optical networks and the related technologies network management software and services have undergone remarkable developments and such networks are now the ultra high speed backbone networks for communication Wavelength Division Multiplexing WDM the ability to support multiple communication pathways over the same fiber enables efficient use of the enormous capability for data communication of optical networks This book gives a broad overview of techniques used in the design of WDM networks for efficient dissemination of information in computer networks It starts with an overview of the hardware components then provides a thorough review of WDM wavelength routed networks algorithms for route and wavelength assignment design of broadcast and select networks logical topology design and techniques to handle faults and algorithms for efficient use of optical networks Each topic has been covered rigorously

with emphasis on detailed explanations of the approaches used starting from the fundamentals up to the state of the art. The optimization techniques covered in the book include graph theoretic algorithms, mixed integer linear programming and heuristics. The book is intended for beginners as well as for specialists and the reader should be able to design WDM networks and follow developments in the field. Each chapter contains a detailed annotated bibliography. There are numerous exercises for the reader to test understanding of the subject while readers unfamiliar with mathematical programming techniques and network flow optimization are offered short easy to understand appendices at the end of the book.

Advances in Optical Networks and Components Partha Pratim Sahu, 2020-07-09 This book is intended as a graduate post graduate level textbook for courses on high speed optical networks as well as computer networks. The ten chapters cover basic principles of the technology as well as latest developments and further discuss network security, survivability and reliability of optical networks and priority schemes used in wavelength routing. This book also goes on to examine Fiber To The Home FTTH standards and their deployment and research issues and includes examples in all the chapters to aid the understanding of problems and solutions. Presents advanced concepts of optical network devices. Includes examples and exercises in all the chapters of the book to aid the understanding of basic problems and solutions for undergraduate and postgraduate students. Discusses optical ring metropolitan area networks and queuing system and its interconnection with other networks. Discusses routing and wavelength assignment. Examines restoration schemes in the survivability of optical networks. *Optical WDM Networks* Hongyue Zhu, 2005 **Multiwavelength Optical Networks** Thomas E.

Stern, Georgios Ellinas, Krishna Bala, 2009 Second edition of the acclaimed Multiwavelength Optical Networks describing architectures enabling technologies and analytical tools. Emerging Optical Network Technologies Krishna M. Sivalingam, Suresh Subramaniam, 2006-01-16 Optical networks have moved from laboratory settings and theoretical research to real world deployment and service oriented explorations. New technologies such as Ethernet PON, traffic grooming, regional and metropolitan network architectures and optical packet switching are being explored and the landscape is continuously and rapidly evolving. Some of the important issues involving these new technologies involve the architectural protocol and performance related issues. This book addresses many of these issues and presents a birds eye view of some of the more promising technologies. Researchers and those pursuing advanced degrees in this field will be able to see where progress is being made and new technologies are emerging. *Emerging Optical Network Technologies: Architectures, Protocols and Performance* provides state of the art material written by the most prominent professionals in their respective areas.

Handbook of Optimization in Telecommunications Mauricio G.C. Resende, Panos M. Pardalos, 2008-12-10 This comprehensive handbook brings together experts who use optimization to solve problems that arise in telecommunications. It is the first book to cover in detail the field of optimization in telecommunications. Recent optimization developments that are frequently applied to telecommunications are covered. The spectrum of topics covered includes planning and design of

telecommunication networks routing network protection grooming restoration wireless communications network location and assignment problems Internet protocol World Wide Web and stochastic issues in telecommunications The book's objective is to provide a reference tool for the increasing number of scientists and engineers in telecommunications who depend upon optimization **The Handbook of Optical Communication Networks** Mohammad Ilyas, Hussein T. Mouftah, 2003-04-14

The Internet revolution Once the public was delighted with 14.4 modem access and fascinated by low tech Web site content But not for long Technology has raced to keep up with users calls for high speed facilities and advanced applications With the development of high speed transmission media and the availability of high speed hardware we are IT Convergence and Services James J. Park, Hamid Arabnia, Hang-Bae Chang, Taeshik Shon, 2011-11-01

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Tomkos, Massimo Tornatore, Peter Winzer, Yongli Zhao, 2020-10-15 This handbook is an authoritative comprehensive reference on optical networks the backbone of today's communication and information society The book reviews the many underlying technologies that enable the global optical communications infrastructure but also explains current research trends targeted towards continued capacity scaling and enhanced networking flexibility in support of an unabated traffic growth fueled by ever emerging new applications The book is divided into four parts Optical Subsystems for Transmission and Switching Core

Networks Datacenter and Super Computer Networking and Optical Access and Wireless Networks Each chapter is written by world renown experts that represent academia industry and international government and regulatory agencies Every chapter provides a complete picture of its field from entry level information to a snapshot of the respective state of the art technologies to emerging research trends providing something useful for the novice who wants to get familiar with the field to the expert who wants to get a concise view of future trends

Managing Traffic Performance in Converged Networks Lorne Mason,Tadeusz Drwiega,James Yan,2007-09-04 This book constitutes the refereed proceedings of the 10th International Teletraffic Congress ITC 2007 held in Ottawa Canada June 2007 Coverage includes IPTV planning and modeling network performance traffic engineering end to end delay in converged networks queuing models impact of convergence and divergence forces on network performance traffic management in wireless networks and network design for capacity and performance

Distributed Computing and Networking Marcos K. Aguilera,Haifeng Yu,Nitin H. Vaidya,Vikram Srinivasan,Romit Roy Choudhury,2011-03-09 This book constitutes the refereed proceedings of the 12th International Conference on Distributed Computing and Networking ICDCN 2011 held in Bangalore India during January 2 5 2011 The 31 revised full papers and 3 revised short papers presented together with 3 invited lectures were carefully reviewed and selected from 140 submissions The papers address all current issues in the field of distributed computing and networking Being a leading forum for researchers and practitioners to exchange ideas and share best practices ICDCN also serves as a forum for PhD students to share their research ideas and get quality feedback from the well renowned experts in the field

Combinatorial Optimization and Applications Ding-Zhu Du,Xiaodong Hu,Panos M. Pardalos,2009-05-25 This book constitutes the refereed proceedings of the Third International Conference on Combinatorial Optimization and Applications COCOA 2009 held in Huangshan China in June 2009 The 50 revised full papers were carefully reviewed and selected from 103 submissions The papers feature original research in the areas of combinatorial optimization both theoretical issues and applications motivated by real world problems thus showing convincingly the usefulness and efficiency of the algorithms discussed in a practical setting

Computer Network Security Vladimir Gorodetsky,Igor Kotenko,Victor A. Skormin,2007-08-24 This book constitutes the refereed proceedings of the Fourth International Conference on Mathematical Methods Models and Architectures for Computer Network Security MMM ACNS 2007 held in St Petersburg Russia in September 2007 Its objective was to bring together leading researchers from academia and governmental organizations as well as practitioners in the area of computer networks and information security

Advances in Computing, Communication, and Control Srija Unnikrishnan,Sunil Surve,Deepak Bhoir,2013-01-11 This book constitutes the refereed proceedings of the Third International Conference on Advances in Computing Communication and Control ICAC3 2013 held in Mumbai India in January 2013 The 69 papers presented in this volume were carefully reviewed and selected for inclusion in the book They deal with topics such as image processing artificial intelligence robotics wireless communications data

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