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Optical communication networks have played and will continue to play a prominent role in the development and deployment of communication network infrastructures. New optical systems and protocols will enable next generation optical networks to meet the diverse requirements from a wide range of new applications and services. Optical networks have evolved to become more flexible, intelligent and reliable. New optical switching architectures, technologies, and sophisticated control and management protocols have already enabled optical networks to be used not only in the core but also the metropolitan and access networks. The widespread deployment of optical communication networks will continue to have a big impact on our future lifestyle. Current Research Progress of Optical Networks is aimed to provide an overview on recent research progresses in optical networking with proposed solutions, survey and tutorials on various issues and topics in optical network technologies and services. This comprehensive resource demonstrates how wireless sensor network (WSN) systems, a key element of the Internet of Things (IoT), are designed and evaluated to solve problems associated with autonomous sensing systems. Functional blocks that form WSN-based systems are described, chapter by chapter, providing the reader with a progressive learning path through all aspects of designing remote sensing capabilities using a WSN-based system. The development and a full description of

fundamental performance equations and technological solutions required by these real-time systems are included. This book explores the objectives and goals associated with tactical intelligence, surveillance, and reconnaissance (T-ISR) missions. Readers gain insight into the correlation between fine-grained sensor resolution associated with WSN-based system complexities and the difficult requirements associated with T-ISR missions. The book demonstrates how to wield emergent technologies to arrive at reliable and robust wireless networking for T-ISR and associated tasks using low-cost, low-power persistent sensor nodes. WSN is broken down into constituent subsystems, key components, functional descriptions, and attendant mathematical descriptions. This resource explains how the design of each element can be approached and successfully integrated into a viable and responsive sensor system that is autonomous, adaptable to mission objectives and environments, and deployable worldwide. It also provides examples of what not to do based on lessons learned from past (and current) systems that failed to provide end users with the required information. Chapters are linked together, in order of system assembly (concepts to operation), to provide the reader with a full toolset that can help deliver versatility in design decisions, solutions, and understanding of such systems, end to end. This book presents a novel framework design for the next generation Marine Wireless Communication Networks (MWCNs). The authors first provide an overview of MWCNs, followed by a discussion of challenges in the design and development of MWCNs in support of a diversity of marine services such as real-time marine monitoring, offshore oil exploration, drilling, marine tourism and fishing. The authors then propose cross layer networking solutions to achieve a high performance modern MWCN that enables efficient and reliable data transmissions under hostile marine environment, which include the network deployment, the physical layer channel coding, intelligent network access and resource management, and learning-based opportunistic routing. Finally, the authors summarize the book and present some open issues that will lead to new research directions in the next generation MWCNs. Few would doubt the potential of information technology to connect individuals, firms and organisations. Whether this will actually lead to the integration of markets and societies is a different issue. The articles collected in this book shed light on crucial considerations for the success of global communication networks. These include frameworks for regulation, inclusion of customers in defining product and service strategies, access to advanced technology and networks for all groups, and more. This textbook presents a detailed introduction to the essentials of networking and communications technologies. Revised and updated, this new edition retains the step-by-step approach of the original, organised to help those without a strong knowledge of the subject matter. Features: provides chapter-ending summaries and review questions, an Appendix on TCP/IP packet formats and an expanded Glossary; supplies supplementary material at the associated Springer website, including teaching slides, solutions to the end-of-chapter questions and supplementary exercises with solutions; presents a greater emphasis on mobile computing and network security, and extended coverage of IPv6 (NEW); discusses networking models and standards, local area and wide area networks, network protocols, TCP/IP-based networks, network management and wireless communications; examines grid and cloud computing, microblogging, mobile ad hoc networks, near-field communication, Power over Ethernet and the Ground Positioning System (NEW). Cyber physical systems emerge when physical systems are integrated with communication networks. In particular, communication networks facilitate dissemination of data among components of physical systems to meet key requirements, such as efficiency and reliability, in achieving an objective. In this dissertation, we consider one of the most important cyber physical systems: the smart grid. The North American Electric Reliability Corporation (NERC) envisions a smart grid that aggressively explores advance communication network solutions to facilitate real-time monitoring and dynamic control of the bulk electric power system. At the distribution level, the smart grid integrates renewable generation and energy storage mechanisms to improve reliability of the grid. Furthermore, dynamic pricing and demand management provide customers an avenue to interact with the power system to determine electricity usage that satisfies their lifestyle. At the transmission level, efficient communication and a highly automated architecture provide visibility in the power system; hence, faults are mitigated faster than they can propagate. However, higher levels of reliability