

Broadband Optical Access Networks And Fiber To The Home Systems Technologies And Deployment Strategies

Broadband Cable Access Networks focuses on broadband distribution and systems architecture and concentrates on practical concepts that will allow the reader to do their own design, improvement, and troubleshooting work. The objective is to enhance the skill sets of a large population that designs and builds broadband cable plants, as well as those maintaining and troubleshooting it. A large cross-section of technical personnel who need to learn these skills design, maintain, and service HFC systems from signal creation through transmission to reception and processing at the customer end point. In addition, data/voice and video specialists need to master and reference the basics of HFC design and distribution before contending with the intricacies of their own unique services. This book serves as an essential reference to all cable engineers—those who specifically design and maintain the HFC distribution plant as well as those primarily concerned with data/voice technology as well as video technology. Concentrates on practical concepts that will allow the user to do his own design, improvement, and trouble-shooting work. Prepares cable engineers and technicians to work with assurance as they face the latest developments and future directions. Concise and tightly focused, allowing readers to easily find answers to questions about an idea or concept they are developing in this area.

This book investigates new enabling technologies for Fi-Wi convergence. The editors discuss Fi-Wi technologies at the three major network levels involved in the path towards convergence: system level, network architecture level, and network management level. The main topics will be: a. At system level: Radio over Fiber (digitalized vs. analogic, standardization, E-band and beyond) and 5G wireless technologies; b. Network architecture level: NGPON, WDM-PON, BBU Hotelling, Cloud Radio Access Networks (C-RANs), HetNets. c. Network management level: SDN for convergence, Next-generation Point-of-Presence, Wi-Fi LTE Handover, Cooperative MultiPoint.

Multi-Protocol Label Switch (MPLS) and Generalized MPLS (GMPLS) are key technologies for next-generation IP backbone networks. Until now, however, engineers have been forced to search for technical papers on this subject and read them in an ad-hoc manner. At last there is a book that explains both MPLS and GMPLS concepts in a systematic way. GMPLS Technologies: Broadband Backbone Networks and Systems addresses the basic concepts, network architectures, protocols, and traffic engineering needed to operate MPLS and GMPLS networks. The book begins with an introduction of the nature and requirements of broadband networks. It describes the basics of control-oriented networks and Internet Protocol (IP). The text then examines the fundamentals of MPLS, explaining why MPLS is preferable to IP packet-based forwarding. This volume covers MPLS applications, details IP router structures, illustrates GMPLS, and explores important studies on traffic engineering in GMPLS Networks. The text concludes with a description of IP, MPLS, and GMPLS standardization topics. Network equipment design engineers and network service provision engineers can reference this book to understand the crucial techniques for

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building MPLS/GMPLS-based networks. Features Addresses the basic concepts, network architectures, protocols, and traffic engineering needed to operate MPLS and GMPLS networks Covers the fundamentals of connection-oriented networks including TCP/IP, flow control mechanism, and ATM protocol Analyzes MPLS issues and applications, such as label switched paths (LSPs) and VPNs Highlights IP router structures, examining technologies of data path function - switch architecture, packet scheduling, and forwarding engine Explores multi-layer traffic engineering, survivable networks, and wavelength-routed optical networks Demonstrates GMPLS-based routers

Broadband Optical Access and Fiber-to-the-Home (FTTH) will provide the ultimate broadband service capabilities. Compared with the currently well-deployed broadband access technologies of ADSL (Asymmetric Digital Subscriber Line) and Cable Modems, optical broadband access with Fiber-to-the-User's home will cater for much higher speed access for new services. Broadband Optical Access Networks and Fiber-to-the-Home presents a comprehensive technical overview of key technologies and deployment strategies for optical broadband access networks and emerging new broadband services. The authors discuss network design considerations, new services, deployment trends and operational experiences, while explaining the current situation and providing insights into future broadband access technologies and services.

Broadband Optical Access Networks and Fiber-to-the-Home: Offers a comprehensive, up-to-date introduction to new developments in broadband access network technologies and services. Examines the impact of research and development in photonics technologies on broadband access and FTTH. Covers ADSL, VDSL with FTTC (Fiber-to-the-Curb), Cable Modem over HFC (Hybrid-Fiber Coax) and Gigabit Ethernet. Discusses the roles of Broadband Wireless LAN and integrated FTTH/Wireless Broadband Access as well as Broadband Home Networks. Provides a global view of broadband network development, presenting different technical and system deployment approaches and strategic considerations for comparison. Gives insight into the worldwide broadband competition and the future of this technology. Broadband Optical Access Networks and Fiber-to-the-Home will be an invaluable resource for engineers in research and development, network planners, business managers, consultants as well as analysts and educators for a better understanding of the future of broadband in the field of telecommunications, data communications, and broadband multimedia service industries.

