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Mobile and Wireless Communications with Practical Use-Case Scenarios - Ramona

Trestian 2022-12-22

The growing popularity of advanced multimedia-rich applications along with the increasing affordability of high-end smart mobile devices has led to a massive growth in mobile data traffic that puts

significant pressure on the underlying network technology. However, no single network technology will be equipped to deal with this explosion of mobile data traffic. While wireless technologies had a spectacular evolution over the past years, the present trend is to adopt a global heterogeneous network of

shared standards that enables the provisioning of quality of service and quality of experience to the end-user. To this end, enabling technologies like machine learning, Internet of Things and digital twins are seen as promising solutions for next generation networks that will enable an intelligent adaptive interconnected environment with support for prediction and decision making so that the heterogeneous applications and users' requirements can be highly satisfied. The aim of this textbook is to provide the readers with a comprehensive technical foundation of the mobile communication systems and wireless network design, and operations and applications of various radio access technologies. Additionally, it also introduces the reader to the latest advancements in technologies in terms of Internet of Things ecosystems, machine learning and digital

twins for IoT-enabled intelligent environments. Furthermore, this textbook also includes practical use-case scenarios using Altair WinProp Software as well as Python, TensorFlow and Jupyter as support for practice-based laboratory sessions.

Ultra-Dense Heterogeneous Networks -

Wen Sun 2022-09-14
Driven by the ever-increasing amount of mobile data, cellular networks evolve from small cell network to ultra-dense heterogeneous networks, to provide high system capacity and spectrum efficiency. By bringing base stations (BSs) to the approximate spatial scale and number magnitude, ultra-dense heterogeneous networks would definitely bring unprecedented paradigm changes to the network design. Firstly, along with densification of small cells, inter-cell interference becomes severe and may deteriorate performance of mobile users.

Assigning network resources including bandwidth and time slots, while avoiding interference, deserves serious consideration. Secondly, the coverage area of BSs becomes small and irregular, resulting in much frequent and complicated handovers when mobile users move around. How to ensure continuous communication and implement effective mobility management, and inter-cell resource allocation and cooperation, remains a challenging issue. Thirdly, such dynamic change in spatial dimension enables us to re-investigate available and ongoing communications and networking techniques, such as massive MIMO, CoMP, millimeter waves (mmWaves), carrier aggregation, full duplex radio, and D2D communications. To address the aforementioned challenging research issues, this book will investigate the service and QoE provisioning in

ultra-dense heterogeneous networks. In particular, firstly we introduce ultra-dense heterogeneous networks by careful definition regarding spatial deployment, generic characteristics, and requirements of ultra-dense heterogeneous networks in order to ensure QoE of mobile users. Secondly, we depict the resource management among small cells in close proximity, mobility management for mobile users (address the super-frequent handovers), and interference management (dealing with the interference due to frequency-reuse in the vicinity). Thirdly, we study the enabling factors, and the integration of ultra-dense heterogeneous networks with enabling technologies, such as massive-MIMO, cloud-RAN, mmWaves, D2D, IoT. Finally, we conclude the book and indicate future directions and challenges.

Software Defined Systems

- Deze Zeng 2019-11-25
This book introduces the software defined system concept, architecture, and its enabling technologies such as software defined sensor networks (SDSN), software defined radio, cloud/fog radio access networks (C/F-RAN), software defined networking (SDN), network function virtualization (NFV), software defined storage, virtualization and docker. The authors also discuss the resource allocation and task scheduling in software defined system, mainly focusing on sensing, communication, networking and computation. Related case studies on SDSN, C/F-RAN, SDN, NFV are included in this book, and the authors discuss how these technologies cooperate with each other to enable cross resource management and task scheduling in software defined system. Novel resource allocation and task scheduling algorithms are introduced and

evaluated. This book targets researchers, computer scientists and engineers who are interested in the information system softwarization technologies, resource allocation and optimization algorithm design, performance evaluation and analysis, next-generation communication and networking technologies, edge computing, cloud computing and IoT. Advanced level students studying these topics will benefit from this book as well.

Network Functions Virtualization (NFV) with a Touch of SDN -

Rajendra Chayapathi
2016-11-14
Network Functions Virtualization (NFV) will drive dramatic cost reductions while also accelerating service delivery. Using NFV with SDN, network owners can provision new functions rapidly on demand, improve scalability, and leverage microservices. Benefits like these will make NFV indispensable for service providers,

mobile operators, telcos, and enterprises alike. Network Functions Virtualization (NFV) with a Touch of SDN is the first practical introduction to NFV's fundamental concepts, techniques, and use cases. Written for wide audiences of network engineers, architects, planners, and operators, it assumes no previous knowledge of NFV architecture, deployment, or management. The authors first explain how virtualization, VMs, containers, and related technologies establish the foundation for the NFV transformation. Next, they show how these concepts and technologies can be applied to virtualize network functions in the cloud, data centers, routing, security, and the mobile packet core. You'll discover new tools and techniques for managing and orchestrating virtualized network devices, and gain new clarity on how SDN and NFV interact and

interrelate. By the time you're done, you'll be ready to assess vendor claims, evaluate architectures, and plan NFV's role in your own networks. Understand NFV's key benefits and market drivers Review how virtualization makes NFV possible Consider key issues associated with NFV network design and deployment Integrate NFV into existing network designs Orchestrate, build, and deploy NFV networks and cloud services Maximize operational efficiency by building more programmable, automated networks Understand how NFV and SDN work together Address security, programmability, performance, and service function chaining Preview evolving concepts that will shape NFV's future