and efficiency rely on the supporting physical communication infrastructure and the network technologies employed. Conventionally, the topology of the communication network tends to be identical to that of the power network. In this dissertation, however, we employ a Demand Response (DR) application to illustrate that a topology that may be ideal for the power network may not necessarily be ideal for the communication network. To develop this illustration, we realize that communication network issues, such as congestion, are addressed by protocols, middle-ware, and software mechanisms. Additionally, a network whose physical topology is designed to avoid congestion realizes an even higher level of performance. For this reason, characterizing the communication infrastructure of smart grids provides mechanisms to improve performance while minimizing cost. Most recently, algebraic connectivity has been used in the ongoing research effort characterizing the robustness of networks to failures and attacks. Therefore, we first derive analytical methods for increasing algebraic connectivity and validate these methods numerically. Secondly, we investigate impact on the topology and traffic characteristics as algebraic connectivity is increased. Finally, we construct a DR application to demonstrate how concepts from graph theory can dramatically improve the performance of a communication network. With a hybrid simulation of both power and communication network, we illustrate that a topology which may be ideal for the power network may not necessarily be ideal for the communication network. To date, utility companies are embracing network technologies such as Multiprotocol Label Switching (MPLS) because of the available support for legacy devices, traffic engineering, and virtual private networks (VPNs) which are essential to the functioning of the smart grid. Furthermore, this particular network technology meets the requirement of non-routability as stipulated by NERC, but these benefits are costly for the infrastructure that supports the full MPLS specification. More importantly, with MPLS routing and other switching technologies, innovation is restricted to the features provided by the equipment. In particular, no practical method exists for utility consultants or researchers to test new ideas, such as alternatives to IP or MPLS, on a realistic scale in order to obtain the experience and confidence necessary for real-world deployments. As a result, novel ideas remain untested. On the contrary, OpenFlow, which has gained support from network providers such as Microsoft and Google and equipment vendors such as NEC and Cisco, provides the programmability and flexibility necessary to enable innovation in next-generation communication architectures for the smart grid. This level of flexibility allows OpenFlow to provide all features of MPLS and allows OpenFlow devices to co-exist with existing MPLS devices. Therefore, in this dissertation we explore a low-cost OpenFlow Software Defined Networking solution and compare its performance to that of MPLS. In summary, we develop methods for designing robust networks and evaluate software defined networking for communication and control in cyber physical systems where the smart grid is the system under consideration. For courses in wireless communication networks and systems A Comprehensive Overview of Wireless Communications Wireless Communication Networks and Systems covers all types of wireless communications, from satellite and cellular to local and personal area networks. Organised into four easily comprehensible, reader-friendly parts, it presents a clear and comprehensive overview of the field of wireless communications. For those who are new to the topic, the book explains basic principles and fundamental topics concerning the technology and architecture of the field. Numerous figures and tables help clarify discussions, and each chapter includes a list of keywords, review questions, homework problems, and suggestions for further reading. The book includes an extensive online glossary, a list of frequently used acronyms, and a reference list. A diverse set of projects and other student exercises enables instructors to use the book as a component in a varied learning experience, tailoring courses to meet their specific needs. The full text downloaded to your computer With eBooks you can: search for key concepts, words and phrases make highlights and notes as you study share your notes with friends eBooks are downloaded to your computer and accessible either offline through the Bookshelf (available as a free download), available online and also via the iPad and Android apps. Upon purchase, you'll gain instant access to this eBook. Time limit The eBooks products do not have an expiry date. You will continue to access your digital ebook products whilst you have your Bookshelf installed. This book focuses on the use of Artificial Intelligence and Machine Learning (AI/ML) based techniques to solve issues related to communication networks, their layers, as well as their applications. The book first offers an introduction to recent trends regarding communication networks. The authors then provide an overview of theoretical concepts of AI/ML, techniques and protocols used in different layers of communication. Furthermore, this book presents solutions that help analyze complex patterns in user data and ultimately improve productivity. Throughout, AI/ML-based solutions are provided, for topics such as signal detection, channel modeling, resource optimization, routing protocol design, transport layer optimization, user/application behavior prediction, software-defined networking, congestion control, communication network optimization, security, and anomaly detection. The book features chapters from a large spectrum of