This book provides a comprehensive description of an optical communications technology known as free space optical—a next-generation communications network that uses optical signals through the atmosphere instead of fiber, RF, or microwaves. This technology potentially offers more complex ultrabandwidth communication services simultaneously to multiple users and in a very short time, compared to fiber optic technology. This text presents established and new advancements drawn from the latest research and development in components, networking, operation, and practices. This book describes the FSO network concepts in simple language. It provides comprehensive coverage in an easy-to-understand, progressive style that starts from the physics of the atmosphere and how it affects optical communications; continues with the design of a network node; and concludes with fiberless network applications from point-to-point to mesh topology. Important areas discussed include: Propagation of

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light in the atmosphere and phenomena that affect light propagation FSO transceiver design Point-to-point FSO systems Ring FSO systems Mesh-FSO systems and integrating the Mesh-FSO with the public network WDM Mesh-FSO FSO network security FSO-specific applications To meet the needs of both academia and industry, key mathematical formulas are presented along with descriptions, while extensive mathematical analyses are minimized or avoided. Free Space Optical Networks for Ultra-Broad Band Services serves as an ideal text for network communication professionals who enter the free space optical communication field, graduate students majoring in optical communications, optical communication engineers, researchers, managers, and consultants.

Considering the key evolutions within the access network technologies as well as the unprecedented levels of bandwidth demands by end users, this book condenses the relentless research, design, and deployment experience of state-of-the-art access networks. Furthermore, it shares the critical steps and details of the developments and deployment of these emergent technologies; which is very crucial particularly as telecommunications vendors and carriers are looking for cost-effective ultra-broadband "last-mile" access solutions to stay competitive in the "post bubble" era. The book is written to provide a comprehensive overview of the major broadband access technologies and deployments involving internationally recognized authors and key players. Due to its scope and depth, the proposed book is able to fill an important gap of today's available literature.

Describes the major architectures, standards, and technologies of Passive Optical Networks (PONs) The ComSoc Guide to Passive Optical Networks provides readers with a concise explanation of the key features of Passive Optical Networks (PONs); the different types of PON architectures and standards; key issues of PON devices, management, and implementation; and the promising business opportunities in access networks. Written for a broad audience, ranging from developers to users, this indispensable book provides an understanding of the evolutionary path of PON access systems and their positioning with respect to the cable, copper, and wireless competitors for broadband access networks. In addition, The ComSoc Guide to Passive Optical Networks: Provides brief, high-level overviews of the architectures and applications of Fiber-to-the-Home (FTTH) or Fiber-to-the-Curb (FTTC) access networks and the alternative HFC, subscriber line, and WiMAX access systems Awards readers with a clear understanding of what BPON, GPON, WDM-PON and EPON are and how they work, together with an introduction to their respective standards Carefully defines all acronyms and technical terms, making the book accessible to those who may not be specialists in this area Gives readers an appreciation of the last mile problems in telecommunications access networks, and the opportunities in optical-wireless integration

With optical fiber telecommunications firmly entrenched in the global information infrastructure, a key question for the future is how deeply will optical communications penetrate and complement other forms of communication (e.g., wireless access, on-premises networks, interconnects, and satellites). Optical Fiber Telecommunications, the seventh edition of the classic series that has chronicled the progress in the research and development of lightwave communications since 1979, examines present and future opportunities by presenting the latest advances on key topics such as: Fiber and