Future Telco - Peter Krüssel 2018-07-23

This book examines the extensive changes in markets, technologies and value chains that telecommunication companies are currently

confronted with. It analyzes the crossroads they have reached and the choices that now need to be made - to be a bit pipe or a trendsetter of digitalization. Based on an analysis of the key challenges for telcos, the book derives future market scenarios and puts forward recommendations for how they can successfully position themselves. It proposes a framework based on seven "levers," which addresses concrete measures in each step of the value chain, ranging from technology, IT and processes, to innovation, marketing and sales issues. The book discusses the current challenges and provides both general recommendations and concrete solutions. Respected experts illustrate innovative strategic and technical trends and provide insights gained in real-life transformation projects. Recent developments in the areas of regulation, product development,

competition between over-the-top (OTT) providers and telcos, as well as technical innovations like 5G, SDN/NFV, LEO satellites and MEC are discussed. Accordingly, practitioners, managers and researchers alike will benefit from the book's wealth of examples and up-to-date insights.

IoT as a Service - Yi-Bing Lin 2018-10-17
This book constitutes the thoroughly refereed proceedings of the 3rd International Conference on IoT as a service, IoTaaS 2017, held in Taichung, Taiwan, in September 2017. The 46 full papers were carefully selected from 65 submissions. The papers deal with the "Everything as a Service" deployment paradigm which enables the easy adoption of IoT based services and applications by end-users, and forces providers of smart objects and middleware platforms to architect their solutions accordingly. The three

special sessions organized were Wearable Technology and Applications (WTAA), Building Smart Machine Applications (BSMA), and Security and Privacy in Internet of Things, Services and People (SP-IoTSP). The WTAA special session aimed to address the challenges of maintaining high efficiency of WTAA in terms of high recognition rate, energy consumption, computational costs and so forth. The BSMA special session aimed to explore how to construct smart machines architecture for the industry under the background of IoT and big data. The SP-IoTSP special session aimed to investigate recent research and future directions for IoTSP security and privacy.

Research Anthology on Developing and Optimizing 5G Networks and the Impact on Society - Management Association, Information Resources 2020-11-27

As technology advances, the emergence of 5G has

become an essential discussion moving forward as its applications and benefits are expected to enhance many areas of life. The introduction of 5G technology to society will improve communication speed, the efficiency of information transfer, and end-user experience to name only a few of many future improvements. These new opportunities offered by 5G networks will spread across industry, government, business, and personal user experiences leading to widespread innovation and technological advancement. What stands at the very core of 5G becoming an integral part of society is the very fact that it is expected to enrich society in a multifaceted way, enhancing connectivity and efficiency in just about every sector including healthcare, agriculture, business, and more. Therefore, it has been a critical topic of research to

explore the implications of this technology, how it functions, what industries it will impact, and the challenges and solutions of its implementation into modern society. Research Anthology on Developing and Optimizing 5G Networks and the Impact on Society is a critical reference source that analyzes the use of 5G technology from the standpoint of its design and technological development to its applications in a multitude of industries. This overall view of the aspects of 5G networks creates a comprehensive book for all stages of the implementation of 5G, from early conception to application in various sectors. Topics highlighted include smart cities, wireless and mobile networks, radio access technology, internet of things, and more. This all-encompassing book is ideal for network experts, IT specialists, technologists,

academicians, researchers, and students.

5G Radio Access Networks

- Hrishikesh

Venkataraman 2017-03-16

C-RAN and virtualized Small Cell technology poses several major research challenges. These include dynamic resource allocation, self-configuration in the baseband pool, high latency in data transfer between radio unit and baseband unit, the cost of data delivery, high volume of data in the network, software networking aspects, potential energy savings, security concerns, privacy of user's personal data at a remote place, limitations of virtualized environment, etc. This book provides deeper insights into the next generation RAN architecture and surveys the coexistence of SDN, C-RAN and Small Cells solutions proposed in the literature at different levels. *Advances in Vehicular Networks* - Barbara M. Masini 2021-01-06

Connected and automated vehicles have revolutionized the way we move, granting new services on roads. This Special Issue collects contributions that address reliable and ultra-low-latency vehicular applications that range from advancements at the access layer, such as using the visible light spectrum to accommodate ultra-low-latency applications, to data dissemination solutions. Further, articles discuss edge computing, neural network-based techniques, and the use of reconfigurable intelligent surfaces (RIS) to boost throughput and enhance coverage.

Mobile Networks and Management - Ramón Agüero 2016-01-08
This book constitutes the post-proceedings of the 7th International Conference on Mobile Networks and Management, MONAMI 2015, held in Santander, Spain, in September 2015. The 16 full papers were carefully reviewed and

selected from 24 submissions. In addition there appears one short and 5 invited papers. These are organized thematically in five parts starting with Cellular Network Management and Self-Organizing Networks in Part I. Radio Resource Management in LTE and 5G Networks aspects are discussed in Part II. Part III presents novel Techniques and Algorithms for Wireless Networks, while Part IV deals with Video Streaming over Wireless Networks. Part V includes papers presenting avant-garde research on applications and services and, finally, Part VI features two papers introducing novel architectural approaches for Wireless Sensor Networks.

