

## Broadband Access Networks Technologies And Deployments Optical Networks

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

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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 Here's an exciting book that gives you a comprehensive understanding of the emerging and proven technologies that allow high-speed remote access to the Internet and to broadband services such as Video-on-Demand. It shows you how to design the network that provides broadband links between end-users and service providers, and the operations systems that control networks.

When one considers broadband, the Internet immediately springs to mind. However, broadband is impacting society in many ways. For instance, broadband networks can be used to deliver healthcare or community related services to individuals who don't have computers, have distance as an issue to contend with, or don't use the internet. Broadband can support better management of scarce energy resources with the advent of smart grids, enables improved teleworking capacity and opens up a world of new entertainment possibilities. Yet scholarly examinations of broadband technology have so far examined adoption, usage, or diffusion but missed exploring the capacity of broadband networks to enable new applications, the management aspects of funding and developing broadband-enabled services, or the policy environment in which such networks are developed. This book explores a wide range of issues associated with the deployment and use of broadband including its impacts on individuals, organizations, and society, and offers a generalist understanding of the technical aspects of broadband. Management of Broadband Technology and Innovation offers insights on broadband from the perspectives of Information Systems, Management, Strategy, and Communications Policy scholars, drawing on research from these disciplines to inform diverse

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aspects of broadband deployment, policy, and use. Issues associated with a subject technical in nature, but now researched in many ways, are emphasised. This book explains various softer aspects of broadband deployment and use, focusing on the benefits of broadband rather than on details of the technology.

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 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.

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The author takes a detailed look at the technologies and techniques needed to operate fixed broadband wireless access networks. With this comprehensive guide, readers discover the technologies required for FBW and learn how to plan, deploy, and manage an access network. This guide helps you make the right choice for your customer base among DSL, cable modem, fiber, and wireless. It gives you up-to-date information on these top competing technologies and can take the nail-biting out of a make-or-break business decision.

With the growing popularity of wireless networks in recent years, the need to increase network capacity and efficiency has become more prominent in society. This has led to the development and implementation of heterogeneous networks. Resource Allocation in Next-Generation Broadband Wireless Access Networks is a comprehensive reference source for the latest scholarly research on upcoming 5G technologies for next generation mobile networks, examining the various features, solutions, and challenges associated with such advances. Highlighting relevant coverage across topics such as energy efficiency, user support, and adaptive multimedia services, this book is ideally designed for academics, professionals, graduate students, and professionals interested in novel research for wireless innovations. Master optical First Mile technologies with this end-to-end solutions guide that incorporates the most current advances and features Understand the range of First Mile technologies available in the marketplace and the policies and technologies impacting future trends Review step-by-step guides to building end-to-end solutions for optical networking Master Free Space Optics, EPON, and PON design and concepts Learn technology options with coverage of the latest optical switching systems Named by an IEEE task force, the first mile refers to the connections between business/residential subscribers and the public networks central office or point of

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presence. This task force, of which Cisco is a member, is developing standards and products that use Ethernet as the Layer 2 protocol of choice for the economical and efficient delivery of broadband related services. "First Mile Advanced Access Technologies" reviews the standards, policies, products, features and services related to the growing delivery of broadband services. It provides an overview of all the protocols currently bringing services to the first mile, including DSL, cable modems, ISDN, satellite, and broadband wireless. The book then moves forward detailing the advancements and capabilities of optical networking. The book also provides end-to-end solution designs, incorporating the latest advancements in the technologies and reviewing the capabilities of some of the newest optical switching systems. A specific review of scalability keeps current design guides in tune with potential future needs. "First Mile Advanced Access Technologies" offers readers step-by-step, basic to advanced coverage of an end-to-end solution for optical networking. Ashwin Gumaste is currently completing a PhD in Optical Networking and is also part of the Photonics Networking Laboratory with Fujitsu. He is the author of DWDM Network Design and Engineering Solutions from Cisco Press. , b>Tony Anthony, CCNP, CCIP, is a Technical Marketing Engineer with the Optical Networking Group at Cisco Systems. He is the author of DWDM Network Design and Engineering Solutions from Cisco Press.

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.

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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. 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

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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. 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)

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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



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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.

An essential reference for deploying IPv6 in broadband networks With the exponential growth of the Internet and increasing number of end users, service providers are increasingly looking for ways to expand their networks to meet the scalability requirements of the growing number of Internet-ready appliances or "always-on" devices. This book bridges a gap in the literature by providing coverage of Internet Protocol Version 6 (IPv6), specifically in broadband access networks. The authors, who are Cisco Certified Internetworking Experts (CCIE), provide comprehensive and first-rate coverage of: IPv6 drivers in broadband networks IPv6 deployment in Cable, DSL, ETTH, and Wireless networks Configuring and troubleshooting IPv6 gateway routers and host Configuring and troubleshooting IPv6 edge routers Configuring and troubleshooting IPv6 provisioning servers The authors also discuss challenges faced by service

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providers and how IPv6 addresses these issues. Additionally, the book is complemented with examples throughout to further facilitate readers' comprehension and a real large-scale IPv6 BB SP case study is presented. Deploying IPv6 in Broadband Access Networks is essential reading for network operators, network design engineers and consultants, network architects, and members of the networking community.