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5G-wireless access networks Inter- and intra-data center communications Free-space and quantum communication links Another key issue is the use of advanced photonics manufacturing and electronic signal processing to lower the cost of services and increase the system performance. To address this, the book covers: Foundry and software capabilities for widespread user access to photonic integrated circuits Nano- and microphotonic components Advanced and nonconventional data modulation formats The traditional emphasis of achieving higher data rates and longer transmission distances are also addressed through chapters on space-division-multiplexing, undersea cable systems, and efficient reconfigurable networking. This book is intended as an ideal reference suitable for university and industry researchers, graduate students, optical systems implementers, network operators, managers, and investors. Quotes: "This book series, which owes much of its distinguished history to the late Drs. Kaminow and Li, describes hot and growing applied topics, which include long-distance and wideband systems, data centers, 5G, wireless networks, foundry production of photonic integrated circuits, quantum communications, and AI/deep-learning. These subjects will be highly beneficial for industrial R&D engineers, university teachers and students, and funding agents in the business sector." Prof. Kenichi Iga President (Retired), Tokyo Institute of Technology "With the passing of two luminaries, Ivan Kaminow and Tingye Li, I feared the loss of one of the premier reference books in the field. Happily, this new version comes to chronicle the current state-of-the-art and is written by the next generation of leaders. This is a must-have reference book for anyone working in or trying to understand the field of optical fiber communications technology." Dr. Donald B. Keck Vice President, Corning, Inc. (Retired) "This book is the seventh edition in the definitive series that was previously marshaled by the extraordinary Ivan Kaminow and Tingye Li, both sadly no longer with us. The series has charted the remarkable progress made in the field, and over a billion kilometers of optical fiber currently snake across the globe carrying ever-increasing Internet traffic. Anyone wondering about how we will cope with this incredible growth must read this book." Prof. Sir David Payne Director, Optoelectronics Research Centre, University of Southampton Updated edition presents the latest advances in optical fiber components, systems, subsystems and networks Written by leading authorities from academia and industry Gives a self-contained overview of specific technologies, covering both the state-of-the-art and future research challenges

In this dissertation, we design a new reservation MAC scheme that arbitrates upstream transmission, prevents collisions, and varies bandwidth according to demand and priority. The new access scheme exploits both WDM and TDM to cater for both light and heavy bandwidth requirements. We analyzed, evaluated, and simulated the performance and practicality of the proposed scheme.

Find out everything you need to know about how current networks will have to evolve to provide for future broadband services In this book, the authors provide an overview of the status, challenges, architectures, and technological solutions for core and metropolitan networks. Furthermore, the book describes the current state of core and metropolitan telecommunication networks, as well as the drivers and motives behind the current paradigm shift in the telecommunications industry. Moreover, the authors elaborate system design guidelines for both point-to-point and multi-hop optical networks taking into consideration the analogue nature of the transmission channel.

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Key Features: Provides coverage of all aspects of core and metro networks supporting future broadband services, and a detailed description of the state-of-the-art Presents a clear path for migrating from point-to-point to data-centric, dynamic, multi-hop optical networks Shows how current systems will need to evolve over the coming years, summarizing challenges and issues to be investigated in future research Covers a wide range of topics from network architectures, to control plane, to key optical and optoelectronic devices, and best practice in transmission and system design Provides results, best practices and guidelines for various technical problems, including numerous hands-on examples Written by authors from cutting-edge companies such as Alcatel-Lucent, Siemens, Lucent, France Telecom, BT, and Telefonica Optical Core and Metro Networks will be of interest to researchers in industry and academia, and advanced (final year undergraduate) and postgraduate students undertaking communications, networking and optics courses.

Broadband optical access network is an ideal solution to alleviate the first/last mile bottleneck of current Internet infrastructures. Richly illustrated throughout to help clarify important topics, Broadband Optical Access Networks covers the architectures, protocols enabling technologies of broadband optical access networks, and all current and future competing technologies for access networks. This comprehensive work presents the evolution of optical access networks, including reach extension, bandwidth enhancement, and discusses the convergence of optical and wireless technologies for broadband access, making it an invaluable reference for researchers, electrical engineers, and graduate students.

Algorithmic discrete mathematics plays a key role in the development of information and communication technologies, and methods that arise in computer science, mathematics and operations research – in particular in algorithms, computational complexity, distributed computing and optimization – are vital to modern services such as mobile telephony, online banking and VoIP. This book examines communication networking from a mathematical viewpoint. The contributing authors took part in the European COST action 293 – a four-year program of multidisciplinary research on this subject. In this book they offer introductory overviews and state-of-the-art assessments of current and future research in the fields of broadband, optical, wireless and ad hoc networks. Particular topics of interest are design, optimization, robustness and energy consumption. The book will be of interest to graduate students, researchers and practitioners in the areas of networking, theoretical computer science, operations research, distributed computing and mathematics.

This book focuses on various Passive optical networks (PONs) types, including currently deployed Ethernet PON (EPON) and Gigabit PON (GPON) as well as next generation WDM PON and OFDM PON. Also this book examines the integrated optical and wireless access networks. Concentrating on two issues in these networks: media access control (MAC) and resource allocation. These two problems can greatly affect performances of PONs such as network resource utilization and QoS of end users. Finally this book will discuss various solutions to address the MAC and resource allocation issues in various PON networks.