Engineering Applications of Neural Networks - Lazaros S. Iliadis 2013-09-25
The two volumes set, CCIS 383 and 384, constitutes the refereed proceedings of the 14th International Conference

on Engineering Applications of Neural Networks, EANN 2013, held on Halkidiki, Greece, in September 2013. The 91 revised full papers presented were carefully reviewed and selected from numerous submissions. The papers describe the applications of artificial neural networks and other soft computing approaches to various fields such as pattern recognition-predictors, soft computing applications, medical applications of AI, fuzzy inference, evolutionary algorithms, classification, learning and data mining, control techniques-aspects of AI evolution, image and video analysis, classification, pattern recognition, social media and community based governance, medical applications of AI-bioinformatics and learning.

Telecommunication Systems - Isiaka Alimi
2019-10-30

This book is based on both industrial and academic research

efforts in which a number of recent advancements and rare insights into telecommunication systems are well presented. The volume is organized into four parts:

"Telecommunication Protocol, Optimization, and Security Frameworks", "Next-Generation Optical Access Technologies", "Convergence of Wireless-Optical Networks" and "Advanced Relay and Antenna Systems for Smart Networks." Chapters within these parts are self-contained and cross-referenced to facilitate further study.

Artificial Intelligence and Machine Learning for EDGE Computing - Rajiv Pandey
2022-05-06

Artificial Intelligence and Machine Learning for Predictive and Analytical Rendering in Edge Computing focuses on the role of AI and machine learning as it impacts and works alongside Edge Computing. Sections

cover the growing number of devices and applications in diversified domains of industry, including gaming, speech recognition, medical diagnostics, robotics and computer vision and how they are being driven by Big Data, Artificial Intelligence, Machine Learning and distributed computing, may it be Cloud Computing or the evolving Fog and Edge Computing paradigms. Challenges covered include remote storage and computing, bandwidth overload due to transportation of data from End nodes to Cloud leading in latency issues, security issues in transporting sensitive medical and financial information across larger gaps in points of data generation and computing, as well as design features of Edge nodes to store and run AI/ML algorithms for effective rendering. Provides a reference handbook on the evolution of distributed

systems, including Cloud, Fog and Edge Computing Integrates the various Artificial Intelligence and Machine Learning techniques for effective predictions at Edge rather than Cloud or remote Data Centers Provides insight into the features and constraints in Edge Computing and storage, including hardware constraints and the technological/architectural developments that shall overcome those constraints

Enabling 5G Communication Systems to Support Vertical

Industries - Muhammad Ali Imran 2019-08-19 How 5G technology can support the demands of multiple vertical industries Recent advances in technology have created new vertical industries that are highly dependent on the availability and reliability of data between multiple locations. The 5G system, unlike previous generations, will be entirely data

driven—addressing latency, resilience, connection density, coverage area, and other vertical industry criteria. Enabling 5G Communication Systems to Support Vertical Industries demonstrates how 5G communication systems can meet the needs unique to vertical industries for efficient, cost-effective delivery of service. Covering both theory and practice, this book explores solutions to problems in specific industrial sectors including smart transportation, smart agriculture, smart grid, environmental monitoring, and disaster management. The 5G communication system will have to provide customized solutions to accommodate each vertical industry's specific requirements. Whether an industry practitioner designing the next generation of wireless communications or a researcher needing to identify open issues and classify their research,

this timely book: Covers the much-discussed topics of supporting multiple vertical industries and new ICT challenges Addresses emerging issues and real-world problems surrounding 5G technology in wireless communication and networking Explores a comprehensive array of essential topics such as connected health, smart transport, smart manufacturing, and more Presents important topics in a clear, concise style suitable for new learners and professionals alike Includes contributions from experts and industry leaders, system diagrams, charts, tables, and examples Enabling 5G Communication Systems to Support Vertical Industries is a valuable resource telecom engineers industry professionals, researchers, professors, doctorate, and postgraduate students requiring up-to-date information on supporting vertical

industries with 5G technology systems.
International dictionary of abbreviations and acronyms of electronics, electrical engineering, computer technology, and information processing - Peter Wennrich
2019-05-20

Signal Processing for 5G

- Fa-Long Luo 2016-08-04
A comprehensive and invaluable guide to 5G technology, implementation and practice in one single volume. For all things 5G, this book is a must-read. Signal processing techniques have played the most important role in wireless communications since the second generation of cellular systems. It is anticipated that new techniques employed in 5G wireless networks will not only improve peak service rates significantly, but also enhance capacity, coverage, reliability, low-latency, efficiency, flexibility, compatibility and convergence to meet the increasing demands

imposed by applications such as big data, cloud service, machine-to-machine (M2M) and mission-critical communications. This book is a comprehensive and detailed guide to all signal processing techniques employed in 5G wireless networks. Uniquely organized into four categories, New Modulation and Coding, New Spatial Processing, New Spectrum Opportunities and New System-level Enabling Technologies, it covers everything from network architecture, physical-layer (down-link and up-link), protocols and air interface, to cell acquisition, scheduling and rate adaptation, access procedures and relaying to spectrum allocations. All technology aspects and major roadmaps of global 5G standard development and deployments are included in the book. Key Features: Offers step-by-step guidance on bringing 5G technology into practice, by applying algorithms and design methodology to

real-time circuit implementation, taking into account rapidly growing applications that have multi-standards and multi-systems. Addresses spatial signal processing for 5G, in particular massive multiple-input multiple-output (massive-MIMO), FD-MIMO and 3D-MIMO along with orbital angular momentum multiplexing, 3D beamforming and diversity. Provides detailed algorithms and implementations, and compares all multicarrier modulation and multiple access schemes that offer superior data transmission performance including FBMC, GFDM, F-OFDM, UPMC, SEFDM, FTN, MUSA, SCMA and NOMA. Demonstrates the translation of signal processing theories into practical solutions for new spectrum opportunities in terms of millimeter wave, full-duplex transmission and license assisted access. Presents well-designed implementation

examples, from individual function block to system level for effective and accurate learning. Covers signal processing aspects of emerging system and network architectures, including ultra-dense networks (UDN), software-defined networks (SDN), device-to-device (D2D) communications and cloud radio access network (C-RAN).

