# 1 Network Slicing Based 5g And Future Le Networks

COMMUNICATION NETWORKS AND SERVICE MANAGEMENT IN THE ERA OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING Discover the impact that new technologies are having on communication systems with this up-to-date and one-stop resource Communication Networks and Service Management in the Era of Artificial Intelligence and Machine Learning delivers a comprehensive overview of the impact of artificial intelligence (AI) and machine learning (ML) on service and network management. Beginning with a fulsome description of ML and AI, the book moves on to discuss management models, architectures, and frameworks. The authors also explore how AI and ML can be used in service management functions like the generation of workload profiles, service provisioning, and more. The book includes a handpicked selection of applications and case studies, as well as a treatment of emerging technologies the authors predict could have a significant impact on network and service management in the future. Statistical analysis and data mining are also discussed, particularly with respect to how they allow for an improvement of the management and security of IT systems and networks. Readers will also enjoy topics like: A thorough introduction to network and service management, machine learning, and artificial intelligence An exploration of artificial intelligence and machine learning for management models, including

autonomic management, policy-based management, intent based management, and network virtualization-based management Discussions of AI and ML for architectures and frameworks, including cloud systems, software defined networks, 5G and 6G networks, and Edge/Fog networks An examination of AI and ML for service management, including the automatic generation of workload profiles using unsupervised learning Perfect for information and communications technology educators, Communication Networks and Service Management in the Era of Artificial Intelligence and Machine Learning will also earn a place in the libraries of engineers and professionals who seek a structured reference on how the emergence of artificial intelligence and machine learning techniques is affecting service and network management.

A comprehensive guide to Fog and Edge applications, architectures, and technologies Recent years have seen the explosive growth of the Internet of Things (IoT): the internet-connected network of devices that includes everything from personal electronics and home appliances to automobiles and industrial machinery. Responding to the ever-increasing bandwidth demands of the IoT, Fog and Edge computing concepts have developed to collect, analyze, and process data more efficiently than traditional cloud architecture. Fog and Edge Computing: Principles and Paradigms provides a comprehensive overview of the state-of-the-art applications and architectures driving this dynamic field of computing while highlighting potential research directions and emerging technologies. Exploring topics

such as developing scalable architectures, moving from closed systems to open systems, and ethical issues rising from data sensing, this timely book addresses both the challenges and opportunities that Fog and Edge computing presents. Contributions from leading IoT experts discuss federating Edge resources, middleware design issues, data management and predictive analysis, smart transportation and surveillance applications, and more. A coordinated and integrated presentation of topics helps readers gain thorough knowledge of the foundations, applications, and issues that are central to Fog and Edge computing. This valuable resource: Provides insights on transitioning from current Cloud-centric and 4G/5G wireless environments to Fog Computing Examines methods to optimize virtualized, pooled, and shared resources Identifies potential technical challenges and offers suggestions for possible solutions Discusses major components of Fog and Edge computing architectures such as middleware, interaction protocols, and autonomic management Includes access to a website portal for advanced online resources Fog and Edge Computing: Principles and Paradigms is an essential source of up-to-date information for systems architects, developers, researchers, and advanced undergraduate and graduate students in fields of computer science and engineering.

5G mobile networks use new concepts and technologies to provide current and future applications from high bit-rate smartphones to highly available Car-to-X and IoT applications. But not only technology is an issue. Also,

the environmental impact is under discussion. These topics are presented here in a well-founded introduction, with the focus on innovative concepts and technologies, including standardization.

This book describes the 5G mobile network from a systems perspective, focusing on the fundamental design principles that are easily obscured by an overwhelming number of acronyms and standards definitions that dominate this space. The book is written for system generalists with the goal of helping bring up to speed a community that understands a broad range of systems issues (but knows little or nothing about the cellular network) so it can play a role in the network's evolution. This is a community that understands both feature velocity and best practices in building robust scalable systems, and so it has an important role to play in bringing to fruition all of 5G's potential. In addition to giving a step-by-step tour of the design rationale behind 5G, the book aggressively disaggregates the 5G mobile network. Building a disaggregated, virtualized, and software-defined 5G access network is the direction the industry is already headed (for good technical and business reasons), but breaking the 5G network down into its elemental components is also the best way to explain how 5G works. It also helps to illustrate how 5G might evolve in the future to provide even more value. An open source implementation of 5G serves as the technical underpinning for the book. The authors, in collaboration with industrial and academic partners, are working towards a cloud-based implementation that takes advantage of both Software-Defined Networking

