

From Gsm To Lte Advanced An Introduction To Le Networks And Le Broadband

This book provides a clear, concise, complete and authoritative introduction to System Architecture Evolution (SAE) standardization work and its main outcome: the Evolved Packet Core (EPC), including potential services and operational scenarios. After providing an insightful overview of SAE's historical development, the book gives detailed explanations of the EPC architecture and key concepts as an introduction. In-depth technical descriptions of EPC follow, including thorough functional accounts of the different components of EPC, protocols, network entities and procedures. Case studies of deployment scenarios show how the functions described within EPC are placed within a live network context, while a description of the services that are predicted to be used shows what EPC as a core network can enable. This book is an essential resource for professionals and students who need to understand the latest developments in SAE and EPC, the 'engine' that connects broadband access to the internet. All of the authors have from their positions with Ericsson been actively involved in GPRS, SAE and 3GPP from a business and technical perspective for many years. Several of the authors have also been actively driving the standardization efforts within 3GPP. "There is no doubt that this book, which appears just when the mobile industry starts its transition away from legacy GSM/GPRS and UMTS networks into the future will become the reference work on SAE/LTE. There are no better qualified persons than the authors of this book to provide both communication professionals and an interested general public with insights into the inner workings of SAE/LTE. Not only are they associated with one of the largest mobile network equipment vendors in the world, they have all actively contributed to and, in some cases, been the driving forces behind the development of SAE/LTE within 3GPP." - from the foreword by Dr. Ulf Nilsson, TeliaSonera R&D, Mobility Core and Connectivity "The authors have done an excellent job in writing this book. Their familiarity with the requirements, concepts and solution alternatives, as well as the standardization work allows them to present the material in a way that provides easy communication between Architecture and Standards groups and Planning/ Operational groups within service provider organizations." - from the foreword by Dr. Kalyani Bogineni, Principal Architect, Verizon Up-to-date coverage of SAE including the latest standards development Easily accessible overview of the architecture and concepts defined by SAE Thorough description of the Evolved Packet Core for LTE, fixed and other wireless accesses Comprehensive explanation of SAE key concepts, security and Quality-of-Service Covers potential service and operator scenarios including interworking with existing 3GPP and 3GPP2 systems Detailed walkthrough of network entities, protocols and procedures Written by established experts in the SAE standardization process, all of whom have extensive experience and understanding of its goals, history and vision

Following on from the successful first edition (March 2012), this book gives a clear explanation of what LTE does and how it works. The content is expressed at a systems level, offering readers the opportunity to grasp the key factors that make LTE the hot topic amongst vendors and operators across the globe. The book assumes no more than a basic knowledge of mobile telecommunication systems, and the reader is not expected to have any previous knowledge of the complex mathematical operations that underpin LTE. This second edition introduces new material for the current state of the industry, such as the new features of LTE in Releases 11 and 12, notably coordinated multipoint transmission and proximity services; the main short- and long-term solutions for LTE voice calls, namely circuit switched fallback and the IP multimedia subsystem; and the evolution and current state of the LTE market. It also extends some of the material from the first edition, such as inter-operation with other technologies such as GSM, UMTS, wireless local area networks and cdma2000; additional features

of LTE Advanced, notably heterogeneous networks and traffic offloading; data transport in the evolved packet core; coverage and capacity estimation for LTE; and a more rigorous treatment of modulation, demodulation and OFDMA. The author breaks down the system into logical blocks, by initially introducing the architecture of LTE, explaining the techniques used for radio transmission and reception and the overall operation of the system, and concluding with more specialized topics such as LTE voice calls and the later releases of the specifications. This methodical approach enables readers to move on to tackle the specifications and the more advanced texts with confidence.

From GSM to LTE-Advanced Pro and 5G An Introduction to Mobile Networks and Mobile Broadband John Wiley & Sons

An all-encompassing coverage on UMTS Networks including an in-depth discussion of current work on UMTS evolution and 4G . UMTS Networks and Beyond offers a comprehensive introduction to the networking aspects of UMTS and the networks coming after UMTS. The book is unique in that it systematically compares how a particular problem, e.g. obtaining connectivity, is solved in UMTS and how the same problem is solved in a Computer Network such as the Internet. It also highlights why the respective solutions are so different. The first part of the book provides a detailed technical discussion of UMTS, including original vision, architecture, protocol stacks and overall functionality. It places UMTS in the context of its evolution of from GSM and its convergence with Computer Networks. The second part of the book discusses today's vision of 4G, and introduces upcoming networking technologies. Emphasis is on LTE / SAE as successor of UMTS; UMB, WiMAX and NGN are also discussed. The book gives an overview of what these technologies are likely to offer, of their architectures, protocols and functionality. It also discusses their differences and similarities, and whether they will qualify as 4G. Key Features: Provides readers, particularly those with a background in IP-based networks, with a technical understanding of what UMTS does, how it works and how it is likely to evolve Explains the differences in design between UMTS Networks and Computer Networks and discusses how these design divergences can be reconciled in the future Shows how economic considerations shape the design of UMTS Motivates why particular design choices are made in UMTS Gives an in-depth introduction to LTE / SAE Provides a detailed picture of the state of the art in 4G Illustrates the theory with numerous tables and figures This comprehensive textbook is essential reading for advanced students and lecturers in communications systems and networking. It is also of interest to engineers and researchers in the field of UMTS and communications systems.

