

Evolved Cellular Network Planning and Optimization for UMTS and LTE



Edited by Lingyang Song and Jia Shen



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Evolved Cellular Network Planning And Optimization For Umts And Lte

Leonhard Korowajczuk



Evolved Cellular Network Planning And Optimization For Umts And Lte:

Evolved Cellular Network Planning and Optimization for UMTS and LTE Lingyang Song, Jia Shen, 2010-08-24 Most books on network planning and optimization provide limited coverage of either GSM or WCDMA techniques Few scrape the surface of HSPA and even fewer deal with TD SCDMA Filling this void *Evolved Cellular Network Planning and Optimization for UMTS and LTE* presents an accessible introduction to all stages of planning and optimizing UMTS HSPA **Broadband Wireless Access Networks for 4G: Theory, Application, and Experimentation** Santos, Raul Aquino, 2013-12-31 With the increased functionality demand for mobile speed and access in our everyday lives broadband wireless networks have emerged as the solution in providing high data rate communications systems to meet these growing needs Broadband Wireless Access Networks for 4G Theory Application and Experimentation presents the latest trends and research on mobile ad hoc networks vehicular ad hoc networks and routing algorithms which occur within various mobile networks This publication smartly combines knowledge and experience from enthusiastic scholars and expert researchers in the area of wideband and broadband wireless networks Students professors researchers and other professionals in the field will benefit from this book s practical applications and relevant studies **Handbook of Communications Security** F. Garzia, 2013

Communications represent a strategic sector for privacy protection and for personal company national and international security The interception damage or lost of information during communication can generate material and non material economic damages from both a personal and collective point of view The purpose of this book is to give the reader information relating to all aspects of communications security beginning at the base ideas and building to reach the most advanced and updated concepts The book will be of interest to integrated system designers telecommunication designers system engineers system analysts security managers technicians intelligence personnel security personnel police army private investigators scientists graduate and postgraduate students and anyone that needs to communicate in a secure way

Wireless Device-to-Device Communications and Networks Lingyang Song, Dusit Niyato, Zhu Han, Ekram Hossain, 2015-03-12 Covering the fundamental theory together with the state of the art in research and development this practical guide provides the techniques needed to design analyze and optimize device to device D2D communications in wireless networking With an ever increasing demand for higher data rate wireless access D2D communication is set to become a key feature supported by next generation cellular networks This book introduces D2D based wireless communications from the physical MAC network and application layer perspectives providing all the key background information before moving on to discuss real world applications as well as potential future developments Key topics are discussed in detail such as dynamic resource sharing for example of spectrum and power between cellular and ad hoc D2D communications to accommodate larger volumes of traffic and provide better service to users Readers will understand the practical challenges of resource management optimization security standardization and network topology and learn how the

design principles are applied in practice **Fundamentals of Network Planning and Optimisation 2G/3G/4G** Ajay R. Mishra, 2018-11-05 Updated new edition covering all aspects of network planning and optimization This welcome new edition provides comprehensive coverage of all aspects of network planning in all the technologies from 2G to 5G in radio transmission and core aspects Written by leading experts in the field it serves as a handbook for anyone engaged in the study design deployment and business of cellular networks It increases basic understanding of the currently deployed and emerging technologies and helps to make evolution plans for future networks The book also provides an overview of the forthcoming technologies that are expected to make an impact in the future such as 5G Fundamentals of Cellular Network Planning and Optimization Second Edition encompasses all the technologies as well as the planning and implementation details that go with them It covers 2G GSM EGPRS 3G WCDMA and 4G LTE networks and introduces 5G The book also looks at all the sub systems of the network focusing on both the practical and theoretical issues Provides comprehensive coverage of the planning aspects of the full range of today s mobile network systems covering radio access network circuit and packet switching signaling control and backhaul Core transmission networks New elements in book include HSPA Ethernet 4G LTE and 5G Covers areas such as Virtualization IoT Artificial Intelligence Spectrum Management and Cloud By bringing all these concepts under one cover Fundamentals of Cellular Network Planning and Optimization becomes essential reading for network design engineers working with cellular service vendors or operators experts scientists working on end to end issues and undergraduate post graduate students **Green Networking and Communications** Shafiullah Khan, Jaime Lloret Mauri, 2013-10-29 Although the information and communication technology ICT industry accounted for only 2 percent of global greenhouse gas emissions in 2007 the explosive increase in data traffic brought about by a rapidly growing user base of more than a billion wireless subscribers is expected to nearly double that number by 2020 It is clear that now is the ti

