

NETWORK THEORY AND APPLICATIONS

# **Multichannel Optical Networks**

**Peng-Jun Wan**

Springer Science+Business Media, B.V.

# Multichannel Optical Networks

**Michael P. McGarry**



## **Multichannel Optical Networks:**

**Multichannel Optical Networks: Theory and Practice** Peng-Jun Wan, Dingzhu Du, Panos M. Pardalos, 1998 A response to the exhaustion of fiber optic cable network capacity for digital telecommunication and the resulting shift from time division multiplexing TDM to wavelength division multiplexing WDM to add capacity and the rapid sales of the new technology Theorists and practitioners in computer science present 17 papers applying theoretical and algorithmic results to such practical problems as admissions control routing and channel assignments multicasting and protection and fault tolerance No index Annotation copyrighted by Book News Inc Portland OR

**Multichannel Optical Networks** Peng-Jun Wan, 2014-05-14 The huge bandwidth of optical fiber was recognized back in the 1970s during the early development of fiber optic technology For the last two decades the capacity of experimental and deployed systems has been increasing at a rate of 100 fold each decade a rate exceeding the increase of integrated circuit speeds Today optical communication in the public communication networks has developed from the status of a curiosity into being the dominant technology Various great challenges arising from the deployment of the wavelength division multiplexing WDM have attracted a lot of efforts from many researchers Indeed the optical networking has been a fertile ground for both theoretical researches and experimental studies This monograph presents the contribution from my past and ongoing research in the optical networking area The works presented in this book focus more on graph theoretical and algorithmic aspects of optical networks Although this book is limited to the works by myself and my coauthors there are many outstanding achievements made by other individuals which will be cited in many places in this book Without the inspiration from their efforts this book would have never been possible This monograph is divided into four parts Multichannel Optical Networking Architectures Broadcast and Select Passive Optical Networks Wavelength Switched Optical Networks SONET WDM Optical Networks The first part consists of the first three chapters Chapter 1 provides a brief survey on the networking architectures of optical trans XVll xvm

MULTICHANNEL OPTICAL NETWORKS port networks optical access networks and optical premise networks

*Multichannel Optical Networks* Peng-Jun Wan, Dingzhu Du, Panos M. Pardalos, 1998-01-01 Time division multiplexing TDM has been the fundamental basis for adding capacity to digital telecommunications networks for decades However within the past two years wavelength division multiplexing WDM has been emerging as an important and widely deployed complement to TDM Sales of systems based on the new technology have risen at breathtaking speed The driving force behind this sales explosion was the unexpected rapid exhaustion of long distance fiber network capacity This fiber exhaust combined with favorable economics for WDM led to the use of this technology over other alternatives The WDM deployment raises fundamental and challenging problems that require novel and innovative solutions This volume presents papers from an interdisciplinary workshop held at DIMACS on multichannel optical networks Leading computer science theorists and practitioners discussed admissions control routing and channel assignment multicasting and protection and fault tolerance

The book features application of theoretical and or algorithmical results to practical problems and addresses the influence of practical problems to theoretical algorithmic studies The volume can serve as a text for an advanced course in computer science networking and operations research     Multichannel Optical Networks Peng-Jun Wan,1998 Time division multiplexing TDM has been the fundamental basis for adding capacity to digital telecommunications networks for decades However within the past two years wavelength division multiplexing WDM has been emerging as an important and widely deployed complement to TDM Sales of systems based on the new technology have risen at breathtaking speed The driving force behind this sales explosion was the unexpected rapid exhaustion of long distance fiber network capacity This fiber exhaust combined with favorable economics for WDM led to the use of this technology over other altern     *Blocking of Multirate Circuits in Multichannel Optical Networks* Venkatraman Tamilraj,2002     Multichannel Interconnection in All-optical Networks Jan Herman Laarhuis,1995     **Optical Networks and Their Applications** Richard A. Barry,1998

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constraints we present the corresponding dynamic bandwidth allocation algorithm for effective resource management in these networks and investigate their performances delay throughput through simulation experiments We further investigate the problem of transmission grant scheduling in multichannel optical access networks using a scheduling theoretic approach We show that the problem can be modeled as an Open Shop and we formulate the joint scheduling and wavelength assignment problem as a Mixed Integer Linear Program MJLP whose objective is to reduce the length of a scheduling period Since the problem is known to be NP hard we introduce a Tabu Search based heuristic for solving the joint problem Different other heuristics are also considered and their performances are compared with those of Tabu and MILP Results indicate that by appropriately scheduling transmission grants and assigning wavelengths substantial and consistent improvements may be obtained in the network performance For example Tabu shows a reduction of up to 29% in the schedule length with substantial reduction in channel idle gaps yielding to both higher channel utilization and lower queuing delays Additionally when the number of channels in the network is not small the benefits of performing appropriate wavelength assignment together with transmission scheduling are observed and discussed We further perform a packet level simulation on the considered network to study the benefits of efficient grant scheduling significant improvements are shown both in terms of system utilization and packet queuing delays

Summaries of Papers Presented at the Optical Fiber Communication Conference ..., 1998

Coherent Lightwave Communications Technology S. Shimada, 2012-12-06 This book covers a wide range of technical issues relating to lightwave technologies using high coherence lightwaves Electromagnetic wave communication started when the first wireless system was invented by Marconi in 1895 However we had to wait about one hundred years to realize a similar technology in the lightwave frequency region The invention of lasers in 1960 and two technology innovations in 1970 low loss silica fiber and semiconductor lasers operating at room temperature promoted the development of fiber optic transmission systems The deployment of high speed long haul fiber optic transmission systems has led to the formation of domestic and international trunk networks The installed fiber cables in local loop plants provide multimedia communication services including broadband video However present lightwave communication systems do not fully utilize the fruitful potential of lightwaves namely the capacity of extremely high frequency electromagnetic information carrier waves The frequency of lightwaves used for fiber optic transmission is about  $200 \text{ THz}$   $14.2 \times 10^{14} \text{ Hz}$  and the frequency bandwidth of the fiber low loss region is about  $13.2 \text{ THz}$   $2 \times 10^{14} \text{ Hz}$  Recent developments of narrow spectrum width semiconductor laser and planar optical waveguide devices offer us the possibilities for a new generation of lightwave based communication systems This book focuses on system aspects of the new generation lightwave communication technologies such as optical frequency division multiplexing and coherent detection Chapter 1 overviews lightwave communication system technology

Wavelength Division Multiple Access Optical Networks Andrea Borella, Giovanni Cancellieri, Franco Chiaraluce, 1998 Strengthen your understanding of fast moving WDMA optical network technology and learn how to better

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