This book focuses on LTE with full updates including LTE-Advanced (Release-11) to provide a complete picture of the LTE system. Detailed explanations are given for the latest LTE standards for radio interface architecture, the physical layer, access procedures, broadcast, relaying, spectrum and RF characteristics, and system performance. Key technologies presented include multi-carrier transmission, advanced single-carrier transmission, advanced receivers, OFDM, MIMO and adaptive antenna solutions, radio resource management and protocols, and different radio network architectures. Their role and use in the context of mobile broadband access in general is explained, giving both a high-level overview and more detailed step-by-step explanations. This book is a must-have resource for engineers and other professionals in the telecommunications industry, working with cellular or wireless broadband technologies, giving an understanding of how to utilize the new technology in order to stay ahead of the competition. New to this edition: In-depth description of CoMP and enhanced multi-antenna transmission including new reference-signal structures and feedback mechanisms Detailed description of the support for heterogeneous deployments provided by the latest 3GPP release Detailed description of new enhanced downlink control-channel structure (EPDDCH) New RF configurations including operation in non-contiguous spectrum, multi-bands base stations and new frequency bands Overview of 5G as a set of well-integrated radio-access technologies, including support for higher frequency bands and flexible spectrum

management, massive antenna configurations, and ultra-dense deployments Covers a complete update to the latest 3GPP Release-11 Two new chapters on HetNet, covering small cells/heterogeneous deployments, and CoMP, including Inter-site coordination Overview of current status of LTE release 12 including further enhancements of local-area, CoMP and multi-antenna transmission, Machine-type-communication, Device-to-device communication

A new edition of Wiley's Communication Systems for the Mobile Information Society, from the same author Wireless systems such as GSM, UMTS, LTE, WiMAX, Wi-Fi and Bluetooth offer possibilities to keep people connected while on the move. In this flood of technology, From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband enables readers to examine and understand each technology, and how to utilise several different systems for the best results. This book contains not only a technical description of the different wireless systems available today, but also explains the rationale behind the different mechanisms and implementations; not only the 'how' but also the 'why' is focused on. Thus the advantages and also limitations of each technology become apparent. Offering a solid introduction to major global wireless standards and comparisons of the different wireless technologies and their applications, this new edition has been updated to provide the latest directions and activities in 3GPP standardization reaching up to Release 10, and importantly includes a new chapter on LTE. The new LTE chapter covers aspects such as Mobility Management and Power Optimization, Voice over LTE, and Air Interface and Radio Network. Provides readers with an introduction to major global wireless standards and compares the different wireless technologies and their applications The performance and capacity of each system in practice is analyzed and explained, accompanied with practical tips on how to discover the functionality of different networks Offers approximately 25% new material, which includes a major new chapter on LTE and updates to the existing material including Release 4 BICN in relation to GSM Questions at the end of each chapter and answers on the accompanying website (<http://www.wirelessmoves.com>) make this book ideal for self study or as course material

"This book is intended to serve two purposes: to provide a coherent explanation of the theories and procedures that underpin forensic radio surveying and of the network technologies being surveyed in a form that can be read cover to cover as a text book; but also to act as a reference resource that can be dipped into as needed"--

This book focuses on providing a detailed and practical explanation of key existing and emerging wireless networking technologies and trends, while minimizing the amount of theoretical background information. The book also goes beyond simply presenting what the technology is, but also examines why the technology is the way it is, the history of its development, standardization, and deployment. The book also describes how each technology is used, what problems it was designed to solve, what problems it was not designed to solve., how it relates to other technologies in the marketplace, and internetworking challenges faced within the context of the Internet, as well as providing deployment trends and standardization trends. Finally, this book decomposes evolving wireless technologies to identify key technical and usage trends in order to discuss the likely characteristics of future wireless networks.

This book is a must-read for all network planners and other professionals wishing to improve the quality and cost efficiency of 3G and LTE networks In this book, the authors address the architecture of the 2/3G network and the Long Term Evolution (LTE) network. The book proposes analytical models that make the analysis and dimensioning of the most important interfaces, i.e. WCDMA or Uu, possible. Furthermore, the authors include descriptions of fundamental technological issues in 2/3 G networks, basic traffic engineering models and frequent examples of the application of analytical models in the analysis and dimensioning of