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

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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.

Communications networks are now dominated by Internet protocol (IP) technologies. This book comprehensively reviews the design, provision and operations of carrier-scale Internet networks. Every aspect of networking, from access to the core network to the surrounding operational support systems has been radically affected by the rapid development of IP technologies and this book presents a good balance between leading edge technology and many of the practical issues surrounding carrier-scale IP networks. This makes for essential reading for those with a technical or business interest in this rapidly changing area.

Broadband optical access network is an ideal solution to alleviate the first/last

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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.

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 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

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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

The Internet has changed significantly from its beginnings as a simple network used to pass data from one computer to another. Containing essential tools for everyday information processing, the Internet is used by small and large organizations alike and continues to evolve with the changing information technology landscape. Technologies and Protocols for the Future of Internet Design: Reinventing the Web aims to provide relevant methods and theories in the area of the Internet design. It is written for the research community and professionals who wish to improve their understanding of future Internet technologies and gain knowledge of new tools and techniques in future Internet design.

Focusing on the most promising broadband applications and services and the business strategies that are most viable to ensure favorable return on investment, this report is authored by industry professionals and examines the current and potential markets for

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a range of broadband applications and services and offers business strategies that providers can adopt to help ensure profitability. Detailed case studies from service providers around the world also provide invaluable insights into the challenges and opportunities present in today's global broadband industry. This report is an important resource for any communications company that hopes to profit from the evolutions in broadband applications and services.

Broadband networks, such as asynchronous transfer mode (ATM), frame relay, and leased lines, allow us to easily access multimedia services (data, voice, and video) in one package. Exploring why broadband networks are important in modern-day telecommunications, Introduction to Broadband Communication Systems covers the concepts and components of both standard and emerging broadband communication network systems. After introducing the fundamental concepts of broadband communication systems, the book discusses Internet-based networks, such as intranets and extranets. It then addresses the networking technologies of X.25 and frame relay, fiber channels, a synchronous optical network (SONET), a virtual private network (VPN), an integrated service digital network (ISDN), broadband ISDN (B-ISDN), and ATM. The authors also cover access networks, including digital subscriber lines (DSL), cable modems, and passive optical networks, as well as explore wireless networks, such as wireless data services, personal communications services (PCS), and satellite communications. The book concludes with chapters on network

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management, network security, and network testing, fault tolerance, and analysis. With up-to-date, detailed information on the state-of-the-art technology in broadband communication systems, this resource illustrates how some networks have the potential of eventually replacing traditional dial-up Internet. Requiring only a general knowledge of communication systems theory, the text is suitable for a one- or two-semester course for advanced undergraduate and beginning graduate students in engineering as well as for short seminars on broadband communication systems.

As the demand for and the variety of 3G services increase, more advanced hardware and software technologies will be needed to enhance the mobile radio communications infrastructure. This forward-looking book delivers a comprehensive overview of the advanced technologies driving the evolution of mobile radio access networks, focusing on high-level architectural issues and system engineering. The book highlights the advantages and drawbacks of these advanced technologies and helps you make strategic decisions on R&D planning and system deployment.

Several trends are hastening the use of MPLS-based VPNs in broadband networks. With this rapid evolution, networking professionals need resources like this new volume.

A comprehensive reference that addresses the need for solid understanding of the operation of IP networks, plus optimization and management techniques to keep those networks running at peak performance Uniquely distinguished from other books on IP

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networks, as it focuses on operation and management support, and is not just another treatise on protocol theory. Includes many practical case studies as further illustration of the concepts discussed.

With the increased functionality demand for mobile speed and access in our everyday lives, broadband wireless networks have emerged as the solution in providing high data rate communications systems to meet these growing needs. *Broadband Wireless Access Networks for 4G: Theory, Application, and Experimentation* presents the latest trends and research on mobile ad hoc networks, vehicular ad hoc networks, and routing algorithms which occur within various mobile networks. This publication smartly combines knowledge and experience from enthusiastic scholars and expert researchers in the area of wideband and broadband wireless networks. Students, professors, researchers, and other professionals in the field will benefit from this book's practical applications and relevant studies.

*Broadband Access Networks Technologies and Deployments* Springer Science & Business Media

This book 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



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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. Included is an online component consisting of spreadsheets that were used in developing the material presented in the book. Concentrates on practical concepts that will allow the user to do his own design, improvement, and troubleshooting 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.

The design and development of cost-effective mobile broadband wireless access networks is a key challenge for many mobile network operators. The over-dimensioning or under-dimensioning of an access network results in both additional costs and customer dissatisfaction. Thushara Weerawardane

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introduces new transport technologies and features for High Speed Packet Access (HSPA) and Long-Term Evolution (LTE) networks. Using advanced scientific methods, he proposes new adaptive flow control and enhanced congestion control algorithms, then defends them with highly-developed analytical models derived from Markov chains. For faster analysis, compared to long-lasting detailed simulations, these models provide optimum network performance and ensure reliable quality standards for end users during transport network congestion. Further, the author investigates and analyzes LTE transport network performance by introducing novel traffic differentiation models and buffer management techniques during intra-LTE handovers.