authors including researchers, students, as well as industrials involved in research and development. A mathematical tool for scientists and researchers who work with computer and communication networks, *Game Theory in Communication Networks: Cooperative Resolution of Interactive Networking Scenarios* addresses the question of how to promote cooperative behavior in interactive situations between heterogeneous entities in communication networking scenarios. It explores network design and management from a theoretical perspective, using game theory and graph theory to analyze strategic situations and demonstrate profitable behaviors of the cooperative entities. The book promotes the use of Game Theory to address important resource management and security issues found in next generation communications networks, particularly heterogeneous networks, for cases where cooperative interactive networking scenarios can be formulated. It provides solutions for representative mechanisms that need improvement by presenting a theoretical step-by-step approach. The text begins with a presentation of theory that can be used to promote cooperation for the entities in a particular interactive situation. Next, it examines two-player interaction as well as interactions between multiple players. The final chapter presents and examines a performance evaluation framework based on MATLAB®. Each chapter begins by introducing basic theory for dealing with a particular interactive situation and illustrating how particular aspects of game theory can be used to formulate and solve interactive situations that appear in communication networks regularly. The second part of each chapter presents example scenarios that demonstrate the applicability and power of the theory—illustrating a number of cooperative interactions and discussing how they could be addressed within the theoretical framework presented in the first part of the chapter. The book also includes simulation code that can be downloaded so you can use some or all of the proposed models to improve your own network designs. Specific topics covered include network selection, user-network interaction, network synthesis, and context-aware security provisioning. This book provides comprehensive coverage of mobile data networking and mobile communications under a single cover for diverse audiences including managers, practicing engineers, and students who need to understand this industry. In the last two decades, many books have been written on the subject of wireless communications and networking. However, mobile data networking and mobile communications were not fully addressed in a unified fashion. This book fills that gap in the literature and is written to provide essentials of wireless communications and wireless networking, including Wireless Personal Area Networks (WPAN), Wireless Local Area Networks (WLAN), and Wireless Wide Area Networks (WWAN). The first ten chapters of the book focus on the fundamentals that are required to study mobile data networking and mobile communications. Numerous solved examples have been included to show applications of theoretical concepts. In addition, unsolved problems are given at the end of each chapter for practice. (A solutions manual will be available.) After introducing fundamental concepts, the book focuses on mobile networking aspects. Four chapters are devoted on the discussion of WPAN, WLAN, WWAN, and internetworking between WLAN and WWAN. Remaining seven chapters deal with other aspects of mobile communications such as mobility management, security, cellular network planning, and 4G systems. A unique feature of this book that is missing in most of the available books on wireless communications and networking is a balance between the theoretical and practical concepts. Moreover, this book can be used to teach a one/two semester course in mobile data networking and mobile communications to ECE and CS students. \*Details the essentials of Wireless Personal Area Networks(WPAN), Wireless Local Are Networks (WLAN), and Wireless Wide Area Networks (WWAN) \*Comprehensive and up-to-date coverage including the latest in standards and 4G technology \*Suitable for classroom use in senior/first year grad level courses. Solutions manual and other instructor support available In recent years the significance of Gaussian processes to communication networks has grown considerably. The inherent flexibility of the Gaussian traffic model enables the analysis, in a single mathematical framework, of systems with both long-range and short-range dependent input streams. *Large Deviations for Gaussian Queues* demonstrates how the Gaussian traffic model arises naturally, and how the analysis of the corresponding queuing model can be performed. The text provides a general introduction to Gaussian queues, and surveys recent research into the modelling of communications networks. Coverage includes: Discussion of the theoretical concepts and practical aspects related to Gaussian traffic models. Analysis of recent research asymptotic results for Gaussian queues, both in the large-buffer and many-sources regime. An emphasis on rare-event analysis, relying on a variety of asymptotic techniques. Examination of single-node FIFO queuing systems, as well as queues operating under more complex scheduling disciplines, and queuing networks. A set of illustrative examples that directly relate to important practical problems in communication networking. A large collection of instructive exercises and accompanying solutions. *Large Deviations for Gaussian Queues* assumes minimal prior knowledge. It is ideally suited for postgraduate students in applied probability, operations research, computer science and electrical engineering. The book's self-contained style makes it perfect for practitioners in the communications networking industry and for researchers in related areas. The viewpoint is that communication networking is about efficient resource sharing. The focus is on the three building blocks of communication networking, namely, multiplexing, switching and routing. The approach is analytical, with the discussion being driven by mathematical analyses of and solutions to specific engineering problems. The result? A comprehensive, effectively organized treatment of core engineering issues in communication networking. Written for both the networking professional and for the classroom, this book covers fundamental concepts in detail and places design issues in context by drawing on real world examples from current technologies. Systematically uses mathematical models and analyses to drive the development of a practical understanding of core network engineering problems. Provides in-depth coverage of many current topics, including network calculus with deterministically-constrained traffic, congestion control for elastic traffic, packet switch queuing, switching architectures, virtual path routing, and routing for quality of service. Includes over 200 hands-on exercises and class-tested problems, dozens of schematic figures, a review of key mathematical concepts, and a glossary. This unified 2001 treatment of