Written by experts in the field, this book provides an overview of all forms of broadband subscriber access networks and technology, including fiber optics, DSL for phone lines, DOCSIS for coax, power line carrier, and wireless. Each technology is described in

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depth, with a discussion of key concepts, historical development, and industry standards. The book contains comprehensive coverage of all broadband access technologies, with a section each devoted to fiber-based technologies, non-fiber wired technologies, and wireless technologies. The four co-authors' breadth of knowledge is featured in the chapters comparing the relative strengths, weaknesses, and prognosis for the competing technologies. Key Features: Covers the physical and medium access layers (OSI Layer 1 and 2), with emphasis on access transmission technology Compares and contrasts all recent and emerging wired and wireless standards for broadband access in a single reference Illustrates the technology that is currently being deployed by network providers, and also the technology that has recently been or will soon be standardized for deployment in the coming years, including vectoring, wavelength division multiple access, CDMA, OFDMA, and MIMO Contains detailed discussion on the following standards: 10G-EPON, G-PON, XG-PON, VDSL2, DOCSIS 3.0, DOCSIS Protocol over EPON, power line carrier, IEEE 802.11 WLAN/WiFi, UMTS/HSPA, LTE, and LTE-Advanced

Provides extensive coverage of standardized QoS technologies for fixed and mobile ultra-broadband networks and services—bringing together technical, regulation, and business aspects The Quality of Service (QoS) has been mandatory for traditional telecommunication services such as telephony (voice) and television (TV) since the first half of the past century, however, with the convergence of telecommunication networks and services onto Internet technologies, the QoS provision remains a big challenge for all ICT services, not only for traditional ones. This book covers the standardized QoS technologies for fixed and mobile ultra-broadband networks and services, including the business aspects and QoS regulation framework, which all will have high impact on the ICTs in the current and the following decade. QoS for Fixed and Mobile Ultra-Broadband starts by introducing readers to the telecommunications field and the technology, and the many aspects of both QoS and QoE (Quality of Experience). The next chapter devotes itself to Internet QoS, starting with an overview of numerous technology protocols and finishing with business and regulatory aspects. The next three chapters look at QoS in NGN and Future Networks, QoS for fixed ultra-broadband, and QoS for mobile ultra-broadband. The book also provides readers with in-depth accounts of services in fixed and mobile ultra-broadband; broadband QoS parameters, KPIs, and measurements; network neutrality; and the QoS regulatory framework.

Comprehensively covers every aspect of QoS technology for fixed and mobile ultra-broadband networks and services, including the technology, the many regulations, and their applications in business Explains how the QoS is transiting from the traditional telecom world to an all-IP world Presents all the fundamentals of QoS regulation, as well as SLA regulation QoS for Fixed and Mobile Ultra-Broadband is an excellent resource for managers, engineers, and employees from regulators, ICT government organizations, telecommunication companies (operators, service providers), ICT companies, and industry. It is also a good book for students and professors from academia who are interested in understanding, implementation, and regulation of QoS for fixed and mobile ultra-broadband.

In the not too distant future, internet access will be dominated by wireless networks. With that, wireless edge using optical core next-generation networks will become as ubiquitous as traditional telephone networks. This means that telecom engineers, chip

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designers, and engineering students must prepare to meet the challenges and opportunities that the development and deployment of these technologies will bring. Bringing together cutting-edge coverage of wireless and optical networks in a single volume, *Internet Networks Wired, Wireless, and Optical Technologies* provides a concise yet complete introduction to these dynamic technologies. Filled with case studies, illustrations, and practical examples from industry, the text explains how wireless, wireline, and optical networks work together. It also:

- Covers WLAN, WPAN, wireless access, 3G/4G cellular, RF transmission
- Details optical networks involving long-haul and metropolitan networks, optical fiber, photonic devices, and VLSI chips
- Provides clear instruction on the application of wireless and optical networks

Taking into account recent advances in storage, processing, sensors, displays, statistical data analyses, and autonomic systems, this reference provides forward thinking engineers and students with a realistic vision of how the continued evolution of the technologies that touch wireless communication will soon reshape markets and business models around the world.

"This book presents a comprehensive overview of emerging optical access network solutions to efficiently meet the anticipated growth in bandwidth demand"--Provided by publisher.