Modeling the Power Consumption and Energy Efficiency of Telecommunications Networks Kerry James Hinton, Robert Ayre, Jeffrey Cheong, 2021-10-28 This book introduces the technical foundations and tools for estimating the power consumption of internet networks and services including a detailed description of how these models are constructed and applied Modeling the Power Consumption and Energy Efficiency of Telecommunications Networks can be used to gain insight into the construction of mathematical models that provide realistic estimates of the power consumption of internet networks and services This knowledge enables forecasting the energy footprint of future networks and services to integrate sustainability and environmental considerations into network planning and design FEATURES Provides the motivation for developing mathematical models for telecommunications network and service power consumption and energy efficiency modeling Presents factors impacting overall network and service power consumption Discusses the types of network equipment and their power consumption profiles Reviews the basics of power modeling including network segmentation traffic forecasting top down and bottom up models wired and wireless networks data centers and servers Explores the

application of energy efficiency metrics for equipment networks and services This book is aimed at students and technologists as well as technology managers and policy makers This book will be of value to any organization that wishes to estimate the energy footprint of the use of information and communications technologies This book can also be integrated into a course on the sustainability of information and communications technologies

UMTS Network Planning, Optimization, and Inter-Operation with GSM Moe Rahnema, 2008-04-15 UMTS Network Planning Optimization and Inter Operation with GSM is an accessible one stop reference to help engineers effectively reduce the time and costs involved in UMTS deployment and optimization Rahnema includes detailed coverage from both a theoretical and practical perspective on the planning and optimization aspects of UMTS and a number of other new techniques to help operators get the most out of their networks Provides an end to end perspective from network design to optimization Incorporates the hands on experiences of numerous researchers Single authorship allows for strong coherency and accessibility Details the complete iteration cycle of radio link budgeting for coverage planning and dimensioning Rahnema demonstrates detailed formulation of radio capacity and coverage in UMTS and discusses the tradeoffs involved He presents complete link budgeting and iterative simulations for capacity and coverage planning along with practical guidelines UMTS Network Planning contains seventeen cohesive and well organized chapters which cover numerous topics including Radio channel structures radio channel models parameters model tuning Techniques for capacity and coverage enhancements Complete treatment of power control handoffs and radio resource practical management processes and parameters Detailed coverage of TCP protocol enhancement for operation over wireless links particularly UMTS Application of GSM measurements to plan and re engineer for UMTS radio sites Guidelines for site co location with GSM the QOS classes parameters and inter workings in UMTS AMR voice codecs and tradeoffs core and access network design architectural evolution and protocols Comprehensive discussion and presentation of practical techniques for radio performance analysis trending and troubleshooting Perfect for professionals in the field and researchers specializing in network enhancement Engineers working on other air interfaces and next generation technologies will find many of the techniques introduced helpful in designing and deploying future wireless networks as well Students and professionals new to the wireless field will also find this book to be a good foundation in network planning performance analysis and optimization

Self-Organizing Networks Juan Ramiro, Khalid Hamied, 2011-10-27 With the current explosion in network traffic and mounting pressure on operators business case Self Organizing Networks SON play a crucial role They are conceived to minimize human intervention in engineering processes and at the same time improve system performance to maximize Return on Investment ROI and secure customer loyalty Written by leading experts in the planning and optimization of Multi Technology and Multi Vendor wireless networks this book describes the architecture of Multi Technology SON for GSM UMTS and LTE along with the enabling technologies for SON planning optimization and healing This is presented mainly from a technology point of view but also covers some critical

business aspects such as the ROI of the proposed SON functionalities and Use Cases Key features Follows a truly Multi Technology approach covering not only LTE but also GSM and UMTS including architectural considerations of deploying SON in today s GSM and UMTS networks Features detailed discussions about the relevant trade offs in each Use Case Includes field results of today s GSM and UMTS SON implementations in live networks Addresses the calculation of ROI for Multi Technology SON contributing to a more complete and strategic view of the SON paradigm This book will appeal to network planners optimization engineers technical strategy managers with operators and R D system engineers at infrastructure and software vendors It will also be a useful resource for postgraduate students and researchers in automated wireless network planning and optimization