(SDN) and cloud-native (microservice-based)
architectures, culminating in a managed 5G-enabled
EdgeCloud-as-a-Service built on the components and
mechanisms described throughout the book.
Written by an industry insider with state of the art
research at their fingertips, this book describes the Radio
Access Network (RAN) architecture, starting with
currently deployed 4G, followed by the description of 5G
requirements and why re-thinking of the RAN
architecture is needed to support these. Based on these
considerations, it explains how 5G network architecture,
which is currently being defined, is likely to evolve. The
aim is not merely to cover relevant standards and
technologies as a purely academic exercise (although a
significant part of the book will be dedicated to these),
but to augment these by practical deployment, to
illustrate why the RAN architecture is changing and
where it is going. With 5G deployments on the horizon,
there is a desire within companies to both re-think the
RAN architecture and to change the proprietary nature of
the RAN. Correspondingly, there is increased interest in
academia, standards bodies and commercial entities
involved in the area.
Learn how radio access network (RAN) slicing allows 5G
networks to adapt to a wide range of environments in this
masterful resource Radio Access Network Slicing and
Virtualization for 5G Vertical Industriesprovides readers
with a comprehensive and authoritative examination of
crucial topics in the field of radio access network (RAN)
slicing. Learn from renowned experts as they detail how
this technology supports and applies to various industrial

sectors, including manufacturing, entertainment, public
safety, public transport, healthcare, financial services,
automotive, and energy utilities. Radio Access Network
Slicing and Virtualization for 5G Vertical Industries
explains how future wireless communication systems
must be built to handle high degrees of heterogeneity,
including different types of applications, device classes,
physical environments, mobility levels, and carrier
frequencies. The authors describe how RAN slicing can
be utilized to adapt 5G technologies to such wide-
ranging circumstances. The book covers a wide range of
topics necessary to understand RAN slicing, including:
Physical waveforms design Multiple service signals
coexistence RAN slicing and virtualization Applications to
5G vertical industries in a variety of environments This
book is perfect for telecom engineers and industry actors
who wish to identify realistic and cost-effective concepts
to support specific 5G verticals. It also belongs on the
bookshelves of researchers, professors, doctoral, and
postgraduate students who want to identify open issues
and conduct further research.
This book contains a collection of high-quality papers
describing the results of relevant investigations and
cutting-edge technologies, aimed at improving key
aspects of real life, including major challenges such as
the development of smart cities, smart buildings, smart
grids, and the reduction of the impact of human activities
on the environment. Sustainability requires the use of
green technologies and techniques and good practices.
Artificial intelligence seems to be an appropriate
approach to optimize the use of resources. The main

focus of this book is the dissemination of novel and
innovative technologies, techniques and applications of
artificial intelligence, computing and information and
communications technologies, and new digital services
such as digital marketing, smart tourism, smart
agriculture, green and renewable energy sources.
Besides, this book focuses on nurturing energy trends
including renewable energies, smart grids, human
activity impact, communication, behaviour, and social
development, and quality of life improvement fields
based on the innovative use of sensors, big data and the
Internet of things (IoT), telecommunications and machine
learning.
This book gathers papers presented at the 9th
International Conference on Computer Engineering and
Networks (CENet2019), held in Changsha, China, on
October 18–20, 2019. It examines innovations in the
fields of computer engineering and networking and
explores important, state-of-the-art developments in
areas such as Information Security, Information Hiding
and Cryptography, Cyber Security, and Intelligent
Computing and Applications. The book also covers
emerging topics in computer engineering and
networking, along with their applications, discusses how
to improve productivity by using the latest advanced
technologies, and examines innovation in the fields of
computer engineering and networking, particularly in
intelligent computing and security.
5G Core Networks: Powering Digitalization provides
an overview of the 5G Core network architecture, as
well as giving descriptions of cloud technologies and