the interface of cellular networks. The specific knowledge included in the content will enable the reader to understand and then to prepare appropriate programming softwares that will allow them to evaluate quality parameters of cellular networks, i.e. blocking probabilities or call losses. Additionally, the book presents models for the analysis and dimensioning of the Wideband Code Division Multiple Access (WCDMA) radio interface and the Iub interface, both carrying a mixture of Release 99 traffic (R99) and High-Speed Packet Access (HSPA) traffic streams. Finally, the analytical models presented in the book can be also used in the process of modeling and optimization of LTE networks. Key Features: Describes the architecture and the modes of operation of the cellular 2/3/4G systems and the LTE network Covers the traffic theory and engineering within the context of mobile networks Presents original analytical methods that enable their users to dimension selected interfaces of cellular networks Discusses models for the analysis and dimensioning of the Wideband Code Division Multiple Access (WCDMA) radio interface and the Iub interface, both carrying a mixture of Release 99 traffic (R99) and High-Speed Packet Access (HSPA) traffic streams Includes problems as well as an accompanying website containing solutions, software tools and interactive flash animations (<http://wiley.teletraffic.pl>) This book will be an invaluable guide for professional engineers (radio planning engineers, optimization engineers, transmission engineers, core network engineers, Service Management engineers) working in the areas of mobile wireless networks technology, not only in optimization process, but also in profitability assessment of newly implemented services (i.e. in NPV - Net Present Value analysis), and researchers and scientists. Advanced students in the fields of mobile communications networks and systems will also find this book insightful.

Cellular Internet of Things: From Massive Deployments to Critical 5G Applications, Second Edition, gives insights into the recent and rapid work performed by the 3rd Generation Partnership Project (3GPP) and the Multefire Alliance (MFA) to develop systems for the Cellular IoT. Beyond the technologies, readers will learn what the mMTC and cMTC market segments look like, deployment options and expected performance in terms of system capacity, expected battery lifetime, data throughput, access delay time and device cost, regulations for operation in unlicensed frequency bands, and how they impact system design and performance. This new edition contains updated content on the latest EC-GSM IoT, LTE-M and NB-IoT features in 3GPP Release 15, critical communication, i.e. URLLC, specified in 3GPP Release 15 for both LTE and NR, LTE-M and NB-IoT for unlicensed frequency bands specified in the Multefire Alliance (MFA), and an updated outlook of what the future holds in Industrial IoT and drone communications, amongst other topics. Provides ubiquitous wireless connectivity for a diverse range of services and applications, describing their performance and how their specifications were developed to meet the most demanding requirements Describes licensed and unlicensed technologies based on 2G, 4G and 5G technologies and how they have evolved towards the Cellular IoT Presents the Narrowband Internet of Things technology and how GSM, LTE and NR have been designed to provide Cellular Internet of Things services Provides use cases that cover ultra-low complex systems connecting billions of devices (massive MTC, mMTC), critical MTC and cMTC based on Ultra-Reliable and Low Latency Communications (URLLC) to meet strict latency and reliability requirements

Provides a unique focus on radio protocols for LTE and LTE-Advanced (LTE-A) Giving readers a valuable understanding of LTE radio protocols, this book covers LTE (Long-Term Evolution) Layer 2/3 radio protocols as well as new features including LTE-Advanced. It is divided into two sections to differentiate between the two technologies' characteristics. The authors systematically explain the design principles and functions of LTE radio protocols during the development of mobile handsets. The book also provides essential knowledge on the interaction between mobile networks and mobile handsets. Among the first publications based on the 3GPP R10 specifications, which introduces LTE-A Beginning with an overview of LTE, topics covered include: Idle Mode Procedure; Packet Data Convergence Protocol and Public Warning Systems Presents the LTE radio interface protocol layers in a readable manner, to enhance the material in the standards publications From an expert author team who have been directly working on the 3GPP standards It is targeted at professionals working or intending to work in the area and can also serve as supplementary reading material for students who need to know how theory on the most extensively used mobile radio interface today is put into practice

An Introduction to LTE explains the technology used by 3GPP Long Term Evolution. The book covers the whole of LTE, both the techniques used for radio communication between the base station and the mobile phone, and the techniques used for signalling communication and data transport in the evolved packet core. It avoids unnecessary detail, focussing instead on conveying a sound understanding of the entire system. The book is aimed at mobile telecommunication professionals, who want to understand what LTE is and how it works. It is invaluable for engineers who are working on LTE, notably those who are transferring from other technologies such as UMTS and cdma2000, those who are experts in one part of LTE but who want to understand the system as a whole, and those who are new to mobile telecommunications altogether. It is also relevant to those working in non technical roles, such as project managers, marketing executives and intellectual property consultants. On completing the book, the reader will have a clear understanding of LTE, and will be able to tackle the more specialised books and the 3GPP specifications with confidence. Key features - Covers the latest developments in release 10 of the 3GPP specifications, including the new capabilities of LTE-Advanced Includes references to individual sections of the 3GPP specifications, to help readers understand the principles of each topic before going to the specifications for more detailed information Requires no previous knowledge of mobile telecommunications, or of the mathematical techniques that LTE uses for radio transmission and reception