Advanced Cellular Network Planning and Optimisation Ajay R. Mishra, 2007-01-11 A highly practical guide rooted in theory to include the necessary background for taking the reader through the planning implementation and management stages for each type of cellular network Present day cellular networks are a mixture of the technologies like GSM EGPRS and WCDMA They even contain features of the technologies that will lead us to the fourth generation networks Designing and optimising these complex networks requires much deeper understanding *Advanced Cellular Network Planning and Optimisation* presents radio transmission and core network planning and optimisation aspects for GSM EGPRS and WCDMA networks with focus on practical aspects of the field Experts from each of the domains have brought their experiences under one book making it an essential read for design practitioners experts scientists and students working in the cellular industry Key Highlights Focus on radio transmission and core network planning and optimisation Covers GSM EGPRS WCDMA network planning optimisation Gives an introduction to the networks technologies beyond WCDMA and explores its current status and future potential Examines the full range of potential scenarios and problems faced by those who design cellular networks and provides advice and solutions all backed up with real world examples This text will serve as a handbook to anyone engaged in the design deployment performance and business of Cellular Networks Efficient planning and optimization of mobile networks are key to guarantee superior quality of service and user experience They also form the essential foundation for the success of future technology development making this book a valuable read on the road towards 4G Tero Ojanper Chief Technology Officer Nokia Networks

Fundamentals of Cellular Network Planning and Optimisation Ajay R. Mishra, 2004-11-19 By 2008 some 2 billion people will be using mobile phones and devices in many cases to access advanced data services Against this backdrop the need for efficient and effective network design will be critical to the success of increasingly complex mobile networks Simon Beresford Wylie SVP Nokia Networks With the complexity of the cellular networks increasing day by day a deeper understanding of the design and performance of end to end cellular networks is required Moreover all the types of networks from 2G 2.5G 3G seem to co exist *Fundamentals of Cellular Network Planning and Optimisation* covers end to end network planning and optimisation aspects from second generation GSM to third generation WCDMA networks including GPRS and EDGE networks All the sub systems

of the network i.e radio network transmission network and core network have been covered with focus on both practical and theoretical issues By bringing all these concepts under one cover this book becomes essential reading for the network design engineers working either with cellular service vendors or operators experts scientists working on end to end issues and undergraduate post graduate students Key Highlights Distinctly divided into four parts 2G GSM 2 5G GPRS EDGE 3G WCDMA and introduction to 4G OFDM ALL IP WLAN Overview respectively Each part focuses on the radio transmission and core networks Concentrates on cellular network planning process and explains the underlying principles behind the planning and optimizing of the cellular networks The text will serve as a handbook for anyone engaged in the study design deployment and business of cellular networks

WCDMA (UMTS) Deployment Handbook Christophe Chevallier, Christopher Brunner, Andrea Garavaglia, Kevin P. Murray, Kenneth R. Baker, 2006-07-11 A complete and practical guide to WCDMA UMTS cellular network deployment After introducing the network architecture of such a system the WCDMA UMTS Deployment Handbook defines the coverage and capacity concepts associated with the dimensioning and design phases Progressing to a discussion of the main system parameters associated with network optimization and detailing optimization techniques for the main services supported by UMTS and includes the specifics of indoor deployment and HSDPA networks evolution Covers all stages from planning to optimization with sufficient details as required on a day to day basis and thorough reference information for the reader who wants to understand the concepts in more detail Relevant for daily tasks The approach taken in this book is similar to the work flow of network planner and optimization engineers allowing such personnel to easily find the relevant information Written by the company which made CDMA a household name QUALCOMM was the first company to use CDMA technology for cellular application and is a technical leader in this domain Based on industry feedback All the contributors to this book have been working in direct interaction with WCDMA operators throughout the world since the early days of WCDMA commercial deployment Looking to the future This book addresses the next level of challenge that WCDMA operators will face deployment of indoor systems and HSDPA Providing a complete introduction and reference guide to everything associated with the life cycle of a WCDMA UMTS cellular network from initial dimensioning through to the successful deployment of indoor solutions or migration to HSDPA this book is a must have for network planners and optimization engineers as well as Telecommunication Engineering students