This book presents an overview of local access networks and discusses new emerging technologies. Underpinning much of the evolving communications technology is the local access itself, both in traditional form of copper pairs but increasingly too through the use of new fibre, radio and copper systems. Fibre-to-the-Home networks constitute a fundamental telecom segment with the required potential to match the huge capacity of transport networks with the new user communication demands. Huge investments in access network infrastructure are expected for the next decade, with many initiatives already launched around the globe recently, driven by the new broadband service demands and the necessity by operators to deploy a future-proof infrastructure in the field. Dense FTTH Passive Optical Networks (PONs) is a cost-efficient way to build fibre access, and international standards (G/E-PON) have been already launched, leading to new set of telecom products for mass deployment. However, these systems only make use of less than 1% of the optical bandwidth; thus, relevant research is taking place to maximize the capacity of these systems, with the latest opto-electronic technologies, demonstrating that the huge bandwidth available through the fibre access can be exploited in a cost-efficient and reliable manner. *Next-Generation FTTH Passive Optical Networks* gathers and analyzes the most relevant techniques developed recently on technologies for the next generation FTTH networks, trying to answer the question: what's after G/E-PONs?

Broadband Optical Access Networks John Wiley & Sons

The access network is expected to be one of the major battlegrounds of telecommunications network operators, since upgrades of the existing narrowband access network will be the critical factor in supplying multimedia broadband services in a competitive market. The future broadband access

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network architecture needs to be flexible enough to efficiently support the provision of a full set of broadband and narrowband services with a wide range of capacity demands. A wide range of broadband access technologies are available. Furthermore, the key issues in the upgrading of the very cost sensitive access network are financial as well as technological, both for incumbent and new entrant operators. Thus, in order to identify minimum-risk introductory strategies the economic viability of access network broadband upgrades needs to be carefully assessed. However, despite the definite need for techno-economic evaluations, very few books have been published in this field. One of the reasons might be that broadband access network upgrading only very recently gained wide recognition as a key challenge for broadband delivery. Secondly, this kind of strategic work and these studies tend to be considered rather sensitive by operators, and thus both results and methodologies are not usually readily available. Thirdly, the work reported in this book in many respects was a major pioneering effort, which quite ambitiously aimed at modelling the whole life-cycle costs and revenue streams of access network upgrades, as opposed to several other efforts, which often are limited to pure investment cost comparisons.

Volume IVA is devoted to progress in optical component research and development. Topics include design of optical fiber for a variety of applications, plus new materials for fiber amplifiers, modulators, optical switches, light wave devices, lasers, and high bit-rate electronics. This volume is an excellent companion to Optical Fiber Telecommunications IVB: Systems and Impairments (March 2002, ISBN: 0-12-3951739). - Fourth in a respected and comprehensive series - Authoritative authors from a range of organizations - Suitable for active lightwave R&D designers, developers, purchasers, operators, students, and analysts - Lightwave components reviewed in Volume A -Lightwave systems and impairments reviewed in Volume B - Up-to-the minute coverage

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

This is an elementary textbook on an advanced topic: broadband telecommunication networks. I must declare at the outset that this book is not primarily intended

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for an audience of telecommunication specialists who are well versed in the concepts, system architectures, and underlying technologies of high-speed, multi media, bandwidth-on-demand, packet-switching networks, although the technically sophisticated telecommunication practitioner may wish to use it as a reference. Nor is this book intended to be an advanced textbook on the subject of broadband networks. Rather, this book is primarily intended for those eager to learn more about this exciting frontier in the field of telecommunications, an audience that includes systems designers, hardware and software engineers, engineering students, R&D managers, and market planners who seek an understanding of local-, metropolitan-, and wide-area broadband networks for integrating voice, data, image, and video. Its primary audience also includes researchers and engineers from other disciplines or other branches of telecommunications who anticipate a future involvement in, or who would simply like to learn more about, the field of broadband networks, along with scientific researchers and corporate telecommunication and data communication managers whose increasingly sophisticated applications would benefit from (and drive the need for) broadband networks. Advanced topics are certainly not ignored (in fact, a plausible argument could be mounted that all of the material is advanced, given the infancy of the topic).