the key concepts in the 3GPP rel-15/16
specifications. Written by the authors who are
heavily involved in development of the 5G standards
and who wrote the successful book on EPC and 4G
Packet Networks, this book provides an authoritative
reference on the technologies and standards of the
3GPP 5G Core network. Content includes: An
overview of the 5G Core Architecture The Stand-
Alone and Non-Stand-Alone Architectures Detailed
presentation of 5G Core key concepts An overview
of 5G Radio and Cloud technologies Learn The
differences between the 5G Core network and
previous core network generations How the
interworking with previous network standards is
defined Why certain functionality has been included
and what is beyond the scope of 5G Core How the
specifications relate to state-of-the-art web-scale
concepts and virtualization technologies Details of
the protocol and service descriptions Examples of
network deployment options Provides a clear,
concise and comprehensive view of 5GS/5GC
Written by established experts in the 5GS/5GC
standardization process, all of whom have extensive
experience and understanding of its goals, history
and vision Covers potential service and operator
scenarios for each architecture Explains the Service
Based Architecture, Network Slicing and support of
Edge Computing, describing the benefits they will
bring Explains what options and parts of the

standards will initially be deployed in real networks, along with their migration paths

This book constitutes the refereed proceedings of two International Workshops held as parallel events of the 16th IFIP WG 12.5 International Conference on Artificial Intelligence Applications and Innovations, AIAI 2020, in Neos Marmaras, Greece, in June 2020: the 9th Mining Humanistic Data Workshop, MHDW 2020, and the 5th Workshop on 5G-Putting Intelligence to the Network Edge, 5G-PINE 2020.* The 6 full papers and 3 short papers presented at MHDW 2020 were carefully reviewed and selected from 16 submissions; out of the 23 papers submitted to 5G-PINE 2020, 11 were accepted as full papers and 1 as a short paper. The MHDW papers focus on topics such as recommendation systems, sentiment analysis, pattern recognition, data mining, and time series. The papers presented at 5G-PINE focus on the latest AI applications in the telecommunication industry and deal with topics such as the Internet of Things, intelligence fusion in 5G networks, and 5G media. *The workshops were held virtually due to the COVID-19 pandemic.

This two-volume set constitutes the refereed post-conference proceedings of the 12th International Conference on Simulation Tools and Techniques, SIMUTools 2020, held in Guiyang, China, in August 2020. Due to COVID-19 pandemic the conference

was held virtually. The 125 revised full papers were
carefully selected from 354 submissions. The papers
focus on simulation methods, simulation techniques,
simulation software, simulation performance,
modeling formalisms, simulation verification and
widely used frameworks.
5G NR: The Next Generation Wireless Access
Technology follows the authors' highly celebrated
books on 3G and 4G by providing a new level of
insight into 5G NR. After an initial discussion of the
background to 5G, including requirements, spectrum
aspects and the standardization timeline, all
technology features of the first phase of NR are
described in detail. Included is a detailed description
of the NR physical-layer structure and higher-layer
protocols, RF and spectrum aspects and co-
existence and interworking with LTE. The book
provides a good understanding of NR and the
different NR technology components, giving insight
into why a certain solution was selected. Content
includes: Key radio-related requirements of NR,
design principles, technical features Details of basic
NR transmission structure, showing where it has
been inherited from LTE and where it deviates from
it, and the reasons why NR Multi-antenna
transmission functionality Detailed description of the
signals and functionality of the initial NR access,
including signals for synchronization and system
information, random access and paging LTE/NR co-

existence in the same spectrum, the benefits of their interworking as one system The different aspects of mobility in NR RF requirements for NR will be described both for BS and UE, both for the legacy bands and for the new mm-wave bands Gives a concise and accessible explanation of the underlying technology and standards for 5G NR radio-access technology Provides detailed description of the NR physical-layer structure and higher-layer protocols, RF and spectrum aspects and co-existence and interworking with LTE Gives insight not only into the details of the NR specification but also an understanding of why certain solutions look like they do

This book provides a comprehensive overview of the latest research and standardization progress towards the 5th generation (5G) of mobile communications technology and beyond. It covers a wide range of topics from 5G use cases and their requirements, to spectrum, 5G end-to-end (E2E) system architecture including core network (CN), transport network (TN) and radio access network (RAN) architecture, network slicing, security and network management. It further dives into the detailed functional design and the evaluation of different 5G concepts, and provides details on planned trials and pre-commercial deployments across the globe. While the book naturally captures the latest agreements in 3rd Generation Partnership