Comprehensive Handbook Demystifies 5G for Technical and Business Professionals in Mobile Telecommunication Fields Much is being said regarding the possibilities and capabilities of the emerging 5G technology, as the evolution towards 5G promises to transform entire industries and many aspects of our society. 5G for the Connected World offers a comprehensive technical overview that telecommunication professionals need to understand and take advantage of these developments. The book offers a wide-ranging coverage of the technical aspects of 5G (with special consideration of the 3GPP Release 15 content), how it enables new services and how it differs from LTE. This includes information on potential use cases, aspects of radio and core networks, spectrum considerations and the services primarily driving 5G development and deployment. The text also looks at 5G in relation

to the Internet of Things, machine to machine communication and technical enablers such as LTE-M, NB-IoT and EC-GSM. Additional chapters discuss new business models for telecommunication service providers and vertical industries as a result of introducing 5G and strategies for staying ahead of the curve. Other topics include: Key features of the new 5G radio such as descriptions of new waveforms, massive MIMO and beamforming technologies as well as spectrum considerations for 5G radio regarding all possible bands Drivers, motivations and overview of the new 5G system – especially RAN architecture and technology enablers (e.g. service-based architecture, compute-storage split and network exposure) for native cloud deployments Mobile edge computing, Non-3GPP access, Fixed-Mobile Convergence Detailed overview of mobility management, session management and Quality of Service frameworks 5G security vision and architecture Ultra-low latency and high reliability use cases and enablers, challenges and requirements (e.g. remote control, industrial automation, public safety and V2X communication) An outline of the requirements and challenges imposed by massive numbers of devices connected to cellular networks While some familiarity with the basics of 3GPP networks is helpful, 5G for the Connected World is intended for a variety of readers. It will prove a useful guide for telecommunication professionals, standardization experts, network operators, application developers and business analysts (or students working in these fields) as well as infrastructure and device vendors looking to develop and integrate 5G into their products, and to deploy 5G radio and core networks.

Many wireless systems like GSM, GPRS, UMTS, Bluetooth, WLAN or WiMAX offer possibilities to keep people connected while on the move. In this flood of technology and claims that one single resource will serve all our needs, this book seeks to enable readers to examine and understand each technology, and how to utilise several different systems for the best results.

Communication Systems for the Mobile Information Society not only contains a technical description of the different wireless systems available today, but also explains the thoughts that are behind the different mechanisms and implementations; not only the 'how' but also the 'why' is in focus. Thus the advantages and also limitations of each technology become apparent. Provides readers with a solid introduction to major global wireless standards and compares the different wireless technologies and their applications Describes the different systems based on the standards, their practical implementation and the design assumptions that were made The performance and capacity of each system in practice is analyzed and explained, accompanied with practical tips on how to discover the functionality of different networks by the readers themselves Questions at the end of each chapter and answers on the accompanying website make this book ideal for self study or as course material Illustrated with many realistic examples of how mobile people can stay in touch with other people, the Internet and their corporate intranet This book is an essential resource for telecommunication engineers, professionals and computer science and electrical engineering students who want to get a thorough end-to-end understanding of the different technical concepts of the systems on the market today.

Extensively updated evaluation of current and future network technologies, applications and devices This book follows on from its successful predecessor with an introduction to next generation network technologies, mobile devices, voice and multimedia services and the mobile web 2.0. Giving a sound technical introduction to 3GPP wireless systems, this book explains the decisions

taken during standardization of the most popular wireless network standards today, LTE, LTE-Advanced and HSPA+. It discusses how these elements strongly influence each other and how network capabilities, available bandwidth, mobile device capabilities and new application concepts will shape the way we communicate in the future. This Second Edition presents a comprehensive and broad-reaching examination of a fast-moving technology which will be a welcome update for researchers and professionals alike. Key features: Fully updated and expanded to include new sections including VoLTE, the evolution to 4G, mobile Internet access, LTE-Advanced, Wi-Fi security and backhaul for wireless networks Describes the successful commercialization of Web 2.0 services such as Facebook, and the emergence of app stores, tablets and smartphones Examines the evolution of mobile devices and operating systems, including ARM and x86 architecture and their application to voice-optimized and multimedia devices Addressing the security solutions for LTE, a cellular technology from Third Generation Partnership Project (3GPP), this book shows how LTE security substantially extends GSM and 3G security. It also encompasses the architectural aspects, known as SAE, to give a comprehensive resource on the topic. Although the security for SAE/LTE evolved from the security for GSM and 3G, due to different architectural and business requirements of fourth generation systems the SAE/LTE security architecture is substantially different from its predecessors. This book presents in detail the security mechanisms employed to meet these requirements. Whilst the industry standards inform how to implement systems, they do not provide readers with the underlying principles behind security specifications. LTE Security fills this gap by providing first hand information from 3GPP insiders who explain the rationale for design decisions. Key features: Provides a concise guide to the 3GPP/LTE Security Standardization specifications Authors are leading experts who participated in decisively shaping SAE/LTE security in the relevant standardization body, 3GPP Shows how GSM and 3G security was enhanced and extended to meet the requirements of fourth generation systems Gives the rationale behind the standards specifications enabling readers to have a broader understanding of the context of these specifications Explains why LTE security solutions are designed as they are and how theoretical security mechanisms can be put to practical use