Distributed Computer and Communication Networks -

Vladimir M. Vishnevskiy
2021-01-01

This book constitutes the refereed post-conference proceedings of the 23rd International Conference on Distributed and Computer and Communication Networks, DCCN 2020, held in Moscow, Russia, in September 2020. The 54 revised full papers and 1 revised short paper were carefully reviewed and selected from 167 submissions. The papers cover the following topics: computer and communication networks; analytical modeling of

distributed systems; and distributed systems applications.

Building the Network of the Future - John

Donovan 2017-06-26

From the Foreword: "This book lays out much of what we've learned at AT&T about SDN and NFV. Some of the smartest network experts in the industry have drawn a map to help you navigate this journey. Their goal isn't to predict the future but to help you design and build a network that will be ready for whatever that future holds. Because if there's one thing the last decade has taught us, it's that network demand will always exceed expectations. This book will help you get ready." -Randall Stephenson, Chairman, CEO, and President of AT&T "Software is changing the world, and networks too. In this in-depth book, AT&T's top networking experts discuss how they're moving software-defined networking from concept to practice, and why it's a business

imperative to do this rapidly." -Urs Hölzle, SVP Cloud

Infrastructure, Google

"Telecom operators face a continuous challenge for more agility to serve their customers with a better customer experience and a lower cost. This book is a very inspiring and vivid testimony of the huge transformation this means, not only for the networks but for the entire companies, and how AT&T is leading it. It provides a lot of very deep insights about the technical challenges telecom engineers are facing today. Beyond AT&T, I'm sure this book will be extremely helpful to the whole industry." -Alain Maloberti, Group Chief Network Officer, Orange Labs Networks "This new book should be read by any organization faced with a future driven by a "shift to software." It is a holistic view of how AT&T has transformed its core infrastructure from hardware based to largely software based to lower costs and speed

innovation. To do so, AT&T had to redefine their technology supply chain, retrain their workforce, and move toward open source user-driven innovation; all while managing one of the biggest networks in the world. It is an amazing feat that will put AT&T in a leading position for years to come." -Jim Zemlin, Executive Director, The Linux Foundation This book is based on the lessons learned from AT&T's software transformation journey starting in 2012 when rampant traffic growth necessitated a change in network architecture and design. Using new technologies such as NFV, SDN, Cloud, and Big Data, AT&T's engineers outlined and implemented a radical network transformation program that dramatically reduced capital and operating expenditures. This book describes the transformation in substantial detail. The subject matter is of great interest to telecom professionals

worldwide, as well as academic researchers looking to apply the latest techniques in computer science to solving telecom's big problems around scalability, resilience, and survivability.

Emerging Wireless Communication and Network Technologies -

Karm Veer Arya
2018-06-09

The book covers a wide range of wireless communication and network technologies, and will help readers understand the role of wireless technologies in applications touching on various spheres of human life, e.g. healthcare, agriculture, building smart cities, forecasting and the manufacturing industry. The book begins by discussing advances in wireless communication, including emerging trends and research directions for network technologies. It also highlights the importance of and need to actively develop these technologies. In turn, the book addresses

different algorithms and methodologies which could be beneficial in implementing 5G Mobile Communication, Vehicular Ad-hoc Networks (VANET), Reliable Cooperative Networks, Delay Tolerant Networks (DTN) and many more contexts related to advanced communications. It then addresses the prominence of wireless communication in connection with the Internet of Things (IoT), Mobile Opportunistic Networks and Cognitive Radio Networks (CRN). Lastly, it presents the new horizons in architecture and building protocols for Li-Fi (Light-Fidelity) and Wearable Sensor Technology.

Proceedings of the 2022 2nd International Conference on Modern Educational Technology and Social Sciences

(ICMETSS 2022) - Youbin Chen 2023-02-10

This is an open access book. ICMETSS 2022 is to bring together innovative academics and industrial experts in the field of Innovation in Teaching & Learning ,

Technology-Enhanced Learning in the Digital Era and Integrating Educational Technologies. The primary goal of the conference is to promote research and developmental activities in Innovations in educational technology in the digital age and another goal is to promote scientific information interchange between researchers, developers, engineers, students, and practitioners working all around the world. The conference will be held every year to make it an ideal platform for people to share views and experiences in Innovations in educational technology in the digital age and related areas.

Fiber-Wireless Convergence in Next-Generation Communication Networks - Massimo Tornatore 2017-01-05

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.

