CableFree LTE Network Dimensioning Calculator   Updated   21/04/2016 SIP

Disclaimer: this is a simple calcuation tool, real-world coverage depends on terrain and other factors

LTE Version: Release 12 (LTE-Advanced, 2016)

Total Coverage Area Required:

| 50 | km | diameter |

LTE 3-sector Base Station Coverage Diameter

| 5 | km | approx |

Proposed number of LTE Base Stations

| 19 | Each BS has 3 sectors, 2x2 MIMO |

Can upgrade to 6 sectors

Can upgrade to 4x4 MIMO

Capacity per-sector		10 MHz		channel
	Downlink		Uplink	
TDD	60.30 Mbps		3.77 Mbps	

Capacity per base station   (64QAM, 2x2 MIMO)

3 sectors

| | 180.91 Mbps | | 11.31 Mbps |

Total Network Capacity

	Downlink		Uplink	
	3.437292 Gbps		0.214831 Gbps	

Subscriber Units

Fixed CPEs		Qty	10000
Capacity	Downlink		Uplink
Max	150 Mbps		51 Mbps
Average	20 Mbps		5 Mbps
Total	200 Gbps		50 Gbps

Mobile CPEs		Qty	0
Capacity	Downlink		Uplink
Max	102 Mbps		51 Mbps
Average	5 Mbps		1 Mbps
Total	0 Gbps		0 Gbps

Total CPE capacity (Fixed + Mobile)

	Downlink		Uplink	
	200 Gbps		50 Gbps	

Contention Ratio   (from Total Network Capacity and Total CPE Capacity)

| | 58.19 :1 | | 232.74 :1 |

Simple Diagram of LTE coverage: 3-sector base stations
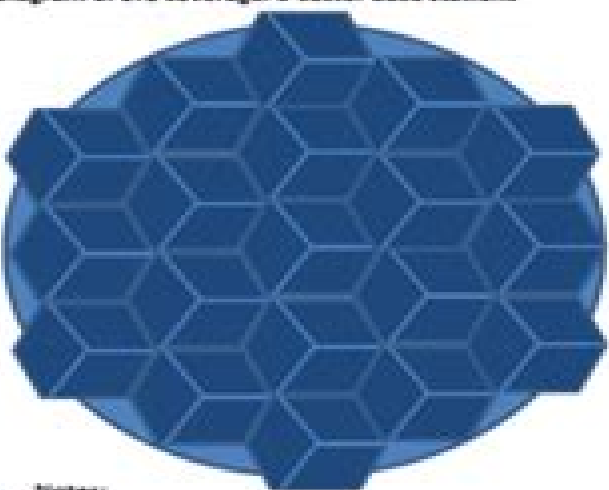
Notes:

Assume 19 Base Stations total, each 3 sectors

Band proposed is 3.5GHz (30MHz allocation). TDD allocation

Assume 80% DL, 10% UL (and 10% overhead). You can change cell C26 on TDD tab to alter

Capacity DL and UL figures from TDD tab below: assumes 64QAM modulation, 2x2 MIMO

Real-world max capacity could be lower for clients drop below 64QAM (long range, etc)

Total Capacity assumes that no limits on backhaul from eNodeB to Core (EPC)

(Does not refer to Internet uplink capacity - which is likely much less than this)

Fixed CPEs:			
Assume	Category 4 UE		150Mbps DL, 51Mbps UL
	2x2 DL, 1x1 UL		64QAM Modulation Max

Mobile CPEs:			
Assume	Category 3 UE		102Mbps DL, 51Mbps UL
	2x2 DL, 1x1 UL		64QAM Modulation Max

Dimensioning Of Lte Network Aalto

Patrick Marsch,Ömer Bulakci,Olav Queseth,Mauro Boldi

Dimensioning Of Lte Network Aalto:

LTE-Advanced and Next Generation Wireless Networks Guillaume de la Roche,Andrés Alayón-Glazunov,Ben Allen,2012-11-05 LTE A and Next Generation Wireless Networks Channel Modeling and Performance describes recent advances in propagation and channel modeling necessary for simulating next generation wireless systems Due to the radio spectrum scarcity two fundamental changes are anticipated compared to the current status Firstly the strict reservation of a specific band for a unique standard could evolve toward a priority policy allowing the co existence of secondary users in a band allocated to a primary system Secondly a huge increase of the number of cells is expected by combining outdoor base stations with smaller cells such as pico femto cells and relays This evolution is accompanied with the emergence of cognitive radio that becomes a reality in terminals together with the development of self organization capabilities and distributed cooperative behaviors The book is divided into three parts Part I addresses the fundamentals e g technologies channel modeling principles etc Part II addresses propagation and modeling discussing topics such as indoor propagation outdoor propagation etc Part III explores system performance and applications e g MIMO Over the air testing electromagnetic safety etc **Design and Deployment of Small Cell Networks** Alagan Anpalagan,Mehdi Bennis,Rath Vannithamby,2015-12-17 This comprehensive resource covers everything you need to know about small cell networks from design to analysis optimization and deployment Detailing fundamental concepts as well as more advanced topics and describing emerging trends challenges and recent research results this book explains how you can improve performance decision making resource management and energy efficiency in next generation wireless networks Key topics covered include green small cell networks and associated trade offs optimized design and performance analysis backhauling and traffic overloading context aware self organizing networks deployment strategies and mobility management in large scale HetNets Written by leading experts in academia and industry and including tools and techniques for small cell network design and deployment this is an ideal resource for graduate students researchers and industry practitioners working in communications and networking **The Telecommunications Handbook** Jyrki T. J. Penttinen,2015-01-13 THE TELECOMMUNICATIONS HANDBOOK ENGINEERING GUIDELINES FOR FIXED MOBILE AND SATELLITE SYSTEMS Taking a practical approach The Telecommunications Handbook examines the principles and details of all the major and modern telecommunications systems currently available to industry and to end users It gives essential information about usage architectures functioning planning construction measurements and optimization The structure of the book is modular giving both overall descriptions of the architectures and functionality of typical use cases as well as deeper and practical guidelines for telecom professionals The focus of the book is on current and future networks and the most up to date functionalities of each network are described in sufficient detail for deployment purposes The contents include an introduction to each technology its evolution path feasibility and utilization solution and network architecture and technical functioning of the systems signaling coding

different modes for channel delivery and security of core and radio system The planning of the core and radio networks system specific field test measurement guidelines hands on network planning advices and suggestions for parameter adjustments and future systems are also described With contributions from specialists in both industry and academia the book bridges the gap between communications in the academic context and the practical knowledge and skills needed to work in the telecommunications industry **Strategic Innovations and Interdisciplinary Perspectives in Telecommunications and Networking** Meghanathan, Natarajan,2019-02-22 The lack of clear communication especially internationally plagues the modern world in a variety of fields Researchers and practitioners within the modern networking and communication industries strive to discover new and innovative ways for humans to better contact one another Strategic Innovations and Interdisciplinary Perspectives in Telecommunications and Networking provides emerging research exploring the theoretical and practical aspects of network management and security as well as applications within computer science mobile and wireless computing and multimedia technology Featuring coverage on a broad range of topics such as coding theory mobile devices and contextual advertising this book is ideal for students researchers social media marketers brand managers networking professionals and engineers seeking current research on cross disciplinary applications of electrical engineering computer science and information technology **4G Wireless Communication Networks** Johnson I. Agbinya,Mari Carmen Aguayo-Torres,Ryszard Klempous,2022-09-01 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 S everal applications of the wireless communication networks including health care underground communication biomedical and bio telemetry systems are detailed in the book **Advanced Information Networking and Applications** Leonard Barolli,Flora Amato,Francesco Moscato,Tomoya Enokido,Makoto Takizawa,2020-03-27 This proceedings book covers the theory design and applications of computer networks distributed computing and information systems Today s networks are evolving rapidly and there are several developing areas and applications These include heterogeneous networking supported by recent technological advances in power wireless communications along with silicon integration of various functionalities such as sensing communications intelligence and actuations which is emerging as a critically important disruptive computer class based on a new platform networking structure and interface that enables novel low cost and high volume applications However implemeting these applications has sometimes been difficult due to interconnection problems As such different networks need to collaborate and wired and next generation wireless systems need to be integrated in order to develop high performance computing solutions to address the problems arising from these networks complexities This ebook presents the latest research findings as well as theoretical and practical perspectives on the innovative methods and development techniques related to the emerging areas of information networking and applications **Software Defined Mobile Networks (SDMN)** Madhusanka Liyanage,Andrei Gurtov,Mika