Project (3GPP) New Radio (NR) Release 15, it goes
significantly beyond this by describing the likely
developments towards the final 5G system that will
ultimately utilize a wide range of spectrum bands,
address all envisioned 5G use cases, and meet or
exceed the International Mobile Telecommunications
(IMT) requirements for the year 2020 and beyond
(IMT-2020). 5G System Design: Architectural and
Functional Considerations and Long Term Research
is based on the knowledge and consensus from 158
leading researchers and standardization experts
from 54 companies or institutes around the globe,
representing key mobile network operators, network
vendors, academic institutions and regional bodies
for 5G. Different from earlier books on 5G, it does
not focus on single 5G technology components, but
describes the full 5G system design from E2E
architecture to detailed functional design, including
details on 5G performance, implementation and roll-
out.
This book provides a comprehensive guide to the
emerging field of network slicing and its importance
to bringing novel 5G applications into fruition. The
authors discuss the current trends, novel enabling
technologies, and current challenges imposed on the
cellular networks. Resource management aspects of
network slicing are also discussed by summarizing
and comparing traditional game theoretic and
optimization based solutions. Finally, the book

presents some use cases of network slicing and
applications for vertical industries. Topics include 5G
deliverables, Radio Access Network (RAN)
resources, and Core Network (CN) resources.
Discusses the 5G network requirements and the
challenges therein and how network slicing offers a
solution Features the enabling technologies of future
networks and how network slicing will play a role
Presents the role of machine learning and data
analytics for future cellular networks along with
summarizing the machine learning approaches for
5G and beyond networks
International Conference on Network Softwarization,
SDN, NFV, etc
Electrical and Computer Engineering
Even as newer cellular technologies and standards
emerge, many of the fundamental principles and the
components of the cellular network remain the same.
Presenting a simple yet comprehensive view of cellular
communications technologies, Cellular Communications
provides an end-to-end perspective of cellular
operations, ranging from physical layer details to call set-
up and from the radio network to the core network. This
self-contained source for practitioners and students
represents a comprehensive survey of the fundamentals
of cellular communications and the landscape of
commercially deployed 2G and 3G technologies and
provides a glimpse of emerging 4G technologies.
In the ever-evolving telecommunication industry, smart
mobile computing devices have become increasingly

affordable and powerful, leading to significant growth in the number of advanced mobile users and their bandwidth demands. Due to this increasing need, the next generation of wireless networks needs to enable solutions to bring together broadband, broadcast, and cellular technologies for global consumers. Paving the Way for 5G Through the Convergence of Wireless Systems provides innovative insights into wireless networks and cellular coexisting solutions that aim at paving the way towards 5G. Through examining data offloading, cellular technologies, and multi-edge computing, it addresses coexistence problems at different levels (i.e., physical characteristics, open access, technology-neutrality, economic characteristics, healthcare, education, energy, etc.), influencing networks to provide solutions for next generation wireless networks. Bridging research and practical solutions, this comprehensive reference source is ideally designed for graduate-level students, IT professionals and technicians, engineers, academicians, and researchers. This detailed, up-to-date introduction to heterogeneous cellular networking introduces its characteristic features, the technology underpinning it and the issues surrounding its use. Comprehensive and in-depth coverage of core topics catalogue the most advanced, innovative technologies used in designing and deploying heterogeneous cellular networks, including system-level simulation and evaluation, self-organisation, range expansion, cooperative relaying, network MIMO, network coding and cognitive radio. Practical design considerations and engineering tradeoffs are also

discussed in detail, including handover management, energy efficiency and interference management techniques. A range of real-world case studies, provided by industrial partners, illustrate the latest trends in heterogeneous cellular networks development. Written by leading figures from industry and academia, this is an invaluable resource for all researchers and practitioners working in the field of mobile communications. Discover how the Internet of Things will change the information and communication technology industry in the next decade The Intelligent Internet of Things explores a unique type of Internet of Things (IoT) architecture, for example, the Web of Things (WoT) with its open character that breaks the barriers among various IoT vertical applications. The authors—noted experts on the topic—examine and compare key technologies from physical to platform level, especially the Narrow Band Internet of Things (NB-IoT) technology. They discuss applications with different data transmission requirements that are typical to IoT. The text also describes the requirements of WoT applications on 5G and includes detailed information on WoT technologies. The Intelligent Internet of Things examines three typical WoT applications: the monitoring application of south-to-north water diversion projects; smart driving applications; and network optimization applications. In addition, the text explores testing and authentication of IoT key technologies, with the required equipment, platform, and outdoor environment development. This important book: Provides information on what IoT/WoT is, when to use it, how to provide IoT services with

certain technologies, and more Discusses restful architecture, main protocols (ZigBee, 6lowpan, CoAP, HTML5) Explores key technologies on different layers (sensing, gathering, application) Examines how IoT will change the information and communication technology industry Written for professionals working in IoT development, management and big data analytics, Intelligent Internet of Things offers an overview of IoT architecture, key technology, current applications and future development of the technology.

