

# Radio Network Planning and Optimisation for UMTS

SECOND EDITION



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# Radio Network Planning And Optimisation For Umts

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## **Radio Network Planning And Optimisation For Umts:**

**Radio Network Planning and Optimisation for UMTS** Jaana Laiho,Achim Wacker,Tomáš Novosad,2006-05-01 Radio Network Planning and Optimisation for UMTS Second Edition is a comprehensive and fully updated introduction to WCDMA radio access technology used in UMTS featuring new content on key developments Written by leading experts at Nokia the first edition quickly established itself as a best selling and highly respected book on how to dimension plan and optimise UMTS networks This valuable text examines current and future radio network management issues and their impact on network performance as well as the relevant capacity and coverage enhancement methods In addition to coverage of WCDMA radio access technology used in UMTS and the planning and optimisation of such a system the service control and management concept in WCDMA and GPRS networks are also introduced This is an excellent source of information for those considering future cellular networks where Quality of Service QoS is of paramount importance Key features of the Second Edition include High Speed Downlink Packet Access HSDPA physical layer dimensioning and radio resource management Quality of Service QoS mechanisms in network for service differentiation Multiple Input Multiple Output MIMO technology Practical network optimisation examples Service optimisation for UMTS and GPRS EDGE capacity optimisation The hot topic of service control and management in WCDMA and GPRS networks that has evolved since the first edition Companion website includes Figures Static radio network simulator implemented in MATLAB This text will have instant appeal to wireless operators and network and terminal manufacturers It will also be essential reading for undergraduate and postgraduate students frequency regulation bodies and all those interested in radio network planning and optimisation particularly RF network systems engineering professionals

**UMTS Radio Network Planning, Optimization and QoS Management** Jukka Lempiäinen,Matti Manninen,2007-05-08 In cellular networks a new generation of CDMA or WCDMA based networks will start operations in most countries in the near future The standardized WCDMA technology generates new challenges in radio network planning optimization and QoS management because of the dynamic nature of its radio interface and various new services and different network operating modes Moreover new and modified radio planning phases as well as new field measurements and emphasized QoS management are needed when UMTS networks are designed and optimized Hence a practical UMTS planning process must be defined in detail from dimensioning to optimization tasks This book follows the UMTS planning process It is organized in three parts Part I UMTS configuration planning Part II UMTS topology planning and Part III UMTS network functionality The first chapter in Part I introduces the UMTS and UTRAN systems and radio network planning strategy and defines a planning process for UMTS In Chapter 2 the UMTS planning process is covered and a detailed description of the UMTS power budget is given with planning threshold examples provided

**Radio Network Planning and Optimisation for UMTS** Jaana Laiho,Achim Wacker,Tomáš Novosad,2005-04-08 Radio Network Planning and Optimisation for UMTS comprehensively explains how to dimension plan and optimise UMTS

Universal Mobile Telecommunications System networks It introduces the properties of the spread spectrum system and provides a general overview of the physical layer of UTRA FDD The radio network planning process for WCDMA is clearly presented and detailed information on how to dimension plan and rollout a 3G network both theoretically and practically is provided This valuable text examines current and future radio network management issues and their impact on network performance as well as the relevant capacity and coverage enhancement methods Includes automation examples of radio resource management Focuses on UTRA FDD and introduces UTRA TDD GPRS and EDGE and examines their interaction and synergy Provides an excellent source of information for those considering future cellular networks where Quality of Service QoS is of paramount importance Analyses the radio network planning challenges and opportunities for both greenfield and existing operators Includes an accompanying CD ROM featuring a static radio network simulator implemented in MATLAB r Authoritative and instructive this text will have instant appeal to wireless operators and network and terminal manufacturers It will also be essential reading for university students frequency regulation bodies and everyone interested in radio network planning and optimisation especially RF network systems engineering professionals

**UMTS Radio Network Planning: Mastering Cell Coupling for Capacity Optimization** Hans-Florian Geerdes,2009-03-11 The author establishes a concise system model for UMTS radio networks which describes interference coupling and its impact on the network This model is the basis for efficient radio network performance analysis as well as new optimization methods for automatic planning