game theory focuses on finding state-of-the-art solutions to issues surrounding the next generation of wireless and communications networks. The key results and tools of game theory are covered, as are various real-world technologies and a wide range of techniques for modeling, design and analysis. *Intelligent Vehicular Network and Communications: Fundamentals, Architectures and Solutions* begins with discussions on how the transportation system has transformed into today's Intelligent Transportation System (ITS). It explores the design goals, challenges, and frameworks for modeling an ITS network, discussing vehicular network model technologies, mobility management architectures, and routing mechanisms and protocols. It looks at the Internet of Vehicles, the vehicular cloud, and vehicular network security and privacy issues. The book investigates cooperative vehicular systems, a promising solution for addressing current and future traffic safety needs, also exploring cooperative cognitive intelligence, with special attention to spectral efficiency, spectral scarcity, and high mobility. In addition, users will find a thorough examination of experimental work in such areas as Controller Area Network protocol and working function of On Board Unit, as well as working principles of roadside unit and other infrastructural nodes. Finally, the book examines big data in vehicular networks, exploring various business models, application scenarios, and real-time analytics, concluding with a look at autonomous vehicles. Proposes cooperative, cognitive, intelligent vehicular networks Examines how intelligent transportation systems make more efficient transportation in urban environments Outlines next generation vehicular networks technology The huge and growing demand for wireless communication systems has spurred a massive effort on the parts of the computer science and electrical engineering communities to formulate ever-more efficient protocols and algorithms. Written by a respected figure in the field, *Handbook of Wireless Networks and Mobile Computing* is the first book to cover the subject from a computer scientist's perspective. It provides detailed practical coverage of an array of key topics, including cellular networks, channel assignment, queuing, routing, power optimization, and much more. 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. *Self-Organization in Sensor and Actor Networks* explores self-organization mechanisms and methodologies concerning the efficient coordination between intercommunicating autonomous systems. Self-organization is often referred to as the multitude of algorithms and methods that organise the global behaviour of a system based on inter-system communication. Studies of self-organization in natural systems first took off in the 1960s. In technology, such approaches have become a hot research topic over the last 4-5 years with emphasis upon management and control in communication networks, and especially in resource-

constrained sensor and actor networks. In the area of ad hoc networks new solutions have been discovered that imitate the properties of self-organization. Some algorithms for on-demand communication and coordination, including data-centric networking, are well-known examples. Key features include: Detailed treatment of self-organization, mobile sensor and actor networks, coordination between autonomous systems, and bio-inspired networking. Overview of the basic methodologies for self-organization, a comparison to central and hierarchical control, and classification of algorithms and techniques in sensor and actor networks. Explanation of medium access control, ad hoc routing, data-centric networking, synchronization, and task allocation issues. Introduction to swarm intelligence, artificial immune system, molecular information exchange. Numerous examples and application scenarios to illustrate the theory. Self-Organization in Sensor and Actor Networks will prove essential reading for students of computer science and related fields; researchers working in the area of massively distributed systems, sensor networks, self-organization, and bio-inspired networking will also find this reference useful. To date, most network research contains one or more of five major problems. First, it tends to be atheoretical, ignoring the various social theories that contain network implications. Second, it explores single levels of analysis rather than the multiple levels out of which most networks are comprised. Third, network analysis has employed very little the insights from contemporary complex systems analysis and computer simulations. Fourth, it typically uses descriptive rather than inferential statistics, thus robbing it of the ability to make claims about the larger universe of networks. Finally, almost all the research is static and cross-sectional rather than dynamic. Theories of Communication Networks presents solutions to all five problems. The authors develop a multitheoretical model that relates different social science theories with different network properties. This model is multilevel, providing a network decomposition that applies the various social theories to all network levels: individuals, dyads, triples, groups, and the entire network. The book then establishes a model from the perspective of complex adaptive systems and demonstrates how to use Blanche, an agent-based network computer simulation environment, to generate and test network theories and hypotheses. It presents recent developments in network statistical analysis, the  $p^*$  family, which provides a basis for valid multilevel statistical inferences regarding networks. Finally, it shows how to relate communication networks to other networks, thus providing the basis in conjunction with computer simulations to study the emergence of dynamic organizational networks. This book is a quantitative text, which focuses on the real issues behind serious modeling and analysis of communications networks. The author covers all the necessary mathematics and theory in order for students to understand the tools that optimize computer networks today. Covers both classical (e.g. queueing theory) and modern (e.g. pricing) aspects of networking Integrates material on communication networks with material on modeling/analyzing and designing such networks Includes a Solution Manual The importance of Broadband Communications in shaping the future telecommunication network has achieved world-wide