This book gathers recent research works in emerging Artificial Intelligence (AI) methods for the convergence of communication, caching, control, and computing resources in cloud-based Internet of Vehicles (IoV) infrastructures. In this context, the book's major subjects cover the analysis and the development of AI-powered mechanisms in future IoV applications and architectures. It addresses the major new technological developments in the field and reflects current research trends and industry needs. It comprises a good balance between theoretical and practical issues, covering case studies, experience and evaluation reports, and best practices in utilizing AI applications in IoV networks. It also provides technical/scientific information about various aspects of AI technologies, ranging from basic concepts to research-grade material, including future directions. This book is intended for researchers, practitioners, engineers, and scientists involved in designing and developing protocols and AI applications and services for IoV-related devices. This book provides the state-of-the-art intelligent methods and techniques for solving real-world problems

along with a vision of the future research. The fifth 2020
Future Technologies Conference was organized virtually
and received a total of 590 submissions from academic
pioneering researchers, scientists, industrial engineers,
and students from all over the world. The submitted
papers covered a wide range of important topics
including but not limited to computing, electronics,
artificial intelligence, robotics, security and
communications and their applications to the real world.
After a double-blind peer review process, 210
submissions (including 6 poster papers) have been
selected to be included in these proceedings. One of the
meaningful and valuable dimensions of this conference
is the way it brings together a large group of technology
geniuses in one venue to not only present breakthrough
research in future technologies, but also to promote
discussions and debate of relevant issues, challenges,
opportunities and research findings. The authors hope
that readers find the book interesting, exciting and
inspiring.
This book constitutes the proceedings of the 11th
International Conference on Network and System
Security, NSS 2017, held in Helsinki, Finland, in August
2017. The 24 revised full papers presented in this book
were carefully reviewed and selected from 83 initial
submissions. The papers are organized in topical
sections on Cloud and IoT Security; Network Security;
Platform and Hardware Security; Crypto and Others; and
Authentication and Key Management. This volume also
contains 35 contributions of the following workshops:
Security Measurements of Cyber Networks

(SMCN-2017); Security in Big Data (SECBD-2017); 5G Security and Machine Learning (IW5GS-2017); of the Internet of Everything (SECIOE-2017). This book, edited by four of the leaders of the National Science Foundation's Global Environment and Network Innovations (GENI) project, gives the reader a tour of the history, architecture, future, and applications of GENI. Built over the past decade by hundreds of leading computer scientists and engineers, GENI is a nationwide network used daily by thousands of computer scientists to explore the next Cloud and Internet and the applications and services they enable, which will transform our communities and our lives. Since by design it runs on existing computing and networking equipment and over the standard commodity Internet, it is poised for explosive growth and transformational impact over the next five years. Over 70 of the builders of GENI have contributed to present its development, architecture, and implementation, both as a standalone US project and as a federated peer with similar projects worldwide, forming the core of a worldwide network. Applications and services enabled by GENI, from smarter cities to intensive collaboration to immersive education, are discussed. The book also explores the concepts and technologies that transform the Internet from a shared transport network to a collection of "slices" -- private, on-the-fly application-specific nationwide networks with guarantees of privacy and responsiveness. The reader will learn the motivation for building GENI and the experience of its precursor infrastructures, the architecture and implementation of

the GENI infrastructure, its deployment across the United States and worldwide, the new network applications and services enabled by and running on the GENI infrastructure, and its international collaborations and extensions. This book is useful for academics in the networking and distributed systems areas, Chief Information Officers in the academic, private, and government sectors, and network and information architects.