Optical Wireless Communications for Broadband Global Internet Connectivity: Fundamental and Potential Applications provides a comprehensive overview for readers who require information about the fundamental science behind optical wireless communications, as well as up-to-date advanced knowledge of the state-of-the-art technologies available today. The book is a useful resource for scientists, researchers, engineers and students interested in understanding optical, wireless communication systems for global channels. Readers will find beneficial knowledge on how related technologies of optical wireless communications can be integrated into achieving worldwide Internet connectivity. Presents an in-depth coverage of information on optical wireless communication in a single source Combines the fundamentals with the most recent advanced technology of achieving global Internet access and connectivity Provides derivations of the mathematical equations Includes between chapter sections where information and learning from one chapter is connected to other chapters The key technology to delivering maximum bandwidth over networks is Dense Wavelength Division Multiplexing (DWDM) Describes in detail how DWDM works and how to implement a range of transmission protocols Covers device considerations, the pros and cons of various network layer protocols, and quality of service (QoS) issues The authors are leading experts in this field and provide real-world implementation examples First book to describe the interplay between the physical and IP (Internet Protocol) layers in optical networks

The evolution of broadband access networks toward bimodal fiber-wireless (FiWi) access networks, described in this book, may be viewed as the endgame of broadband access. After discussing the economic impact of broadband access and current worldwide deployment statistics, all the major legacy wireline and wireless broadband access technologies are reviewed. State-of-the-art GPON and EPON fiber access networks are described, including their migration to next-generation systems such as

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OCDMA and OFDMA PONs. The latest developments of wireless access networks are covered, including VHT WLAN, Gigabit WiMAX, LTE and WMN. The advantages of FiWi access networks are demonstrated by applying powerful network coding, heterogeneous optical and wireless protection, hierarchical frame aggregation, hybrid routing and QoS continuity techniques across the optical-wireless interface. The book is an essential reference for anyone working on optical fiber access networks, wireless access networks or converged FiWi systems.

Nowadays, the Internet plays a vital role in our lives. It is currently one of the most effective media that is shifting to reach into all areas in today's society. While we move into the next decade, the future of many emerging technologies (IoT, cloud solutions, automation and AI, big data, 5G and mobile technologies, smart cities, etc.) is highly dependent on Internet connectivity and broadband communications. The demand for mobile and faster Internet connectivity is on the rise as the voice, video, and data continue to converge to speed up business operations and to improve every aspect of human life. As a result, the broadband communication networks that connect everything on the Internet are now considered a complete ecosystem routing all Internet traffic and delivering Internet data faster and more flexibly than ever before. This book gives an insight into the latest research and practical aspects of the broadband communication networks in support of many emerging paradigms/applications of global Internet from the traditional architecture to the incorporation of smart applications. This book includes a preface and introduction by the editors, followed by 20 chapters written by leading international researchers, arranged in three parts. This book is recommended for researchers and professionals in the field and may be used as a reference book on broadband communication networks as well as on practical uses of wired/wireless broadband communications. It is also a concise guide for students and readers interested in studying Internet connectivity, mobile/optical broadband networks and concepts/applications of telecommunications engineering.

An expert guide to the new and emerging field of broadband circuits for optical fiber communication. This exciting publication makes it easy for readers to enter into and deepen their knowledge of the new and emerging field of broadband circuits for optical fiber communication. The author's selection and organization of material have been developed, tested, and refined from his many industry courses and seminars. Five types of broadband circuits are discussed in detail: * Transimpedance amplifiers * Limiting amplifiers * Automatic gain control (AGC) amplifiers * Lasers drivers * Modulator drivers. Essential background on optical fiber, photodetectors, lasers, modulators, and receiver theory is presented to help readers understand the system environment in which these broadband circuits operate. For each circuit type, the main specifications and their impact on system performance are explained and illustrated with numerical values. Next, the circuit concepts are discussed and illustrated with practical implementations. A broad range of circuits in MESFET, HFET, BJT, HBT, BiCMOS, and CMOS technologies is covered. Emphasis is on circuits for digital, continuous-mode transmission in the 2.5 to 40 Gb/s range, typically used in SONET, SDH, and Gigabit Ethernet applications. Burst-mode circuits for passive optical networks (PON) and analog circuits for hybrid fiber-coax (HFC) cable-TV applications also are discussed. Learning aids are provided throughout the text to help readers grasp and apply difficult concepts and techniques, including: * Chapter summaries that

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highlight the key points * Problem-and-answer sections to help readers apply their newknowledge * Research directions that point to exciting new technologicalbreakthroughs on the horizon * Product examples that show the performance of actual broadbandcircuits * Appendices that cover eye diagrams, differential circuits, Sparameters, transistors, and technologies * A bibliography that leads readers to more complete and in-depthtreatment of specialized topics This is a superior learning tool for upper-level undergraduates andgraduate-level students in circuit design and optical fibercommunication. Unlike other texts that concentrate on analogcircuits in general or mostly on optics, this text providesbalanced coverage of electronic, optic, and system issues. Professionals in the fiber optic industry will find it an excellentreference, incorporating the latest technology and discoveries inthe industry.