recognition. This volume validates the huge significance of the field and explores key items concerning research, development and applications. The ideas and experiences presented will be of great interest to operators and users, for research and development, from both a technical and a commercial perspective. As the cellular world and the Internet converge, mobile networks are transitioning from circuit to packet and the Internet Protocol (IP) is now recognized as the fundamental building block for all next-generation communication networks. The all-IP vision provides the flexibility to deliver cost-effective services and applications that meet the evolving needs of mobile users. RF engineers, mobile network designers, and system architects will be expected to have an understanding of IP fundamentals and how their role in delivering the end-to-end system is crucial for delivering the all-IP vision that makes the Internet accessible anytime, anywhere. IP Design for Mobile Networks discusses proper IP design theory to effectively plan and implement your next-generation mobile network so that IP integrates all aspects of the network. The book outlines, from both a standards and a design theory perspective, both the current and target state of mobile networks, and the technology enablers that will assist the migration. This IP transition begins with function-specific migrations of specific network domains and ends with an end-to-end IP network for radio, transport, and service delivery. The book introduces many concepts to give you exposure to the key technology trends and decision points affecting today's mobile operators. The book is divided into three parts: Part I provides an overview of how IP is being integrated into mobile systems, including radio systems and cellular networks. Part II provides an overview of IP, the technologies used for transport and connectivity of today's cellular networks, and how the mobile core is evolving to encompass IP technologies. Part III provides an overview of the end-to-end services network based on IP, including context awareness and services. Presents an overview of what mobile networks look like today—including protocols used, transport technologies, and how IP is being used for specific functions in mobile networks Provides an all-inclusive reference manual for IP design theory as related to the broader application of IP for mobile networks Imparts a view of upcoming trends in mobility standards to better prepare a network evolution plan for IP-based mobile networks This book is part of the Networking Technology Series from Cisco Press®, which offers networking professionals valuable information for constructing efficient networks, understanding new technologies, and building successful careers. ciscopress.com In today's interactive network environment, where various types of organizations are eager to monitor and track Internet use, anonymity is one of the most powerful resources available to counterbalance the threat of unknown spectators and to ensure Internet privacy. Addressing the demand for authoritative information on anonymous Internet usage, Anonymous Communication Networks: Protecting Privacy on the Web examines anonymous communication networks as a solution to Internet privacy concerns. It explains how anonymous communication networks make it possible for participants to communicate with each other without revealing their identities. The book explores various anonymous communication networks as possible solutions to Internet privacy concerns—making it ideal for network researchers and anyone interested in protecting their privacy or the privacy of their users. Identifying specific scenarios where it is best to be anonymous, it details the two main approaches to anonymous communication networks: onion routing and mixed networks. Details helpful tips for optimizing onion routing Defines and classifies mixed networks Illustrates the application of a mixed network to e-voting with a case study Considers the application of symmetric cipher and Diffie-Hellman key exchange in Tor Supplies detailed guidance on how to download and install Tor, I2P, JAP/JonDo, and QuickSilver Using examples and case studies, the book illustrates the usefulness of anonymous communication networks for web browsing, email, e-banking, and e-voting. It explains how to obtain anonymous usage permits for cloud software and analyzes the spectrum of existing techniques for anonymous cyber surfing. The text concludes by examining future directions to supply you with the understanding required to ensure anonymous Internet browsing. 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, 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. This book contains a selection of papers presented at a symposium organized under the aegis of COST Telecommunications Action 285. COST (European Cooperation in the field of Scientific and Technical Research) is a framework for scientific and technical cooperation, allowing the coordination of national research on a European level. Action 285 sought to enhance existing tools and develop new modeling and simulation tools. If you need to know more about communication's security management, this is the perfect book for you... Secure Communications

confronts the practicalities of implementing the ideals of the security policy makers. Based on 15 years experience, the author addresses the key problems faced by security managers, starting from network conception, initial setting up and the maintenance of network security by key management. Many different types of communications networks are discussed using a wide range of topics, including voice, telephone, mobile phone, radio, fax, data transmission and storage, IP, and Email technologies. Each topic is portrayed in a number of different operational environments. \* Explains the practical links between cryptography and telecommunications \* Addresses the pertinent issues of implementation of cryptography as a method of protecting information \* Supports each communications technology and the fundamentals of cryptography with useful and relevant telecommunications material \* Provides practical solutions by network modelling and stimulating the reader's imagination on how to deal with their own network protection \* Highlights the need for a structured infrastructure in an organisation's security that complements the technical solutions Easy to read and highly illustrated, this timely publication probes