The aim of the book is to provide latest research findings, innovative research results, methods and development techniques from both theoretical and practical perspectives related to the emerging areas of information networking and applications. Networks of today are going through a rapid evolution and there are many emerging areas of information networking and their applications. Heterogeneous networking supported by recent technological advances in low power wireless communications along with silicon integration of various functionalities such as sensing, communications, intelligence and actuations are emerging as a critically important disruptive computer class based on a new platform, networking structure and interface that enable novel, low cost and high volume applications. Several of such applications have been difficult to realize because of many interconnections problems. To fulfill their large range of applications different kinds of networks need to collaborate and wired and next generation wireless systems should be integrated in order to develop high performance computing solutions to problems arising from the complexities of these networks. This book covers the theory, design and applications of computer networks, distributed computing and information systems.

SRv6 Network Programming, beginning with the challenges

for Internet Protocol version 6 (IPv6) network development, describes the background, roadmap design, and implementation of Segment Routing over IPv6 (SRv6), as well as the application of this technology in traditional and emerging services. The book begins with the development of IP technologies by focusing on the problems encountered during MPLS and IPv6 network development, giving readers insights into the problems tackled by SRv6 and the value of SRv6. It then goes on to explain SRv6 fundamentals, including SRv6 packet header design, the packet forwarding process, protocol extensions such as Interior Gateway Protocol (IGP), Border Gateway Protocol (BGP), and Path Computation Element Protocol (PCEP) extensions, and how SRv6 supports existing traffic engineering (TE), virtual private networks (VPN), and reliability requirements. Next, SRv6 network deployment is introduced, covering the evolution paths from existing networks to SRv6 networks, SRv6 network deployment processes, involved O&M technologies, and emerging 5G and cloud services supported by SRv6. Bit Index Explicit Replication IPv6 encapsulation (BIERv6), an SRv6 multicast technology, is then introduced as an important supplement to SRv6 unicast technology. The book concludes with a summary of the current status of the SRv6 industry and provides an outlook for new SRv6-based technologies. SRv6 Network Programming: Ushering in a New Era of IP Networks collects the research results of Huawei SRv6 experts and reflects the latest development direction of SRv6. With rich, clear, practical, and easy-to-understand content, the volume is intended for network planning engineers, technical support engineers and network administrators who need a grasp of the most cutting-edge IP network technology. It is also intended for communications network researchers in scientific research institutions and universities. Authors: Zhenbin Li is the Chief Protocol Expert of Huawei and member of the IETF

IAB, responsible for IP protocol research and standards promotion at Huawei. Zhibo Hu is a Senior Huawei Expert in SR and IGP, responsible for SR and IGP planning and innovation. Cheng Li is a Huawei Senior Pre-research Engineer and IP standards representative, responsible for Huawei's SRv6 research and standardization.

A reliable and focused treatment of the emergent technology of fifth generation (5G) networks This book provides an understanding of the most recent developments in 5G, from both theoretical and industrial perspectives. It identifies and discusses technical challenges and recent results related to improving capacity and spectral efficiency on the radio interface side, and operations management on the core network side. It covers both existing network technologies and those currently in development in three major areas of 5G: spectrum extension, spatial spectrum utilization, and core network and network topology management. It explores new spectrum opportunities; the capability of radio access technology; and the operation of network infrastructure and heterogeneous QoE provisioning. 5G Networks: Fundamental Requirements, Enabling Technologies, and Operations Management is split into five sections: Physical Layer for 5G Radio Interface Technologies; Radio Access Technology for 5G Networks; 5G Network Interworking and Core Network Advancements; Vertical 5G Applications; and R&D and 5G Standardization. It starts by introducing emerging technologies in 5G software, hardware, and management aspects before moving on to cover waveform design for 5G and beyond; code design for multi-user MIMO; network slicing for 5G networks; machine type communication in the 5G era; provisioning unlicensed LAA interface for smart grid applications; moving toward all-IT 5G end-to-end infrastructure; and more. This valuable resource: Provides a comprehensive reference for all layers of 5G networks

Focuses on fundamental issues in an easy language that is understandable by a wide audience Includes both beginner and advanced examples at the end of each section Features sections on major open research challenges 5G Networks: Fundamental Requirements, Enabling Technologies, and Operations Management is an excellent book for graduate students, academic researchers, and industry professionals, involved in 5G technology.

This proceedings constitutes the refereed proceedings of the 15th EAI International Conference on Communications and Networking, ChinaCom 2020, held in November 2020 in Shanghai, China. Due to COVID-19 pandemic the conference was held virtually. The 54 papers presented were carefully selected from 143 submissions. The papers are organized in topical sections on Transmission Optimization in Edge Computing; Performance and Scheduling Optimization in Edge Computing; Mobile Edge Network System; Communication Routing and Control; Transmission and Load Balancing; Edge Computing and Distributed Machine Learning; Deep Learning.