Photonic Applications for Radio Systems Networks - Fabio Cavaliere 2019-09-30

This hands-on, practical new resource provides optical network designers with basic but necessary information about radio systems air interface and radio access network architecture, protocols,

and interfaces, using 5G use cases as relevant example. The book introduces mobile network designers to the transmission modeling techniques for the design of a radio access optical network. The main linear and non-linear propagation effects in optical fiber are covered. The book introduces mobile network designers to the optical technologies used in digital and analog radio access networks, such as optical amplifiers and transmitters, and describes different deployment scenarios, including point-to-point fiber systems, wavelength-division multiplexing systems, and passive optical networks. New integrated photonic technologies for optical switching are also discussed. The book illustrates the principles of optical beamforming and explains how optical technologies can be used to provide accurate phase and frequency control of antenna elements. The

new architecture of the optical transport network, driven by the new, challenging requirements that 5G poses in terms of high capacity, high energy efficiency, low latency and low cost is discussed. The use of photonic devices to perform tasks as radio-frequency generation and beamforming, with improved accuracy and cost compared to traditional electronic systems, especially when moving to mm-waves is also explored. Readers also learn the replacement of electric interconnect systems with higher speed and more energy efficient optical lines to perform more effectively computationally demanding baseband processing in 5G. All presented propagation models can be implemented in a spreadsheet, in order to provide the designer with simple rules of thumbs for network planning.

5G Mobile Communications

- Saad Asif 2018-07-20

This book will help readers comprehend technical and policy elements of telecommunication particularly in the context of 5G. It first presents an overview of the current research and standardization practices and lays down the global frequency spectrum allocation process. It further lists solutions to accommodate 5G spectrum requirements. The readers will find a considerable amount of information on 4G (LTE-Advanced), LTE-Advanced Pro, 5G NR (New Radio); transport network technologies, 5G NGC (Next Generation Core), OSS (Operations Support Systems), network deployment and end-to-end 5G network architecture. Some details on multiple network elements (end products) such as 5G base station/small cells and the role of semiconductors in telecommunication are also provided. Keeping trends in mind, service delivery mechanisms

along with state-of-the-art services such as MFS (mobile financial services), mHealth (mobile health) and IoT (Internet-of-Things) are covered at length. At the end, telecom sector's burning challenges and best practices are explained which may be looked into for today's and tomorrow's networks. The book concludes with certain high level suggestions for the growth of telecommunication, particularly on the importance of basic research, departure from ten-year evolution cycle and having a 20-30 year plan. Explains the conceivable six phases of mobile telecommunication's ecosystem that includes R&D, standardization, product/network/device & application development, and burning challenges and best practices. Provides an overview of research and standardization on 5G. Discusses solutions to address 5G spectrum requirements while

describing the global frequency spectrum allocation process. Presents various case studies and policies. Provides details on multiple network elements and the role of semiconductors in telecommunication. Presents service delivery mechanisms with special focus on IoT.

Optical and Wireless Technologies - Vijay Janyani 2019-04-09

This volume presents selected papers from the 2nd International Conference on Optical and Wireless Technologies, conducted from 10th to 11th February, 2018. It focuses on extending the limits of currently used systems encompassing optical and wireless domains, and explores novel research on wireless and optical techniques and systems, describing practical implementation activities, results and issues. The book will serve as a valuable reference resource for academics and researchers across the

globe.

5G+ - Zhengmao Li

2020-08-10

This book takes China Mobile's "5G +" plan as the mainline, introduces three major scenarios, nine indicators, system architecture and basic principles of 5G, and systematically explains the essence of China Mobile's "5G +" for the first time. A lot of industry use cases and solutions are introduced for 5G to bring new changes to life, industries, and social governance. This book can benefit all readers who are interested in 5G. It also can be a reference for vertical industry partners to fully understand the possible applications of 5G. Most of all, it will help to promote all industries with new developments based on 5G's new kinetic energy.

Edge Computing and Capability-Oriented

Architecture - Haishi

Bai 2021-08-15

Fueled by ubiquitous computing ambitions, the edge is at the center of confluence of many

emergent technological trends such as hardware-rooted trust and code integrity, 5G, data privacy and sovereignty, blockchains and distributed ledgers, ubiquitous sensors and drones, autonomous systems and real-time stream processing. Hardware and software pattern maturity have reached a tipping point so that scenarios like smart homes, smart factories, smart buildings, smart cities, smart grids, smart cars, smart highways are in reach of becoming a reality. While there is a great desire to bring born-in-the-cloud patterns and technologies such as zero-downtime software and hardware updates/upgrades to the edge, developers and operators alike face a unique set of challenges due to environmental differences such as resource constraints, network availability and heterogeneity of the environment. The first part of the book discusses various edge

computing patterns which the authors have observed, and the reasons why these observations have led them to believe that there is a need for a new architectural paradigm for the new problem domain. Edge computing is examined from the app designer and architect's perspectives. When they design for edge computing, they need a new design language that can help them to express how capabilities are discovered, delivered and consumed, and how to leverage these capabilities regardless of location and network connectivity. Capability-Oriented Architecture is designed to provide a framework for all of these. This book is for everyone who is interested in understanding what ubiquitous and edge computing means, why it is growing in importance and its opportunities to you as a technologist or decision maker. The book covers the broad spectrum of edge

environments, their challenges and how you can address them as a developer or an operator. The book concludes with an introduction to a new architectural paradigm called capability-based architecture, which takes into consideration the capabilities provided by an edge environment. .

Multiplexing - Somayeh Mohammady 2022-07-20

The idea of sharing a medium between signals originated sometime in the late 18th century and first appeared in wired telephone systems in the United States in the early 19th century. Multiplexing (MUX), a method by which multiple analog or digital signals are combined into one signal over a shared medium, increases the capacity of the communication channel by dividing it into several logical channels, one for each message signal or data stream to be transferred. On the receiver side, the reverse process known as de-multiplexing (DEMUX)

helps to extract the original channel. This book examines recent advances and novel applications in MUX and DEMUX. It discusses how MUX is applied in free-space optics (FSO) applications and how 5G and 6G signals benefit from MUX, among other topics.