The LTE-Advanced Deployment Handbook Jyrki T. J. Penttinen, 2015-11-30 LTE Advanced is the new Global standard which is expected to create a foundation for the future wireless broadband services The standard incorporates all the latest technologies recently developed in the field of wireless communications Presented in a modular style the book provides an introductory description for beginners as well as practical guidelines for telecom specialists It contains an introductory module that is suitable for the initial studies of the technology based on the 3GPP Release 10 11 and beyond of LTE and SAE The latter part of the book is suitable for experienced professionals who will benefit from the practical descriptions of the physical core and radio network

planning end to end performance measurements physical network construction and optimization of the system The focus of the book is in the functioning planning construction measurements and optimization of the radio and core networks of the Release 10 and beyond of the 3GPP LTE and SAE standards It looks at the practical description of the Advanced version of the LTE SAE how to demystify the LTE Advanced functionality and planning and how to carry out practical measurements of the system In general the book describes how to do it for the 4G system which is compliant with the ITU R requirements

Modeling and Dimensioning of Mobile Wireless Networks Maciej Stasiak, Mariusz Glabowski, Arkadiusz Wisniewski, Piotr Zwierzykowski, 2010-12-09 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 Iub 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

From LTE to LTE-Advanced Pro and 5G Moe Rahnema, Marcin Dryjanski, 2017-09-30 This practical hands on new resource presents LTE technologies from end to end including network planning and the optimization tradeoff process This book examines the features of LTE Advanced and LTE Advanced Pro and

how they integrate into existing LTE networks Professionals find in depth coverage of how the air interface is structured at the physical layer and how the related link level protocols are designed and work This resource highlights potential 5G solutions as considered in releases 14 and beyond the migration paths and the challenges involved with the latest updates and standardization process Moreover the book covers performance analysis and results as well as SON specifications and realization Readers learn about OFDMA and how DFT is used to implement it Link budgeting parameter estimations and network planning and sizing is explained Insight into core network architecture is provided including the protocols and signaling used for both data and voice services The book also presents a detailed chapter on the end to end data transfer optimization mechanisms based on the TCP protocol This book provides the tools needed for network planning and optimization while addressing the challenges of LTE and LTE advanced networks

Evolved Packet System (EPS) Pierre Lescuyer,Thierry Lucidarme,2008-02-28 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

Design, Deployment and Performance of 4G-LTE Networks Ayman ElNashar,Mohamed A. El-saidny,Mahmoud Sherif,2014-03-13 This book provides an insight into the key practical aspects and best practice of 4G LTE network design performance and deployment Design Deployment and Performance of 4G LTE Networks addresses the key practical aspects and best practice of 4G networks design performance and deployment In addition the book focuses on the end to end aspects of the LTE network architecture and different deployment scenarios of commercial LTE networks It describes the air interface of LTE focusing on the access stratum protocol layers PDCP RLC MAC and Physical Layer The air interface described in this book covers the concepts of LTE frame structure downlink and uplink scheduling and detailed illustrations of the data flow across the protocol layers It describes the details of the optimization process including performance measurements and troubleshooting mechanisms in addition to demonstrating common issues and case studies