This book will discuss the principles of operation and features for the emerging consumer home terminals such as digital set-top boxes and cable modems. This book will also provide the detailed technical principles of both fiber optics and RF cable TV systems.

COST – the acronym for European COoperation in Science and Technology – is the oldest and widest European intergovernmental network for cooperation in - search. Established by the Ministerial Conference in November 1971, COST is presently used by the scientific communities of 35 European countries to coop- ate in common research projects supported by national funds. The funds provided by COST – less than 1% of the total value of the projects – support the COST cooperation networks (COST Actions) through which, with € 30 million per year, more than 30,000 European scientists are involved in - search having a total value which exceeds € 2 billion per year. This is the financial worth of the European added value which COST achieves. A “bottom up approach” (the initiative of launching a COST Action comes from the European scientists themselves), “à la carte participation” (only countries interested in the Action participate), “equality of access” (participation is open also to the scientific communities of countries not belonging to the European - ion) and “flexible structure” (easy implementation and light management of the research initiatives) are the main characteristics of COST.

Fiber-based access is recognized as the most promising technology for solving broadband bandwidth bottlenecks. Time division multiplexing passive optical networks (TDM-PONs) that are passive and non-reconfigurable are currently the most widely deployed type of fiber access networks. However, due to their passive nature, TDM-PONs faces several limitations such as inflexible service area coverage, lack of intelligence for control, and inability to counteract security attacks. In order to address the current limitations of optical access networks, we propose reconfigurable technologies for next generation PONs. Two novel reconfigurable technologies are proposed, analyzed, and experimentally evaluated. The first solution is a reconfigurable power-and wavelength- assignment technology based on a novel non-volatile, reconfiguration node. The proposed remote node can reconfigure the network to adapt it to varying degrees of deployment conditions and/or network attacks. Moreover, the proposed remote node incorporates a novel quasi-passive device that does not consume energy once it is reconfigured into a new latching state. Therefore, the proposed remote node has very low energy consumption and does not require local

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power supply to preserve the passive character of the distribution network. In particular, two novel quasi-passive optical power splitter technologies based on Micro-Electro-Mechanical Systems (MEMS) and transition metal oxide have been designed for the reconfigurable device. A simulation study shows the proposed reconfigurable device would outperform traditional passive splitter in terms of maximum number of supportable users under realistic deployment conditions. The second solution addresses the issue of reconfigurable network consolidation and infrastructure simplification. Current TDM-PONs suffers from limited reach and split-ratio. To enhance the performance in terms of service range and quality of service, reconfigurable network consolidation is a promising solution. It can also simplify the network and reduce cost. We propose the following novel reconfigurable technologies for consolidation and simplification of next generation access networks: (1) Passive reach-extension technology for the drop section of optical access networks; (2) Sleep mode ONUs for energy saving; (3) Centrally managed optical signature that can monitor and protect the upstream link; and (4) Multi-rate burst mode receivers. These reconfigurable technologies can bring the intelligence into optical access networks and improve the efficiency and flexibility for next generation optical access networks.

Gigabit-capable passive optical networks (G-PON) have a large and increasing base of support among telecommunications operators around the world. Written by two of the experts in the field, this book explains G-PON in detail, both the original 2.5 Gb/s version and XG-PON, the 10 Gb/s second generation. The foundation established by this book is also invaluable in understanding NG2 (next-generation 2) G-PON, which is built upon a number of XG-PON systems on parallel wavelengths. As well as a history that clarifies the reasons for many of the existing features, the book looks at current and evolving technology and discusses some of the alternatives for future access networks.

"This book is a collection of the latest contributions to the area of survivability in optical networks, focusing on theoretical and practical aspects of network survivability methodologies applied to real world scenarios"--Provided by publisher.