the sensitive issues that manufacturers and agencies prefer to avoid and uses eye opening, historical events, to highlight the failings and weaknesses of the past and present. So if you work within the areas of telecommunications and security or are a researcher or student eager to know more, read on... This book aims to fill a growing need in the research community for a reference that describes the state-of-the-art in securing group communications. It focuses on tailoring the security solution to the underlying network architecture (such as the wireless cellular network or the ad hoc/sensor network), or to the application using the security methods (such as multimedia multicasts). This book presents architectural solutions of wireless network and its variations. It basically deals with modeling, analysis, design and enhancement of different architectural parts of wireless network. The main aim of this book is to enhance the applications of wireless network by reducing and controlling its architectural issues. The book discusses efficiency and robustness of wireless network as a platform for communication and data transmission and also discusses some challenges and security issues such as limited hardware resources, unreliable communication, dynamic topology of some wireless networks, vulnerability and unsecure environment. This book is edited for users, academicians and researchers of wireless network. Broadly, topics include modeling of security enhancements, optimization model for network lifetime, modeling of aggregation systems and analyzing of troubleshooting techniques. Design of Modern Communication Networks focuses on methods and algorithms related to the design of communication networks, using optimization, graph theory, probability theory and simulation techniques. The book discusses the nature and complexity of the network design process, then introduces theoretical concepts, problems and solutions. It demonstrates the design of network topology and traditional loss networks, followed by uncontrolled packet networks, flow-controlled networks, and multiservice networks. Access network design is reviewed, and the book concludes by considering the design of survivable (reliable) networks and various reliability concepts. A toolbox of algorithms: The book provides practical advice on implementing algorithms, including the programming aspects of combinatorial algorithms. Extensive solved problems and illustrations: Wherever possible, different solution methods are applied to the same examples to compare performance and verify precision and applicability. Technology-independent: Solutions are applicable to a wide range of network design problems without relying on particular technologies. This book targets major issues in terrestrial-satellite communication networks and presents the solutions. While the terrestrial networks can achieve high-speed data service at low cost, satellite based access is one way to complement terrestrial based networks to ensure ubiquitous, 100% geographic coverage. The coexistence and cooperation between terrestrial and satellite networks are of great potential in future communication networks, and satellite radio access networks has already been considered in the fifth-generation (5G) networks to be supported for phase 2. Therefore, it is important to study the architectures of terrestrial-satellite networks, as well as the possible techniques and challenges. The authors introduce the technique of beamforming in satellite communication systems, which is an efficient transmitting method for multiple access, and they discuss the main challenges as well as prospective applications. The authors introduce possible methods for interference cancelation reception in terrestrial-satellite communication networks when reusing the frequency band between the two networks. Due to the limitation of spectrum resources, spectrum sharing will become one of the important issues in terrestrial-satellite communication networks. The problems of spectrum coexistence between GEO and Terrestrial Systems and between GEO and NEGO systems are also discussed. Finally, taking both the two system into consideration, the resource allocation problem will be more complex due to the coupling between resources and the interference. Based on this, the authors propose several resource allocation schemes in different scenarios of terrestrial-satellite communication networks, which can optimize the capacity performance of the system. The expected audience for this book includes (but not limited to) graduate students, professors, researchers, scientists, practitioners, engineers, industry managers, and government researchers working in the field of satellite communications and networks. The expected audience for this book includes (but not limited to) graduate students, professors, researchers, scientists, practitioners, engineers, industry managers, and government researchers working in the field of satellite communications and networks. The key to a successful future mobile communication system lies in the design of its radio scheduler. One of the key challenges of the radio scheduler is how to provide the right balance between Quality of Service (QoS) guarantees and the overall system performance. Yasir Zaki proposes innovative solutions for the design of the Long Term Evolution (LTE) radio scheduler and presents several LTE radio scheduler analytical models that can be used as efficient tools for radio dimensioning. The author also introduces a novel wireless network virtualization framework and highlights the potential gains of using this framework for the future network operators. This framework enables the operators to share their resources and reduce their cost, thus achieving a better overall system performance and radio resource utilization. Broadband Powerline Communications: Network Design covers the applications of broadband PLC systems in low-voltage supply networks, a promising candidate for the realization of cost effective solutions for "last mile" communications networks. There are many activities surrounding the development and application of PLC technology in the access area, particularly because of strong interest of new network providers after the deregulation of telecommunications market. Nowadays, there are no existing standards for broadband PLC networks, which use a frequency range up to 30 MHz. This book includes relevant and timely information regarding broadband PLC