based on actual field results The book provides detailed performance analysis of key features enhancements such as C DRX for Smartphones battery saving CSFB solution to support voice calls with LTE and MIMO techniques The book presents analysis of LTE coverage and link budgets alongside a detailed comparative analysis with HSPA Practical link budget examples are provided for data and VoLTE scenarios Furthermore the reader is provided with a detailed explanation of capacity dimensioning of the LTE systems The LTE capacity analysis in this book is presented in a comparative manner with reference to the HSPA network to benchmark the LTE network capacity The book describes the voice options for LTE including VoIP protocol stack IMS Single Radio Voice Call Continuity SRVCC In addition key VoLTE features are presented Semi persistent scheduling SPS TTI bundling Quality of Service QoS VoIP with C DRX Robust Header Compression RoHC and VoLTE Vocoders and De Jitter buffer The book describes several LTE and LTE A advanced features in the evolution from Release 8 to 10 including SON eICIC CA CoMP HetNet Enhanced MIMO Relays and LBS This book can be used as a reference for best practices in LTE networks design and deployment performance analysis and evolution strategy Conveys the theoretical background of 4G LTE networks Presents key aspects and best practice of 4G LTE networks design and deployment Includes a realistic roadmap for evolution of deployed 3G 4G networks Addresses the practical aspects for designing and deploying commercial LTE networks Analyzes LTE coverage and link budgets including a detailed comparative analysis with HSPA References the best practices in LTE networks design and deployment performance analysis and evolution strategy Covers infrastructure sharing scenarios for CAPEX and OPEX saving Provides key practical aspects for supporting voice services over LTE Written for all 4G engineers designers working in networks design for operators network deployment engineers R D engineers telecom consulting firms measurement performance tools firms deployment subcontractors senior undergraduate students and graduate students interested in understanding the practical aspects of 4G LTE networks as part of their classes research or projects

[LTE, WiMAX and WLAN Network Design, Optimization and Performance Analysis](#) Leonhard Korowajczuk, 2011-08-22 A technological overview of LTE and WiMAX LTE WiMAX and WLAN Network Design Optimization and Performance Analysis provides a practical guide to LTE and WiMAX technologies introducing various tools and concepts used within In addition topics such as traffic modelling of IP centric networks RF propagation fading mobility and indoor coverage are explored new techniques which increase throughput such as MIMO and AAS technology are highlighted and simulation network design and performance analysis are also examined Finally in the latter part of the book Korowajczuk gives a step by step guide to network design providing readers with the capability to build reliable and robust data networks By focusing on LTE and WiMAX this book extends current network planning approaches to next generation wireless systems based on OFDMA providing an essential resource for engineers and operators of fixed and wireless broadband data access networks With information presented in a sequential format LTE WiMAX and WLAN Network Design Optimization and Performance Analysis aids a progressive development of knowledge

complementing latter graduate and postgraduate courses while also providing a valuable resource to network designers equipment vendors reference material operators consultants and regulators

Key Features One of the first books to comprehensively explain and evaluate LTE Provides an unique explanation of the basic concepts involved in wireless broadband technologies and their applications in LTE WiMAX and WLAN before progressing to the network design Demonstrates the application of network planning for LTE and WiMAX with theoretical and practical approaches Includes all aspects of system design and optimization such as dynamic traffic simulations multi layered traffic analysis statistical interference analysis and performance estimations

LTE Backhaul Esa Metsälä, Juha Salmelin, 2015-09-10 The aim of this book is to enable network planners to realize and maintain cost efficient LTE backhaul networks which meet the necessary performance requirements Through an introduction to the technology background the economical modelling the dimensioning theory planning and optimization processes and relevant network management aspects the reader shall obtain all relevant information to achieve good backhaul results in their own network environment It is aimed at network planners and other experts with responsibilities for LTE IP network dimensioning LTE network planning providing and managing leased lines business management LTE IP network operation and optimization

Cellular Network Planning Marcelo Sampaio de Alencar, Djalma de Melo Carvalho Filho, 2016-12-19 Over the recent years few books have been published covering all the subjects needed to understand the very fundamental concepts of cell planning Most books which deal with this topic are destined to very specific audiences and the vast majority introduce the subject at a very basic or technical level or are destined to an academic audience Cellular Network Planning begins with an introduction to the subject covering conventional and contemporary wireless systems Spectral allocation and the frequency plan are discussed along with the essential characteristics of wireless systems The design of mobile cellular systems includes cell planning traffic and channel problems The book presents a review of existing models considering both green field dimensioning and network expansion strategies and discusses multi objective optimization and base station deployment based on artificial immune systems It also discusses a cost effective base station deployment approach based on artificial immune systems and introduces the modified MO AIS algorithm Technical topics discussed in the book include Mobile Cellular Network Basics Evolution of Mobile Cellular System The Mobile Communications Channel Propagation Models Cell Planning Green Field Dimensioning Network Expansion Cost effective Planning Strategies

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