5G NR: Architecture, Technology, Implementation, and Operation of 3GPP New Radio Standards is an in-depth, systematic, technical reference on 3GPP's New Radio standards (Release 15 and beyond), covering the underlying theory, functional descriptions, practical considerations and implementation of the 5G new radio access technology. The book describes the design and operation of individual components and shows how they are integrated into the overall system and operate from a systems perspective. Uniquely, this book gives detailed information on RAN protocol layers, transport, network architecture and services, as well as practical implementation and deployment issues, making it suitable for researchers and engineers who are designing and developing 5G systems. Reflecting on the

author's 30 plus years of experience in signal processing, microelectronics and wireless communication system design, this book is ideal for professional engineers, researchers and graduate students working and researching in cellular communication systems and protocols as well as mobile broadband wireless standards. Strong focus on practical considerations, implementation and deployment issues Takes a top-down approach to explain system operation and functional interconnection Covers all functional components, features, and interfaces based on clear protocol structure and block diagrams Describes RF and transceiver design considerations in sub-6 GHz and mmWave bands Covers network slicing, SDN/NFV/MEC networks and cloud and virtualized RAN architectures Comprehensive coverage of NR multi-antenna techniques and beamformed operation A consistent and integrated coverage reflecting the author's decades of experience in developing 3G, 4G and 5G technologies and writing two successful books in these areas Wiley 5G Ref: The Essential 5G reference Online is a large-scale, fully comprehensive, twice-yearly updating digital reference, planned for release in 2020 to coincide with commercial deployment of 5G. This essential resource maps out a solid vision of emerging technologies widely foreseen to be adopted by 5G mobile systems, based on current business trends, proven technologies, and the latest international research. Wiley 5G Ref offers a user-friendly format that provides the user with article-level, in-depth technical surveys on all aspects of 5G solutions, architectures, technologies and standards for researchers, practitioners and students in information and communication engineering, computer science and engineering, and telecommunication networking.

A comprehensive text to an understanding the next generation mobile broadband and wireless Internet of Things

(IoT) technologies 5G Verticals brings together in one comprehensive volume a group of visionaries and technical experts from academia and industry. The expert authors discuss the applications and technologies that comprise 5G verticals. The earlier network generations (2G to 4G) were designed as on-size-fits-all, general-purpose connectivity platforms with limited differentiation capabilities. 5G networks have the capability to demand customizable mobile networks and create an ecosystem for technical and business innovation involving vertical markets such as automotive, healthcare, manufacturing, energy, food and agriculture, city management, government, public transportation, media and more. 5G will serve a large portfolio of applications with various requirements ranging from high reliability to ultra-low latency going through high bandwidth and mobility. In this book, the authors explore applications and usages of various 5G verticals including a set of key metrics for these uses and their corresponding target requirements. The book also examines the potential network architectures and enabling technologies to meet the requirements of 5G verticals. This important book: Offers a comprehensive resource to the promise of 5G Verticals Provides a set of key metrics for the uses and target requirements Contains illustrative examples of the technology and applications Includes contributions from experts in the field and professionals that developed the 5G standards Provides an analysis of specific vertical industries which have the potential to be among the first industries to use 5G Written for industry practitioners, engineers and researchers, 5G Verticals discusses the technology that enables the 5G system to be flexibly deployed and scaled. Computing in Communication Networks: From Theory to Practice provides comprehensive details and practical implementation tactics on the novel concepts and enabling technologies at the core of the paradigm shift from store and

forward (dumb) to compute and forward (intelligent) in future communication networks and systems. The book explains how to create virtualized large scale testbeds using well-established open source software, such as Mininet and Docker. It shows how and where to place disruptive techniques, such as machine learning, compressed sensing, or network coding in a newly built testbed. In addition, it presents a comprehensive overview of current standardization activities. Specific chapters explore upcoming communication networks that support verticals in transportation, industry, construction, agriculture, health care and energy grids, underlying concepts, such as network slicing and mobile edge cloud, enabling technologies, such as SDN/NFV/ ICN, disruptive innovations, such as network coding, compressed sensing and machine learning, how to build a virtualized network infrastructure testbed on one's own computer, and more. Provides a uniquely comprehensive overview on the individual building blocks that comprise the concept of computing in future networks Gives practical hands-on activities to bridge theory and implementation Includes software and examples that are not only employed throughout the book, but also hosted on a dedicated website This book includes a selection of papers from the 2018 World Conference on Information Systems and Technologies (WorldCIST'18), held in Naples, Italy on March27-29, 2018. WorldCIST is a global forum for researchers and practitioners to present and discuss recent results and innovations, current trends, professional experiences and the challenges of modern information systems and technologies research together with their technological development and applications. The main topics