High-Density and De-Densified Smart Campus Communications - Daniel

Minoli 2022-01-06
High-Density and De-Densified Smart Campus Communications Design, deliver, and implement high-density communications solutions
High-density campus communications are critical in the operation of densely populated airports, stadiums, convention centers, shopping malls, classrooms, hospitals, dense smart cities, and more. They also drive Smart City and Smart Building use cases as High-Density Communications (HDC) become recognized as an essential fourth utility. However, the unique requirements and

designs demanded by HDC make implementation challenging. In High-Density and De-Densified Smart Campus Communications: Technologies, Integration, Implementation and Applications, a team of experienced technology strategists delivers a one-of-a-kind treatment of the requirements, technologies, designs, solutions, and trends associated with HDC. From the functional requirements for HDC and emerging data/Wi-Fi 6/internet access/5G cellular/OTT video, and IoT automation—including pandemic-related de-densification—to the economics of broad deployment of HDC, this book includes coverage of every major issue faced by the professionals responsible for the design, installation, and maintenance of high-density communication networks. It also includes: A thorough introduction to traditional and emerging voice/cellular design

for campus applications, including the Distributed Antenna System (DAS) Comprehensive explorations of traditional sensor networks and Internet of Things services approaches Practical discussions of high-density Wi-Fi hotspot connectivity and related technologies, like Wi-Fi 5, Wi-Fi 6, spectrum, IoT, VoWiFi, DASs, microcells issues, and 5G versus Wi-Fi issues In-depth examinations of de-densification, office social distancing, and Ultra-Wideband (UWB) technologies Perfect for telecommunication researchers and engineers, networking professionals, technology planners, campus administrators, and equipment vendors, High-Density Smart Campus Communications will also earn a place in the libraries of senior undergraduate and graduate students in applied communications technologies.

Wireless Automation as an Enabler for the Next

Industrial Revolution -
Muhammad Ali Imran
2020-02-25

Presents the components, challenges, and solutions of wireless automation as enablers for industry 4.0 This timely book introduces the state of the art in industrial automation techniques, concentrating on wireless methods for a variety of applications, ranging from simple smart homes to heavy-duty complex industrial setting with robotics accessibility. It covers a wide range of topics including the industrial revolution enablers, applications, challenges, their possible solutions, and future directions. Wireless Automation as an Enabler for the Next Industrial Revolution opens with an introduction to wireless sensor networks and their applications in various domains, emphasizing industrial wireless networks and their future uses. It then takes a look at life-span extension for

sensor networks in the industry, followed by a chapter on multiple access and resource sharing for low latency critical industrial networks. Industrial automation is covered next, as is the subject of ultra reliable low latency communications. Other topics include: self healing in wireless networks; cost efficiency optimization for industrial automation; a non event-based approach for non-intrusive load monitoring; wireless networked control; and caching at the edge in low latency wireless networks. The book finishes with a chapter on the application of terahertz sensing at nano-scale for precision agriculture. Introduces the future evolving dimension in industrial automation and discusses the enablers of the industrial revolution Places particular emphasis on wireless communication techniques which make industrial automation reliable, efficient, and cost-

effective Covers many of the associated topics and concepts like robotics, AI, internet-of-things, telesurgery, and remote manufacturing Of great interest to researchers from academia and industry who are looking at the industrial development from various perspectives Wireless Automation as an Enabler for the Next Industrial Revolution is an excellent book for telecom engineers, IoT experts, and industry professionals. It would also greatly benefit researchers, professors, and doctorate and postgraduate students involved in automation and industry 4.0.

Cloud Computing: A Hands-On Approach -

Arshdeep Bahga

2013-12-09

About the Book Recent industry surveys expect the cloud computing services market to be in excess of \$20 billion and cloud computing jobs to be in excess of 10 million worldwide in 2014 alone. In addition, since a majority of

existing information technology (IT) jobs is focused on maintaining legacy in-house systems, the demand for these kinds of jobs is likely to drop rapidly if cloud computing continues to take hold of the industry. However, there are very few educational options available in the area of cloud computing beyond vendor-specific training by cloud providers themselves. Cloud computing courses have not found their way (yet) into mainstream college curricula. This book is written as a textbook on cloud computing for educational programs at colleges. It can also be used by cloud service providers who may be interested in offering a broader perspective of cloud computing to accompany their own customer and employee training programs. The typical reader is expected to have completed a couple of courses in programming using traditional high-level languages at the college-level, and is

either a senior or a beginning graduate student in one of the science, technology, engineering or mathematics (STEM) fields. We have tried to write a comprehensive book that transfers knowledge through an immersive "hands-on approach", where the reader is provided the necessary guidance and knowledge to develop working code for real-world cloud applications. Additional support is available at the book's website: www.cloudcomputingbook.info Organization The book is organized into three main parts. Part I covers technologies that form the foundations of cloud computing. These include topics such as virtualization, load balancing, scalability & elasticity, deployment, and replication. Part II introduces the reader to the design & programming aspects of cloud computing. Case studies on design and implementation of several cloud applications in the

areas such as image processing, live streaming and social networks analytics are provided. Part III introduces the reader to specialized aspects of cloud computing including cloud application benchmarking, cloud security, multimedia applications and big data analytics. Case studies in areas such as IT, healthcare, transportation, networking and education are provided.

Cloud Radio Access

Networks - Tony Q. S. Quek 2017-02-02

The first book on Cloud Radio Access Networks (C-RANs), covering fundamental theory, current techniques, and potential applications.