systems and especially PLC access networks and contributions to the design aspects of broadband PLC access systems and their network components. This book: Offers explanations on how broadband PLC networks are realized, what the important characteristics for the transmission on electrical power grids are, and which implementation solutions have been recently considered for the realization of broadband PLC systems. Considers various system realizations, disturbance scenarios and their impact the transmission in PLC networks, electro-magnetic compatibility, applied modulation schemes, coding, and error handling methods. Pays particular attention to the specifics of the PLC MAC layer and its protocols, as well as the modelling and performance evaluation of broadband PLC networks. Campus Network Architectures and Technologies begins by describing the service challenges facing campus networks, and then details the intent-driven campus network architectures and technologies of Huawei Cloud Campus Solution. After reading this book, you will have a comprehensive understanding of next-generation campus network solutions, technical implementations, planning, design, and other know-how. Leveraging Huawei's years of technical expertise and practices in the campus network field, this book systematically describes the use of technical solutions such as virtualization, big data, AI, and SDN in campus networks. You will be able to reconstruct campus networks quickly and efficiently utilizing this informative description. Additionally, this book provides detailed suggestions for campus network design and deployment based on Huawei's extensive project implementation experience, assisting with the construction of automated and intelligent campus networks required to cope with challenges. This is a practical, informative, and easy-to-understand guide for learning about and designing campus networks. It is intended for network planning engineers, network technical support engineers, network administrators, and enthusiasts of campus network technologies. Authors Ningguo Shen is Chief Architect for Huawei's campus network solutions. He has approximately 20 years' experience in campus network product and solution design, as well as a wealth of expertise in network planning and design. Mr. Shen previously served as a system engineer for the campus switch, data center switch, and WLAN product lines, and led the design of Huawei's intent-driven campus network solution. Bin Yu is an Architect for Huawei's campus network solutions. He has 12 years' experience in campus network product and solution design, as well as extensive expertise in network planning and design and network engineering project implementation. Mr. Yu once led the design of multiple features across various campus network solutions. Mingxiang Huang is a Documentation Engineer for Huawei's campus network solutions. He has three years of technical service experience, and four years of expertise in developing campus network product documentation. Mr. Huang was previously in charge of writing manuals for Huawei router and switch

products. He has authored many popular technical series, including *Be an OSPF Expert*, *Insight into Routing Policies*, and *Story behind Default Routes*. Hailin Xu is a Documentation Engineer for Huawei's campus network solutions. He has two years of marketing experience in smart campus solutions, and six years of expertise in developing network products and solution documentation. Extremely familiar with Huawei's campus network products and solutions, Mr. Xu was previously in charge of writing manuals for Huawei routers, switches, and campus network solutions. In addition, he has participated in smart campus marketing projects within such sectors as education, government, and real estate. This book provides a tutorial on quantum communication networks. The authors discuss current paradigm shifts in communication networks that are needed to add computing and storage to the simple transport ideas of prevailing networks. They show how these 'softwarized' solutions break new grounds to reduce latency and increase resilience. The authors discuss how even though these solutions have inherent problems due to introduced computing latency and energy consumption, the problems can be solved by hybrid classical-quantum communication networks. The book brings together quantum networking, quantum information theory, quantum computing, and quantum simulation. The algebraic path problem is a generalization of the shortest path problem in graphs. Various instances of this abstract problem have appeared in the literature, and similar solutions have been independently discovered and rediscovered. The repeated appearance of a problem is evidence of its relevance. This book aims to help current and future researchers add this powerful tool to their arsenal, so that they can easily identify and use it in their own work. Path problems in networks can be conceptually divided into two parts: A distillation of the extensive theory behind the algebraic path problem, and an exposition of a broad range of applications. First of all, the shortest path problem is presented so as to fix terminology and concepts: existence and uniqueness of solutions, robustness to parameter changes, and centralized and distributed computation algorithms. Then, these concepts are generalized to the algebraic context of semirings. Methods for creating new semirings, useful for modeling new problems, are provided. A large part of the book is then devoted to numerous applications of the algebraic path problem, ranging from mobile network routing to BGP routing to social networks. These applications show what kind of problems can be modeled as algebraic path problems; they also serve as examples on how to go about modeling new problems. This monograph will be useful to network researchers, engineers, and graduate students. It can be used either as an introduction to the topic, or as a quick reference to the theoretical facts, algorithms, and application examples. The theoretical background assumed for the reader is that of a graduate or advanced undergraduate student in computer science or engineering. Some familiarity with algebra and algorithms is helpful, but not necessary. Algebra, in particular, is used as a convenient and concise language to describe problems that are essentially combinatorial. Table of Contents: Classical Shortest Path / The Algebraic Path Problem / Properties