Broadband communication expands our opportunities for entertainment, e-commerce and work at home, health care, education, and even e-government. It can make the Internet more useful to more people. But it all hinges on higher capacity in the “first mile” or “last mile” that connects the user to the larger communications network. That connection is often adequate for large organizations such as universities or corporations, but enhanced connections to homes are needed to reap the full social and economic promise. Broadband: Bringing Home the Bits provides a contemporary snapshot of technologies, strategies, and policies for improving our communications and information

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infrastructure. It explores the potential benefits of broadband, existing and projected demand, progress and failures in deployment, competition in the broadband industry, and costs and who pays them. Explanations of broadband's alphabet soup " HFC, DSL, FTTH, and all the rest " are included as well. The report's finding and recommendations address regulation, the roles of communities, needed research, and other aspects, including implications for the Telecommunications Act of 1996.

Learn to design and build a broadband network with help from this easy-to-understand introductory guide. You'll get practical info on everything from hardware and software to design concepts and sample network blueprints. Includes hundreds of figures and illustrations to help put information in a visual context.

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

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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

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broadband multimedia service industries.

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 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.

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

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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. This book provides you with a thorough introduction to wireless access and local networks, covers broadband mobile wireless access systems, and details mobile and broadband wireless local area networks. This forward-looking reference focuses on cutting-edge mobile WiMax,

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WiFi, and WiBro technologies, including in-depth design and implementation guidance. Expert Oliver C. Ibe provides you with the technical background you need to confidently select and implement the best remote access technologies for your company's network. He fills you in on everything you should know about how remote traffic is processed from source to network, and the technologies, services, and protocols it is likely to encounter along the way. He also acquaints you with all the remote access devices currently on the market, and describes, in detail, how each will perform with legacy networking services and technologies. With the help of numerous illustrations and time flow diagrams, and a complete glossary of technical terms, he provides clear, detailed coverage of: \* xDSL, HFC, FTTC, FTTH, and other broadband access technologies. \* Remote access performance with legacy and emerging technologies and services. \* Remote access network security including basic security services, cryptographic systems, IP security protocols, and Web security. \* Firewalls and firewall architectures. \* Virtual Private Network (VPN) architectures and implementations. \* VPN applications including intranets, extranets, and voice over IP. \* Wireless remote access services. \* Mobile data networking including CDPD, mobile IP, and short message services. With the ubiquitous diffusion of the IoT, Cloud Computing, 5G and other evolved wireless technologies into our daily lives, the world will see the Internet of the future expand ever more quickly. Driving the progress of communications and connectivity are mobile and wireless technologies, including traditional WLANs technologies and low, ultra-power, short and long-range technologies. These technologies facilitate the communication among the growing number of connected devices, leading to the generation of huge volumes of data. Processing and analysis of such "big data" brings about many opportunities, as well as many challenges,

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such as those relating to efficient power consumptions, security, privacy, management, and quality of service. This book is about the technologies, opportunities and challenges that can drive and shape the networks of the future. Written by established international researchers and experts, *Networks of the Future* answers fundamental and pressing research challenges in the field, including architectural shifts, concepts, mitigation solutions and techniques, and key technologies in the areas of networking. The book starts with a discussion on Cognitive Radio (CR) technologies as promising solutions for improving spectrum utilization, and also highlights the advances in CR spectrum sensing techniques and resource management methods. The second part of the book presents the latest developments and research in the areas of 5G technologies and Software Defined Networks (SDN). Solutions to the most pressing challenges facing the adoption of 5G technologies are also covered, and the new paradigm known as Fog Computing is examined in the context of 5G networks. The focus next shifts to efficient solutions for future heterogeneous networks. It consists of a collection of chapters that discuss self-healing solutions, dealing with Network Virtualization, QoS in heterogeneous networks, and energy efficient techniques for Passive Optical Networks and Wireless Sensor Networks. Finally, the areas of IoT and Big Data are discussed, including the latest developments and future perspectives of Big Data and the IoT paradigms.

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 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



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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. 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.

Multi-Protocol Label Switch (MPLS) and Generalized MPLS (GMPLS) are key technologies for

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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 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

Access to the Internet is an increasing problem in many areas of the world. As the popularity

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and usefulness of the Internet increases on a daily basis, lack of access to the technology is putting many groups at a disadvantage in terms of better education, better jobs and even in terms of higher levels of civic participation. However, creating a network infrastructure to serve outlying communities and sectors of the population is not straight-forward. This book brings together all the aspects of the problem – technical, regulatory and economic - into one volume to provide a comprehensive resource. It describes the latest technological advances that allow cost-effective network infrastructures to be built, and places them in the context of the applications and services that the infrastructure will deliver. A section on business models and case studies from North American and Europe demonstrate that the solutions are economically and practically viable. This book is essential for anyone looking to gain an understanding of the issues and technology surrounding the access debate. It will be of particular relevance to network engineers/designers/planners at the incumbent operator companies charged with delivering broadband access to as yet unconnected regions. Governments and regulatory bodies will also find this a useful guide to the problems that they may face.

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