Springer Handbook of

Optical Networks - Biswanath Mukherjee 2020-10-15

This handbook is an authoritative, comprehensive reference on optical networks, the backbone of today's communication and information society. The book reviews the many

underlying technologies that enable the global optical communications infrastructure, but also explains current research trends targeted towards continued capacity scaling and enhanced networking flexibility in support of an unabated traffic growth fueled by ever-emerging new applications. The book is divided into four parts: Optical Subsystems for Transmission and Switching, Core Networks, Datacenter and Super-Computer Networking, and Optical Access and Wireless Networks. Each chapter is written by world-renown experts that represent academia, industry, and international government and regulatory agencies. Every chapter provides a complete picture of its field, from entry-level information to a snapshot of the respective state-of-the-art technologies to emerging research trends, providing something useful for the

novice who wants to get familiar with the field to the expert who wants to get a concise view of future trends.

Digitally Assisted, Fully Integrated, Wideband Transmitters for High-Speed Millimeter-Wave Wireless Communication Links -

David del Rio 2018-07-07

This book presents design methods and considerations for digitally-assisted wideband millimeter-wave transmitters. It addresses

comprehensively both RF design and digital implementation simultaneously, in order to design energy- and cost-efficient high-performance transmitters for mm-wave high-speed communications. It covers the complete design flow, from link budget assessment to the transistor-level design of different RF front-end blocks, such as mixers and power amplifiers, presenting different alternatives and discussing the existing trade-offs. The authors also analyze the

effect of the imperfections of these blocks in the overall performance, while describing techniques to correct and compensate for them digitally.

Well-known techniques are revisited, and some new ones are described, giving examples of their applications and proving them in real integrated circuits.

5G Physical Layer Technologies -

Mosa Ali Abu-Rgheff 2019-11-04

Written in a clear and concise manner, this book presents readers with an in-depth discussion of the 5G technologies that will help move society beyond its current capabilities. It perfectly illustrates how the technology itself will benefit both individual consumers and industry as the world heads towards a more connected state of being. Every technological application presented is modeled in a schematic diagram and is considered in depth through mathematical

analysis and performance assessment. Furthermore, published simulation data and measurements are checked. Each chapter of 5G Physical Layer Technologies contains texts, mathematical analysis, and applications supported by figures, graphs, data tables, appendices, and a list of up to date references, along with an executive summary of the key issues. Topics covered include: the evolution of wireless communications; full duplex communications and full dimension MIMO technologies; network virtualization and wireless energy harvesting; Internet of Things and smart cities; and millimeter wave massive MIMO technology. Additional chapters look at millimeter wave propagation losses caused by atmospheric gases, rain, snow, building materials and vegetation; wireless channel modeling and array mutual coupling; massive array configurations and 3D

channel modeling; massive MIMO channel estimation schemes and channel reciprocity; 3D beamforming technologies; and linear precoding strategies for multiuser massive MIMO systems. Other features include: In depth coverage of a hot topic soon to become the backbone of IoT connecting devices, machines, and vehicles Addresses the need for green communications for the 21st century Provides a comprehensive support for the advanced mathematics exploited in the book by including appendices and worked examples Contributions from the EU research programmes, the International telecommunications companies, and the International standards institutions (ITU; 3GPP; ETSI) are covered in depth Includes numerous tables and illustrations to aid the reader Fills the gap in the current literature where technologies are not explained in depth or omitted altogether 5G

Physical Layer Technologies is an essential resource for undergraduate and postgraduate courses on wireless communications and technology. It is also an excellent source of information for design engineers, research and development engineers, the private-public research community, university research academics, undergraduate and postgraduate students, technical managers, service providers, and all professionals involved in the communications and technology industry.

Powering the Internet of Things With 5G Networks
- Mohanan, Vasuky
2017-07-12

With the rise of mobile and wireless technologies, more sustainable networks are necessary to support such communications. These next generation networks can now be utilized to strengthen the growing era of the Internet of Things.

Powering the Internet of Things With 5G Networks

is a comprehensive reference source for the latest scholarly research on the progression and design of fifth generation networks and their role in supporting the Internet of Things. Including a range of perspectives on topics such as privacy and security, large scale monitoring, and scalable architectures, this book is ideally designed for technology developers, academics, researchers, and practitioners interested in the convergence of the Internet of Things and 5G networks.

MIMO Wireless Networks - Bruno Clerckx 2013-01-23

This book is unique in presenting channels, techniques and standards for the next generation of MIMO wireless networks. Through a unified framework, it emphasizes how propagation mechanisms impact the system performance under realistic power constraints. Combining a solid mathematical analysis with a physical

and intuitive approach to space-time signal processing, the book progressively derives innovative designs for space-time coding and precoding as well as multi-user and multi-cell techniques, taking into consideration that MIMO channels are often far from ideal. Reflecting developments since the first edition was published, this book has been thoroughly revised, and now includes new sections and five new chapters, respectively dealing with receiver design, multi-user MIMO, multi-cell MIMO, MIMO implementation in standards, and MIMO system-level evaluation. Extended introduction to multi-dimensional propagation, including polarization aspects Detailed and comparative description of physical models and analytical representations of single- and multi-link MIMO channels, covering the latest standardized models Thorough overview of space-time coding techniques, covering

both classical and more recent schemes under information theory and error probability perspectives Intuitive illustration of how real-world propagation affects the capacity and the error performance of MIMO transmission schemes Detailed information theoretic analysis of multiple access, broadcast and interference channels In-depth presentation of multi-user diversity, resource allocation and (non-)linear MU-MIMO precoding techniques with perfect and imperfect channel knowledge Extensive coverage of cooperative multi-cell MIMO-OFDMA networks, including network resource allocation optimization, coordinated scheduling, beamforming and power control, interference alignment, joint processing, massive and network MIMO Applications of MIMO and Coordinated Multi-Point (CoMP) in LTE, LTE-A and WiMAX Theoretical derivations and results contrasted with

practical system level evaluations highlighting the performance of single- and multi-cell MIMO techniques in realistic deployments