A comparative introduction to major global wireless standards, technologies and their applications From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband, 3rd Edition provides technical descriptions of the various wireless technologies currently in use. It explains the rationales behind their differing mechanisms and implementations while exploring the advantages and limitations of each technology. This edition has been fully updated and substantially expanded to reflect the significant evolution in mobile network technology occurring over the past several years. The chapter on LTE has been extensively enhanced with new coverage of current implementations of LTE carrier aggregation, mobility management, cell reselection and handover procedures, as well as the latest developments in 5G radio and core networks in 3GPP. It now features additional information on the TD-LTE air interface, IPv6 in mobile networks, Network Function Virtualization (NFV) and Narrowband Internet of Things (NB-IOT). Voice-over-LTE (VoLTE) is now treated extensively in a separate chapter featuring coverage of the VoLTE call establishment process, dedicated bearer setup, header compression, speech codec and bandwidth negotiation, supplementary service configuration and VoLTE emergency calls. In addition, extensive coverage of Voice-over-Wifi and mission critical communication for public safety organizations over LTE has been added. The WLAN chapter now

provides coverage of WPA2-Professional with certificates for authentication in large deployments, such as the global Eduroam network and the new WLAN 60 GHz air interface. Bluetooth evolution has been addressed by including a detailed description of Bluetooth Low Energy (BLE) in the chapter devoted to Bluetooth. Describes the different systems based on the standards, their practical implementation and design assumptions, and the performance and capacity of each system in practice is analyzed and explained Questions at the end of each chapter and answers on the accompanying website make this book ideal for self-study or as course material.

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.

The Definitive Guide to LTE Technology Long-Term Evolution (LTE) is the next step in the GSM evolutionary path beyond 3G technology, and it is strongly positioned to be the dominant global standard for 4G cellular networks. LTE also represents the first generation of cellular networks to be based on a flat IP architecture and is designed to seamlessly support a variety of different services, such as broadband data, voice, and multicast video. Its design incorporates many of the key innovations of digital communication, such as MIMO (multiple input multiple output) and OFDMA (orthogonal frequency division multiple access), that mandate new skills to plan, build, and deploy an LTE network. In Fundamentals of LTE , four leading experts from academia and industry explain the technical foundations of LTE in a tutorial style—providing a comprehensive overview of the standards. Following the same approach that made their recent Fundamentals of WiMAX successful, the authors offer a complete framework for understanding and evaluating LTE. Topics include Cellular wireless history and evolution: Technical advances, market drivers, and foundational networking and communications technologies Multicarrier modulation theory

and practice: OFDM system design, peak-to-average power ratios, and SC-FDE solutions Frequency Domain Multiple Access: OFDMA downlinks, SC-FDMA uplinks, resource allocation, and LTE-specific implementation Multiple antenna techniques and tradeoffs: spatial diversity, interference cancellation, spatial multiplexing, and multiuser/networked MIMO LTE standard overview: air interface protocol, channel structure, and physical layers Downlink and uplink transport channel processing: channel encoding, modulation mapping, Hybrid ARQ, multi-antenna processing, and more Physical/MAC layer procedures and scheduling: channel-aware scheduling, closed/open-loop multi-antenna processing, and more Packet flow, radio resource, and mobility management: RLC, PDCP, RRM, and LTE radio access network mobility/handoff procedures

A practical guide to LTE design, test and measurement, this new edition has been updated to include the latest developments This book presents the latest details on LTE from a practical and technical perspective. Written by Agilent's measurement experts, it offers a valuable insight into LTE technology and its design and test challenges. Chapters cover the upper layer signaling and system architecture evolution (SAE). Basic concepts such as MIMO and SC-FDMA, the new uplink modulation scheme, are introduced and explained, and the authors look into the challenges of verifying the designs of the receivers, transmitters and protocols of LTE systems. The latest information on RF and signaling conformance testing is delivered by authors participating in the LTE 3GPP standards committees. This second edition has been considerably revised to reflect the most recent developments of the technologies and standards. Particularly important updates include an increased focus on LTE-Advanced as well as the latest testing specifications. Fully updated to include the latest information on LTE 3GPP standards Chapters on conformance testing have been majorly revised and there is an increased focus on LTE-Advanced Includes new sections on testing challenges as well as over the air MIMO testing, protocol testing and the most up-to-date test capabilities of instruments Written from both a technical and practical point of view by leading experts in the field

This book is a detailed compendium of these major advancements focusing exclusively on the emerging broadband wireless communication technologies which support broadband wireless data rate transmissions. Editor: Jan Nikodem, La Trobe University, Melbourne, Australia. This book addresses the emerging technology for Orthogonal Frequency Division Multiple Access (OFDMA), covering OFDMA physical layer as well as network technology. The book also includes information on IEEE 802.16e and WiMAX networks and also offers a comparison with other OFDMA technologies. OFDMA is the fastest growing area in the wireless marketplace, and the backbone of systems used in WiMAX. WiMAX is the technology that enables wireless users to communicate at any time from any location without having to find a WiFi hotspot. From the editors of the highly successful LTE for UMTS:Evolution to LTE-Advanced, this new book examines the maintechnical enhancements brought by LTE-Advanced, thoroughly covering3GPP Release 10 specifications and the main items in Release 11.Using illustrations, graphs and real-life scenarios, the authorssystematically lead readers through this cutting-edge topic toprovide an outlook on existing technologies as well as possiblefuture developments. The book is structured to follow the main technical areas thatwill be enhanced by the LTE-Advanced specifications. The maintopics covered include: Carrier Aggregation; Multiantenna MIMOTransmission, Heterogeneous Networks; Coordinated MultipointTransmission (CoMP); Relay nodes; 3GPP milestones and IMT-Advancedprocess in ITU-R; and LTE-Advanced PerformanceEvaluation. Key features: Leading author and editor team bring their expertise to thenext generation of LTE technology Includes tables, figures and plots illustrating the concepts orsimulation results, to aid understanding of the topic, and enablingreaders to be ahead of the technological advances