covered are: A) Information and Knowledge
Management; B) Organizational Models and
Information Systems; C) Software and Systems
Modeling; D) Software Systems, Architectures,
Applications and Tools; E) Multimedia Systems and
Applications; F) Computer Networks, Mobility and
Pervasive Systems; G) Intelligent and Decision
Support Systems; H) Big Data Analytics and
Applications; I) Human–Computer Interaction; J)
Ethics, Computers & Security; K) Health Informatics;
L) Information Technologies in Education; M)
Information Technologies in Radiocommunications;
N) Technologies for Biomedical Applications.
This book presents a selection of papers from the
2017 World Conference on Information Systems and
Technologies (WorldCIST'17), held between the 11st
and 13th of April 2017 at Porto Santo Island,
Madeira, Portugal. WorldCIST is a global forum for
researchers and practitioners to present and discuss
recent results and innovations, current trends,
professional experiences and challenges involved in
modern Information Systems and Technologies
research, together with technological developments
and applications. The main topics covered are:
Information and Knowledge Management;
Organizational Models and Information Systems;
Software and Systems Modeling; Software Systems,
Architectures, Applications and Tools; Multimedia
Systems and Applications; Computer Networks,

Mobility and Pervasive Systems; Intelligent and Decision Support Systems; Big Data Analytics and Applications; Human–Computer Interaction; Ethics, Computers & Security; Health Informatics; Information Technologies in Education; and Information Technologies in Radiocommunications. 5G is the upcoming generation of the wireless network that will be the advanced version of 4G LTE+ providing all the features of a 4G LTE network and connectivity for IoT devices with faster speed and lower latency. The 5G network is going to be a service-oriented network, connecting billions of IoT devices and mobile phones through the wireless network, and hence, it needs a special emphasis on security. Security is the necessary enabler for the continuity of the wireless network business, and in 5G, network security for IoT devices is the most important aspect. As IoT is gaining momentum, people can remotely operate or instruct their network devices. Therefore, there is a need for robust security mechanisms to prevent unauthorized access to the devices. Evolution of Software-Defined Networking Foundations for IoT and 5G Mobile Networks is a collection of innovative research on the security challenges and prevention mechanisms in high-speed mobile networks. The book explores the threats to 5G and IoT and how to implement effective security architecture for them. While highlighting topics including artificial intelligence,

mobile technology, and ubiquitous computing, this
book is ideally designed for cybersecurity experts,
network providers, computer scientists,
communication technologies experts, academicians,
students, and researchers.
A comprehensive guide to 5G technology,
applications and potential for the future 5G brings
new technology solutions to the 5G mobile networks
including new spectrum options, new antenna
structures, new physical layer and protocols designs
and new network architectures. 5G Technology:
3GPP New Radio is a comprehensive resource that
offers explanations of 5G specifications,
performance evaluations, aspects of device design,
practical deployment considerations and illustrative
examples from field experiences. With contributions
from a panel of international experts on the topic, the
book presents the main new technology components
in 5G and describes the physical layer, radio
protocols and network performance. The authors
review the deployment aspects such as site density
and transport network and explore the 5G
performance aspects including data rates and
coverage and latency. The book also contains
illustrative examples of practical field measurement.
In addition, the book includes the most recent
developments in 4G LTE evolution and offers an
outlook for the future of the evolution of 5G. This
important book: Offers an introduction to 5G

technology and its applications Contains contributions from international experts on the topic Reviews the main technology components in 5G Includes information on the optimisation of the Internet of things Presents illustrative examples of practical field measurements Written for students and scientists interested in 5G technology, 5G Technology: 3GPP New Radio provides a clear understanding of the underlying 5G technology that promotes the opportunity to take full benefit of new capabilities.

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