Introduction to Mobile Network Engineering: GSM, 3G-WCDMA, LTE and the Road to 5G -

Alexander Kukushkin
2018-07-03

Summarizes and surveys current LTE technical specifications and implementation options for engineers and newly qualified support staff. Concentrating on three mobile communication technologies, GSM, 3G-WCDMA, and LTE—while majorly focusing on Radio Access Network (RAN) technology—this book describes principles of mobile radio technologies that are used in mobile phones and service providers' infrastructure supporting their operation. It introduces some basic concepts of mobile network engineering used in design and rollout of the mobile network. It then follows up with

principles, design constraints, and more advanced insights into radio interface protocol stack, operation, and dimensioning for three major mobile network technologies: Global System Mobile (GSM) and third (3G) and fourth generation (4G) mobile technologies. The concluding sections of the book are concerned with further developments toward next generation of mobile network (5G). Those include some of the major features of 5G such as a New Radio, NG-RAN distributed architecture, and network slicing. The last section describes some key concepts that may bring significant enhancements in future technology and services experienced by customers. Introduction to Mobile Network Engineering: GSM, 3G-WCDMA, LTE and the Road to 5G covers the types of Mobile Network by Multiple Access Scheme; the cellular system; radio propagation; mobile radio channel;

radio network planning; EGPRS - GPRS/EDGE; Third Generation Network (3G), UMTS; High Speed Packet data access (HSPA); 4G-Long Term Evolution (LTE) system; LTE-A; and Release 15 for 5G. Focuses on Radio Access Network technologies which empower communications in current and emerging mobile network systems Presents a mix of introductory and advanced reading, with a generalist view on current mobile network technologies Written at a level that enables readers to understand principles of radio network deployment and operation Based on the author's post-graduate lecture course on Wireless Engineering Fully illustrated with tables, figures, photographs, working examples with problems and solutions, and section summaries highlighting the key features of each technology described Written as a modified and expanded set of lectures on wireless

engineering taught by the author, Introduction to Mobile Network Engineering: GSM, 3G-WCDMA, LTE and the Road to 5G is an ideal text for post-graduate and graduate students studying wireless engineering, and industry professionals requiring an introduction or refresher to existing technologies.

Microstrip Antenna Design for Wireless Applications - Praveen Kumar Malik 2021-11-30

This book focuses on recent advances in the field of microstrip antenna design and its applications in various fields including space communication, mobile communication, wireless communication, medical implants and wearable applications. Scholars as well as researchers and those in the electronics/ electrical/ instrumentation engineering fields will benefit from this book. The book shall provides the necessary literature and techniques using which to assist students

and researchers would design antennas for the above-mentioned applications and will ultimately enable users to take measurements in different environments. It is intended to help scholars and researchers in their studies, by enhancing their the knowledge and skills in on the latest applications of microstrip antennas in the world of communications such as world like IoT, D2D, satellites and wearable devices, to name a few. FEATURES Addresses the complete functional framework workflow in printed antenna design systems Explores the basic and high-level concepts, including advanced aspects in planer design issues, thus serving as a manual for those in the the industry while also assisting beginners Provides the latest techniques used for antennas in terms of structure, defected ground, MIMO and fractal designs Discusses case studies related to data-

intensive technologies in microchip antennas in terms of the most recent applications and similar uses for the Internet of Things and device-to-device communication *Introduction to Wireless Communications and Networks* - Krishnamurthy Raghunandan 2022-03-31 This book provides an intuitive and accessible introduction to the fundamentals of wireless communications and their tremendous impact on nearly every aspect of our lives. The author starts with basic information on physics and mathematics and then expands on it, helping readers understand fundamental concepts of RF systems and how they are designed. Covering diverse topics in wireless communication systems, including cellular and personal devices, satellite and space communication networks, telecommunication regulation, standardization and safety, the book combines theory and practice using problems

from industry, and includes examples of day-to-day work in the field. It is divided into two parts - basic (fundamentals) and advanced (elected topics). Drawing on the author's extensive training and industry experience in standards, public safety and regulations, the book includes information on what checks and balances are used by wireless engineers around the globe and address questions concerning safety, reliability and long-term operation. A full suite of classroom information is included.

Cloud Mobile Networks -
Mojtaba Vaezi 2017-04-25
This book explores the challenges and opportunities in exploiting cloud technologies for 5G, ranging from radio

access network (RAN) to the evolved packet core (EPC). With a specific focus on cloud RAN and EPC, the text carefully explains the influence of recent network technologies such as software defined networking (SDN), visualization, and cloud technologies in the evolution of architecture for future mobile networks. The book discusses the causes, benefits and challenges of cloud RAN and its interplay with other evolving technologies for future mobile networks. Researchers and professionals involved in mobile technology or cloud computing will find this book a valuable resource. The text is also suitable for advanced-level students studying all types of networking.