"Where this book is exceptional is that the reader will not just learn how LTE works but why it works" Adrian Scrase, ETSI Vice-President,

International Partnership Projects Following on the success of the first edition, this book is fully updated, covering the latest additions to LTE and the key features of LTE-Advanced. This book builds on the success of its predecessor, offering the same comprehensive system-level understanding built on explanations of the underlying theory, now expanded to include complete coverage of Release 9 and the developing specifications for LTE-Advanced. The book is a collaborative effort of more than 40 key experts representing over 20 companies actively participating in the development of LTE, as well as academia. The book highlights practical implications, illustrates the expected performance, and draws comparisons with the well-known WCDMA/HSPA standards. The authors not only pay special attention to the physical layer, giving an insight into the fundamental concepts of OFDMA-FDMA and MIMO, but also cover the higher protocol layers and system architecture to enable the reader to gain an overall understanding of the system. Key New Features: Comprehensively updated with the latest changes of the LTE Release 8 specifications, including improved coverage of Radio Resource Management RF aspects and performance requirements Provides detailed coverage of the new LTE Release 9 features, including: eMBMS, dual-layer beamforming, user equipment positioning, home eNodeBs / femtocells and pico cells and self-optimizing networks Evaluates the LTE system performance Introduces LTE-Advanced, explaining its context and motivation, as well as the key new features including: carrier aggregation, relaying, high-order MIMO, and Cooperative Multi-Point transmission (CoMP). Includes an accompanying website containing a complete list of acronyms related to LTE and LTE-Advanced, with a brief description of each (http://www.wiley.com/go/sesia_theumts) This book is an invaluable reference for all research and development engineers involved in implementation of LTE or LTE-Advanced, as well as graduate and PhD students in wireless communications. Network operators, service providers and R&D managers will also find this book insightful.

Future mobile access networks will require upgraded telecommunications networks; 3G LTE/ SAE is the next step, allowing data rates above 100 Mbps. Telecommunications engineers will need to understand the new SAE/ EPC architecture and its tendency towards automatic configuration, but the complexity, length and dryness of the standards documents make it difficult for them to find the information they need and work out how to apply it to their daily product and network development. This book - a new edition of SAE and the Evolved Packet Core - provides clear, concise and comprehensive coverage of the entire SAE/ EPC architecture, explaining concepts and standards and how they are used in commercial service settings. More than just a précis of the standards, it gives real insight into their development and the real-world scenarios in which they have been used since the publication of the first edition. This second edition places more emphasis on key aspects such as mobile systems and protocols (Diameter, GTP, S1-AP), and includes new coverage of femtocells, SIPTO, LIPA, LTE relay and LTE Advanced. Up-to-date coverage of SAE including the latest standards development Easily accessible overview of the architecture and concepts defined by SAE Thorough description of the Evolved Packet Core for LTE, fixed and other wireless accesses Comprehensive explanation of SAE key concepts, security and Quality-of-Service Covers potential service and operator scenarios including interworking with existing 3GPP and 3GPP2 systems Detailed walkthrough of network entities, protocols and procedures Written by established experts in the SAE standardization process, all of whom have extensive experience and understanding of its

goals, history and vision

A comprehensive overview of the 5G landscape covering technology options, most likely use cases and potential system architectures.

This very up-to-date and practical book, written by engineers working closely in 3GPP, gives insight into the newest technologies and standards adopted by 3GPP, with detailed explanations of the specific solutions chosen and their implementation in HSPA and LTE. The key technologies presented include multi-carrier transmission, advanced single-carrier transmission, advanced receivers, OFDM, MIMO and adaptive antenna solutions, advanced radio resource management and protocols, and different radio network architectures. Their role and use in the context of mobile broadband access in general is explained. Both a high-level overview and more detailed step-by-step explanations of HSPA and LTE implementation are given. An overview of other related systems such as TD SCDMA, CDMA2000, and WIMAX is also provided. This is a 'must-have' resource for engineers and other professionals working with cellular or wireless broadband technologies who need to know how to utilize the new technology to stay ahead of the competition. The authors of the book all work at Ericsson Research and are deeply involved in 3G development and standardisation since the early days of 3G research. They are leading experts in the field and are today still actively contributing to the standardisation of both HSPA and LTE within 3GPP. * Gives the first explanation of the radio access technologies and key international standards for moving to the next stage of 3G evolution: fully operational mobile broadband * Describes the new technologies selected by the 3GPP to realise High Speed Packet Access (HSPA) and Long Term Evolution (LTE) for mobile broadband * Gives both higher-level overviews and detailed explanations of HSPA and LTE as specified by 3GPP