**Understanding UMTS Radio Network Modelling, Planning and Automated Optimisation** Maciej Nawrocki,Hamid Aghvami,Mischa Dohler,2006-07-06 This book sets out to provide the theoretical foundations that will enable radio network planners to plan model and optimize radio networks using state of the art findings from around the globe It adopts a logical approach beginning with the background to the present status of UMTS radio network technology before devoting equal coverage to planning modelling and optimization issues All key planning areas are covered including the technical and legal implications of network infrastructure sharing hierarchical cell structure HCS deployment ultra high site deployment and the benefits and limitations of using computer aided design CAD software Theoretical models for UMTS technology are explained as generic system models stand alone services and mixed services Business modelling theory and methods are put forward taking in propagation calculations link level UMTS static and UMTS dynamic simulations The challenges and goals of the automated optimization process are explored in depth using cutting edge cost function and optimization algorithms This theory based resource containing prolific illustrative case studies explains the reasons for UMTS radio networks performance issues and how to use this foundational knowledge to model plan and optimize present and future systems

*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 *Fundamentals of Network Planning and Optimisation 2G/3G/4G* Ajay R. Mishra, 2018-07-24 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     **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     Planning and Optimisation of 3g and 4g Wireless Networks J. I. Agbinya,2010-02-15 Packed with details of the technologies that support each network type this cutting edge reference leads the reader step by step on how to plan and optimize various types of wireless networks It examines current and emerging network planning and enhancement techniques     *Radio Interface System Planning for GSM/GPRS/UMTS* Jukka Lempinen,Matti Manninen,2007-05-08 Radio network system planning is a comprehensive optimisation task where different planning targets coverage capacity and quality have a direct influence on each other and where optimised solution is a compromise of these planning areas In order to find out the cost effective and high quality radio network plan the well known theoretical details have to be bound with practical radio planning issues like planning phases and planning parameters At the same time the long term network evolution paths and the possible changes of the radio propagation environment have to be well understood Radio Interface System Planning for GSM GPRS UMTS introduces the radio system planning where these theoretical and practical details have both been emphasized and then utilized for the planning of GSM GPRS and UMTS mobile networks The key planning parameters for these systems are explained and the typical values for power budget various margins gains and losses and frequency reuse are given Also the book describes the common tasks in radio system planning The planning methods and phases introduced in the book can also be applied to other mobile communication systems     Fundamentals of Cellular Network Planning and Optimisation Ajay R. Mishra,2004-05-21 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

*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

### **Optimization Methods for UMTS Radio Network**

**Planning** Andreas Eisenblätter, 2003 *Operations Research Proceedings 2003* Dino Ahr, Roland Fahrion, Marcus Oswald, Gerhard Reinelt, 2012-12-06 This volume contains a selection of papers referring to lectures presented at the symposium Operations Research 2003 OR03 held at the Ruprecht Karls Universität Heidelberg September 3 5 2003 This international conference took place under the auspices of the German Operations Research Society GOR and of Dr Erwin Teufel prime minister of Baden Württemberg The symposium had about 500 participants from countries all over the world It attracted academicians and practitioners working in various fields of Operations Research and provided them with the most recent advances in Operations Research and related areas in Economics Mathematics and Computer Science The program consisted of 4 plenary and 13 semi plenary talks and more than 300 contributed papers selected by the program committee to be presented in 17 sections Due to a limited number of pages available for the proceedings volume the length of each article as well as the total number of accepted contributions had to be restricted Submitted manuscripts have therefore been

reviewed and 62 of them have been selected for publication This refereeing procedure has been strongly supported by the section chairmen and we would like to express our gratitude to them Finally we also would like to thank Dr Werner Muller from Springer Verlag for his support in publishing this proceedings volume

**Efficient Methods for WCDMA Radio Network Planning and Optimization** Ulrich Türke, 2007-12-08 Ulrich Türke introduces innovative models and algorithms for the evaluation of WCDMA UMTS network performance He establishes an advanced snapshot analysis method which allows the efficient and accurate analysis of large radio networks The author develops two statistical evaluation methods which furnish quick approximations of relevant results from snapshot simulations Finally he discusses the application of these methods to automatic network optimization The majority of the developed strategies are successfully applied in a commercial radio network planning and optimization tool