Service providers are increasingly focused on delivering triple-play bundles that incorporate Internet, video, and VoIP services—as well as multi-play bundles containing even more advanced services. *Broadband Network Architectures* is the first comprehensive guide to designing, implementing, and managing the networks that make triple-play services possible. Hellberg, Greene, and Boyes present their field-tested industry best practices and objectively evaluate the tradeoffs associated with key up-front architectural decisions that balance the complexities of bundled services and sophisticated traffic policies. *Broadband Network Architectures* not only documents what is possible on this rapidly changing field of networking, but it also details how to divide Internet access into these more sophisticated services with specialized Quality of Service handling. Coverage includes · An in-depth introduction to next-generation triple-play services: components, integration, and business connectivity · Triple-play backbone design: MPLS, Layer 3 VPNs, and Broadband Network Gateways (BNGs)/Broadband Remote Access Servers (B-RAS) · Protocols and strategies for integrating BNGs into robust triple-play networks · Triple-play access network design: DSLAM architectures, aggregation networks, transport, and Layer 2 tunneling · VLAN-per-customer versus service-per-VLAN architectures: advantages and disadvantages · PPP or DHCP: choosing the right access protocol · Issues associated with operating in wholesale, unbundled environments · IP addressing and subscriber session management · Broadband network security, including Denial of Service attacks and VoIP privacy · The future of wireless broadband: IMS, SIP, and non-SIP based fixed mobile convergence and wireless video

This book presents fundamental passive optical network (PON) concepts, providing you with

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the tools needed to understand, design, and build these new access networks. The logical sequence of topics begins with the underlying principles and components of optical fiber communication technologies used in access networks. Next, the book progresses from descriptions of PON and fiber-to-the-X (FTTX) alternatives to their application to fiber-to-the-premises (FTTP) networks and, lastly, to essential measurement and testing procedures for network installation and maintenance. An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.

The mobile market has experienced unprecedented growth over the last few decades. Consumer trends have shifted towards mobile internet services supported by 3G and 4G networks worldwide. Inherent to existing networks are problems such as lack of spectrum, high energy consumption, and inter-cell interference. These limitations have led to the emergence of 5G technology. It is clear that any 5G system will integrate optical communications, which is already a mainstay of wide area networks. Using an optical core to route 5G data raises significant questions of how wireless and optical can coexist in synergy to provide smooth, end-to-end communication pathways. *Optical and Wireless Convergence for 5G Networks* explores new emerging technologies, concepts, and approaches for seamlessly integrating optical-wireless for 5G and beyond. Considering both fronthaul and backhaul perspectives, this timely book provides insights on managing an ecosystem of mixed and multiple access network communications focused on optical-wireless convergence. Topics include Fiber-Wireless (FiWi), Hybrid Fiber-Wireless (HFW), Visible Light Communication (VLC), 5G optical sensing technologies, approaches to real-time IoT applications, Tactile Internet, Fog Computing (FC), Network Functions Virtualization (NFV), Software-Defined Networking (SDN), and many others. This book aims to provide an inclusive survey of 5G optical-wireless requirements, architecture developments, and technological solutions.

Provides a comprehensive and updated account of WDM optical network systems. Optical networking has advanced considerably since 2010. A host of new technologies and applications has brought a significant change in optical networks, migrating it towards an all-optical network. This book places great emphasis on the network concepts, technology, and methodologies that will stand the test of time and also help in understanding and developing advanced optical network systems. The first part of *Optical WDM Networks: From Static to Elastic Networks* provides a qualitative foundation for what follows—presenting an overview of optical networking, the different network architectures, basic concepts, and a high-level view of the different network structures considered in subsequent chapters. It offers a survey of enabling technologies and the hardware devices in the physical layer, followed by a more detailed picture of the network in the remaining chapters. The next sections give an in-depth study of the three basic network structures: the static broadcast networks, wavelength routed networks, and the electronic/optical logically routed networks, covering the characteristics of the optical networks in the access, metropolitan area, and long-haul reach. It discusses the networking picture; network control and management, impairment management and survivability. The last section of the book covers the upcoming technologies of flex-grid and software defined optical networking. Provides concise, updated, and comprehensive coverage of WDM optical networks. Features numerous examples and exercise problems for the student to practice. Covers, in detail, important topics, such as, access, local area, metropolitan, wide area all-optical and elastic networks. Includes protocols, design, and analysis along with the control and management of the networks. Offers exclusive chapters on advance topics to cover the present and future technological trends, such as, software defined optical networking and the flexible grid optical networks. *Optical WDM Networks: From Static to Elastic Networks* is an excellent book for under and post graduate students in electrical/communication engineering. It will also be very useful to practicing professionals in communications, networking, and optical systems.

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