Cellular Internet of Things: Technologies, Standards and Performance gives insight into the recent work performed by the 3rd Generation Partnership Project (3GPP) to develop systems for the Cellular Internet of Things. It presents both the design of the new Narrowband Internet of Things (NB-IoT) technology and how GSM and LTE have evolved to provide Cellular Internet of Things services. The criteria used for the design and objectives of the standardization work are explained, and the technical details and performance of each technology is presented. This book discusses the overall competitive landscape for providing wireless connectivity, also introducing the most promising technologies in the market. Users will learn how cellular systems work and how they can be designed to cater to challenging new requirements that are emerging in the telecom industry, what the physical layers and procedures in idle and connected mode look like in EC-GSM-IoT, LTE-M, and NB-IoT, and what the expected performance of these new systems is in terms of expected coverage, battery lifetime, data throughput, access delay time and device cost. Provides a detailed introduction to the EC-

GSM-IoT, LTE-M and NB-IoT technologies Presents network performance of the 3GPP cellular technologies, along with an analysis of the performance of non-cellular alternatives operating in unlicensed spectrum Includes prediction of true performance levels using state-of-the-art simulation models developed in the 3GPP standardization process

A concise introduction to IMT-Advanced Systems, including LTE-Advanced and WiMAX There exists a strong demand for fully extending emerging Internet services, including collaborative applications and social networking, to the mobile and wireless domain. Delivering such services can be possible only through realizing broadband in the wireless. Two candidate technologies are currently competing in fulfilling the requirements for wireless broadband networks, WiMAX and LTE. At the moment, LTE and its future evolution LTE-Advanced are already gaining ground in terms of vendor and operator support. Whilst both technologies share certain attributes (utilizing Orthogonal Frequency Division Multiple Access (OFDMA) in downlink, accommodating smart antennas and full support for IP-switching, for example), they differ in others (including uplink technology, scheduling, frame structure and mobility support). Beyond technological merits, factors such as deployment readiness, ecosystem maturity and migration feasibility come to light when comparing the aptitude of the two technologies. LTE, LTE-Advanced and WiMAX: Towards IMT-Advanced Networks provides a concise, no-nonsense introduction to the two technologies, covering both interface and networking considerations. More critically, the book gives a multi-faceted comparison, carefully analyzing and distinguishing the characteristics of each technology and spanning both technical and economic merits. A “big picture” understanding of the market strategies and forecasts is also offered. Discusses and critically evaluates LTE, LTE-Advanced and WiMAX (Legacy and Advanced) Gives an overview of the principles and advances of each enabling technology Offers a feature-by-feature comparison between the candidate technologies Includes information which appeals to both industry practitioners and academics Provides an up-to-date report on market and industry status

This revised edition of Communication Systems from GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband Second Edition (Wiley 2010) contains not only a technical description of the different wireless systems available today, but also explains the rationale behind the different mechanisms and implementations; not only the ‘how’ but also the ‘why’. In this way, the advantages and also limitations of each technology become apparent. Offering a solid introduction to major global wireless standards and comparisons of the different wireless technologies and their applications, this edition has been updated to provide the latest directions and activities in 3GPP standardization up to Release 12, and importantly includes a new chapter on Voice over LTE (VoLTE). There are new sections on Building Blocks of a Voice Centric Device, Building Blocks of a Smart Phone, Fast Dormancy, IMS and High-Speed Downlink Packet Access, and Wi-Fi-Protected Setup. Other sections have been considerably updated in places reflecting the

current state of the technology. • Describes the different systems based on the standards, their practical implementation and design assumptions, and the performance and capacity of each system in practice is analyzed and explained • Questions at the end of each chapter and answers on the accompanying website make this book ideal for self-study or as course material

2G/GSM and 3G/UMTS are key mobile communication technologies, chosen by more than 2 billion people around the world. In order to adapt to new services, increasing demand for user bandwidth, quality of service and requirements for network convergence, major evolutions are introduced in 3G network standard. Evolved Packet System (EPS) presents the EPS evolution of the 3G/UMTS standard introduced by the 3rd Generation Partnership Project (3GPP) standard committee. This new topic is looked at from a system perspective, from the radio interface to network and service architecture. Hundreds of documents being issued by Standard organisations are summarised in one book to allow the reader to get an accessible comprehensive view of EPS evolution. Proposes a system view of Evolved UMTS, from the radio to Core and service architecture Gives a comprehensive and global view of the system that technical specifications do not provide Describes the new system as well as the inheritance and migration from 2G/GSM and 3G/UMTS Written by experts in the field who specialise in two complementary but very different technical domains (i.e. "radio interface" and "network architecture") Contains many figures and examples for better understanding. This book is essential for industry professionals in the telecommunication business, telecommunication system architects and designers, product manufacturers and operators and postgraduate students.