and Computation of Solutions / Applications / Related Areas / List of Semirings and Applications Explaining how to apply to mathematical programming to network design and control, Linear Programming and Algorithms for Communication Networks: A Practical Guide to Network Design, Control, and Management fills the gap between mathematical programming theory and its implementation in communication networks. From the basics all the way through to more advanced concepts, its comprehensive coverage provides readers with a solid foundation in mathematical programming for communication networks. Addressing optimization problems for communication networks, including the shortest path problem, max flow problem, and minimum-cost flow problem, the book covers the fundamentals of linear programming and integer linear programming required to address a wide range of problems. It also: Examines several problems on finding disjoint paths for reliable communications Addresses optimization problems in optical wavelength-routed networks Describes several routing strategies for maximizing network utilization for various traffic-demand models Considers routing problems in Internet Protocol (IP) networks Presents mathematical puzzles that can be tackled by integer linear programming (ILP) Using the GNU Linear Programming Kit (GLPK) package, which is designed for solving linear programming and mixed integer programming problems, it explains typical problems and provides solutions for communication networks. The book provides algorithms for these problems as well as helpful examples with demonstrations. Once you gain an understanding of how to solve LP problems for communication networks using the GLPK descriptions in this book, you will also be able to easily apply your knowledge to other solvers. Green Communications and Networking introduces novel solutions that can bring about significant reductions in energy consumption in the information and communication technology (ICT) industry-as well as other industries, including electric power. Containing the contributions of leading experts in the field, it examines the latest research advances Car-to-X (C2X) communication in terms of Car-to-Car (C2C) and Car-to-Infrastructure (C2I) communication aims at increasing road safety and traffic efficiency by exchanging foresighted traffic information. Thereby, security and privacy are regarded as an absolute prerequisite for successfully establishing the C2X technology on the market. Towards the paramount objective of covering the entire ITS reference model with security and privacy measures, Hagen Stübing develops dedicated solutions for each layer, respectively. On application layer a security architecture in terms of a Public Key Infrastructure is presented, which provides low complexity and operational costs, while at the same time security and privacy constraints are preserved. On facility layer complementary security solutions based on mobility data verification are proposed, which promise efficient message content protection at a low computational complexity. On network layer a privacy protocol is presented aiming at a creation of cryptographic mix zones by means of group keys, which enhance privacy towards a global adversary. On physical layer a technique denoted as Secure C2X Beamforming is presented, which enhances privacy and security by means of radiation pattern control. The importance of quality of service (QoS) has risen with the recent evolution of telecommunication networks, which are characterised by a great heterogeneity. While many applications require a specific level of assurance from the network; communication networks are characterized by different service providers, transmission means and implementer solutions such as asynchronous transfer mode (ATM), Internet protocol version 4 (IPv4), IPv6 and MPLS. Providing comprehensive coverage of QoS issues within heterogeneous network environments, "QoS Over Heterogeneous Networks" looks to find solutions to questions such as does QoS fit within heterogeneous networks and what is the impact on performance if information traverses different network portions that implement specific QoS schemes. Includes: A series of algorithms and protocols to help solve potential QoS problems. State of the art case studies and operative examples to illustrate points made. Information on QoS mapping in terms of service-level specification (SLS) and an in-depth discussion of related issues Chapters end-to-end (E2E) QoS, QoS architecture, QoS over heterogeneous networks and QoS internetworking and mapping. An ideal book for graduate students, researchers and lecturers. System designers, developers and engineers will also find "QoS Over Heterogeneous Networks" a valuable reference. This monograph focuses on exploring game theoretic modeling and mechanism design for problem solving in Internet and network economics. For the first time, the main theoretical issues and applications of mechanism design are bound together in a single text. "For nearly 20 years, the Army has had limited success in developing an information network - -sensors, software, and radios to give soldiers the exact information they need, when they need it, in any environment. Such a network is expected to improve situational awareness and decision making in combat. Under its network modernization strategy, the Army is implementing a new agile process intended to leverage industry technology solutions. The Army has taken a number of steps to begin executing its network strategy and agile process, including establishing a baseline network architecture for Army communications. The Army's agile process involves seven phases and three decision points to allow officials to quickly evaluate emerging networking technologies to determine if they address capability gaps and can be deployed to the field. However, the network strategy is still evolving and the Army has not yet executed one full cycle of the agile process. This book addresses the extent to which the Army's network strategy and agile process addresses cost, technology maturity, security, and readiness; and the Army's strategy for facing other risks and challenges. This book also examines the results of the Network Integration Evaluations (NIEs) conducted to date and the extent to which the Army has procured and fielded network solutions, and Army actions to enhance the NIE process." --Publisher's website.

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