**Telecommunications and Networking – ICT 2004** José Neuman De Souza, Petre Dini, Pascal Lorenz, 2004-07-28 Welcome to the 11th International Conference on Telecommunications ICT2004 hosted by the city of Fortaleza Brazil As with other ICT events in the past this professional meeting continues to be highly competitive and very well perceived by the international networking community attracting excellent contributions and active participation This year a total of 430 papers from 36 countries were submitted from which 188 were accepted Each paper was viewed by several members of the ICT2004 Technical Program Committee We were very pleased to receive a large percentage of top quality contributions The topics of submitted papers covered a wide spectrum from photonic techniques signal processing cellular networks and wireless networks to ad hoc networks We believe the ICT2004 papers offer a wide range of solutions to key problems in telecommunications and describe challenging avenues for industrial research and development In addition to the conference regular sessions seven tutorials and a workshop were organized The tutorials focused on special topics dealing with next generation networks The workshop focused on particular problems and solutions in heavily distributed and shareable environments We would like to thank the ICT 2004 Technical Program Committee members and referees Without their support the creation of such a broad conference program would not be possible We also thank all the authors who made a particular effort to contribute to ICT2004 We truly believe that due to all these efforts the national conference program consisted of top quality contributions We are also indebted to many individuals and organizations that made this conference possible In particular we would like to thank the members of the ICT2004 Organizing Committee for their help in all aspects of the organization of this professional meeting

**Telecommunications Network Design and Management** G. Anandalingam, S. Raghavan, 2013-04-17 Telecommunications Network Design And Management represents the state of the art of applying operations research techniques and solutions across a broad spectrum of telecommunications problems and implementation issues The first three chapters of the book deal with the design of wireless networks including UMTS and Ad Hoc networks Chapters 4-6 deal with the optimal design of telecommunications networks Techniques used for network design range from genetic algorithms to combinatorial



optimization heuristics Chapters 7 10 analyze traffic flow in telecommunications networks focusing on optimizing traffic load distribution and the scheduling of switches under multi media streams and heavy traffic Chapters 11 14 deal with telecommunications network management examining bandwidth provisioning admission control queue management dynamic routing and feedback regulation in order to ensure that the network performance is optimized Chapters 15 16 deal with the construction of topologies and allocation of bandwidth to ensure quality of service

**Traffic and QoS Management in Wireless Multimedia Networks** Yevgeni Koucheryavy, Giovanni Giambene, Dirk Staehle, Francisco Barcelo-Arroyo, Torsten Braun, Vasilios Siris, 2009-04-20 The current book provides a final report of activity performed by the COST 290 Action Traffic and QoS Management in Wireless Multimedia Networks which ran from March 10 2004 until June 3 2008 After an introduction to the COST framework and the Action s survey time frame and activities the main part of the book addresses a number of technical issues which are structured into several chapters All those issues have been carefully investigated by the COST 290 community during the course of the project the information presented in this book can be regarded as ultimate for each particular topic every open research issue addressed in the book is described carefully corresponding existing studies are analyzed and results achieved by the COST 290 community are presented and compared and further research directions are defined and analyzed Because the book covers a wide area of research addressing issues of modern wired and wireless networking at different layers starting from the physical layer up to the application layer it can be recommended to be used by researchers and students to obtain a comprehensive analysis on particular research topics including related areas to obtain broad and ultimate referencing and to be advised on current open issues COST 290 is one of the Actions of the European COST Program Founded in 1971 COST is an intergovernmental framework for European Cooperation in the field of Scientific and Technical Research allowing the coordination of nationally funded research on a European level

Fundamentals of Ultra-Dense Wireless Networks David López-Pérez, Ming Ding, 2022-06-30 A comprehensive text dedicated to ultra dense networks covering fundamental theory and practical applications

**Mobile Lightweight Wireless Systems** Javier Del Ser, Eduard Axel Jorswieck, Joaquin Miguez, Marja Matinmikko, Daniel P Palomar, Sancho Salcedo Sanz, Sergio Gil-Lopez, 2012-04-23 This book constitutes the thoroughly refereed post conference proceedings of the Third International ICST Conference Mobile Lightweight Wireless Systems MOBILIGHT 2011 held in Bilbao Spain on May 9 10 2011 In numbers MOBILIGHT 2011 was organized as a 2 day single track event with 18 technical presentations and 3 specialized workshops focused on opportunistic sensing and processing in mobile wireless sensor and cellular networks MOBISENSE multimode wireless access networks MOWAN and strategic network planning applied to market regulation NETSTRAT totaling to 34 papers presented during the conference and included in the proceedings

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