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-Advance 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

The evolution of mobile communication standards presents numerous challenges in mobile handset design. Designers must continue to turn out handsets that maintain high device performance and air interface compatibility, while at the same time shrink power consumption, form factors, and costs. Mobile Handset Design is uniquely written to equip professionals and students with a complete understanding of how a mobile phone works, and teaches the skills to design the latest mobile handsets. Das walks readers through mobile phone operating principles, system infrastructure, TDMA-FDMA-CDMA-OFDMA techniques, hardware anatomy, software and protocols, and internal modules, components, and circuits. He presents all problems associated with mobile wireless channels and recommends corresponding design solutions to overcome those issues. Mobile RF front-end, digital baseband design techniques, and associated trade-offs are also covered. Das also discusses the productization aspects and reviews new research developments for different mobile phone system generations. Teaches basic working principles of legacy and 4G mobile systems Vividly illustrates and explains all key components and the anatomy of mobile phones Explains all hardware and software blocks, from principle to practice to product Discusses key design attributes such as low power consumption and slim form factors Moves through all topics in a systematic fashion for easy comprehension Presentation files with lecture notes available for instructor use This book is essential for practicing software, hardware and RF design engineers and product managers working to create innovative, competitive handsets. Mobile Handset Design is also ideal for fresh graduates or experienced engineers who are new to the mobile industry, and is well-suited for industry veterans as a handy reference. Lecture materials for instructors available at <http://www.wiley.com/go/dasmobile>

Understand the new technologies of the LTE standard and their impact on system performance improvements with this practical guide. A comprehensive reference on the call procedures of 4G RAN and Core networks, LTE Signaling, Troubleshooting and Optimization describes the protocols and procedures of LTE. It explains essential topics from basic performance measurement counters, radio quality and user plane quality to the standards, architecture, objectives and functions of the different interfaces. The first section gives an overview of LTE/EPC network architecture, reference points, protocol stacks, information elements and elementary procedures. The proceeding parts target more advanced topics to cover LTE/EPC signalling and radio quality analysis. This book supplements the information provided in the 3GPP standards by giving readers access to a universal LTE/EPC protocol sequence to ensure they have a clear understanding of the issues involved. It describes the normal signaling procedures as well as explaining how to identify and troubleshoot abnormal network behavior and common failure causes. Enables the reader to understand the signaling procedures and parameters that need to be analyzed when monitoring UMTS networks Covers the essential facts on signaling procedures by providing first hand information taken from real LTE/EPC traces A useful reference on the topic, also providing sufficient details for test and measurement experts who need to analyze LTE/EPC signaling procedures and measurements at the most detailed level Contains a description of LTE air interface monitoring scenarios as well as other key topics up to an advanced level LTE Signaling, Troubleshooting and Optimization is the Long Term Evolution successor to the

previous Wiley books UMTS Signaling and UMTS Performance Measurement.

Opportunities are at hand for professionals eager to learn and apply the latest theories and practices in air interface technologies. Written by experienced researchers and professionals, LTE-Advanced Air Interface Technology thoroughly covers the performance targets and technology components studied by 3GPP for LTE-Advanced. Besides being an expla

This exciting new book delivers a comprehensive overview of the cellular network architecture, with focus on the positioning applications and emergency call services, and covers aspects brought by 5G, including the core virtualization and the network slicing to optimize cellular network deployments. Focus is given to the different positioning technologies used in cellular networks, divided in satellite positioning, terrestrial radio positioning, non-RF positioning and a brief introduction to sensor fusion and Bayesian theory. It provides an overview of all the positioning technologies used in cellular networks, from GSM to 5G, from RAT independent technologies, such as A-GNSS (including GNSS evolution, RTK and PPP), WiFi, Bluetooth and sensor fusion, to cellular network native technologies, such as OTDOA / DL-TDOA, ECID, multi-cell RTT and the Angle Of Arrival (AOA) based techniques that take advantage of 5G mmWave beamforming features. Different positioning protocols, especially the LTE Positioning Protocol (LPP), which is used for LTE and 5G NR and defines the communication between the user device (mobile phone, connected vehicle, etc.) and the base station are explained extensively, and compares it with other competing protocols such as OMA LPPE. Furthermore, it also explains the core network positioning protocols (LPPa, NRPPa), that describe the communication between the location server and the core network. Explanation of different signaling parameters will enable the reader to understand better how positioning works in a cellular network. The contents of this book are aimed at all types of users, from beginners to the concept of positioning to experts that are looking to enhance their knowledge of positioning in cellular networks.

Written by experts actively involved in the 3GPP standards and product development, LTE for UMTS, Second Edition gives a complete and up-to-date overview of Long Term Evolution (LTE) in a systematic and clear manner. Building upon on the success of the first edition, LTE for UMTS, Second Edition has been revised to now contain improved coverage of the Release 8 LTE details, including field performance results, transport network, self optimized networks and also covering the enhancements done in 3GPP Release 9. This new edition also provides an outlook to Release 10, including the overview of Release 10 LTE-Advanced technology components which enable reaching data rates beyond 1 Gbps. Key updates for the second edition of LTE for UMTS are focused on the new topics from Release 9 & 10, and include: LTE-Advanced; Self optimized networks (SON); Transport network dimensioning; Measurement results.

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