Ylianttila,2015-06-17 This book describes the concept of a Software Defined Mobile Network SDMN which will impact the network architecture of current LTE 3GPP networks SDN will also open up new opportunities for traffic resource and mobility management as well as impose new challenges on network security Therefore the book addresses the main affected areas such as traffic resource and mobility management virtualized traffics transportation network management network security and techno economic concepts Moreover a complete introduction to SDN and SDMN concepts Furthermore the reader will be introduced to cutting edge knowledge in areas such as network virtualization as well as SDN concepts relevant to next generation mobile networks Finally by the end of the book the reader will be familiar with the feasibility and opportunities of SDMN concepts and will be able to evaluate the limits of performance and scalability of these new technologies while applying them to mobile broadb and networks **The LTE-Advanced Deployment Handbook** Jyrki T. J. Penttinen,2016-01-26 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 3GPPRelease 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 de mystify 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 *Intelligent Data Analysis and Applications* Ajith Abraham,Xin Hua Jiang,Václav Snášel,Jeng-Shyang Pan,2015-07-14 This volume of Advances in Intelligent Systems and Computing contains accepted papers presented in the main track of ECC 2015 the Second Euro China Conference on Intelligent Data Analysis and Applications The aim of ECC is to provide an internationally respected forum for scientific research in the broad area of intelligent data analysis computational intelligence signal processing and all associated applications of AIs The second edition of ECC was organized jointly by VSB Technical University of Ostrava Czech Republic and Fujian University of Technology Fuzhou China The conference organized under the patronage of Mr Miroslav Novak President of the Moravian Silesian Region took place in late June and early July 2015 in the Campus of the VSB Technical University of Ostrava Czech Republic *LTE-A Cellular Networks* Abid Yahya,2016-09-02 In this book three different methods are presented to enhance the capacity and coverage area in LTE A cellular networks The scope involves the evaluation of the effect of the RN location in terms of capacity and the determination of the optimum

location of the relay that provides maximum achievable data rate for users with limited interference at the cell boundaries This book presents a new model to enhance both capacity and coverage area in LTE A cellular network by determining the optimum location for the RN with limited interference The new model is designed to enhance the capacity of the relay link by employing two antennas in RN This design enables the relay link to absorb more users at cell edge regions An algorithm called the Balance Power Algorithm BPA is developed to reduce MR power consumption The book pertains to postgraduate students and researchers in wireless mobile communications *Information and Communication Technology for Development for Africa* Fisseha Mekuria,Ethiopia Nigussie,Tesfa Tegegne,2019-08-01 This book constitutes the proceedings of the Second International Conference on Information and Communication Technology for Development for Africa ICT4DA 2019 held in Bahir Dar Ethiopia in May 2019 The 29 revised full papers presented were carefully reviewed and selected from 69 submissions The papers address the impact of ICT in fostering economic development in Africa In detail they cover the following topics artificial intelligence and data science wireless and mobile computing and Natural Language Processing **Communication Systems and Networks** Subir Biswas,Animesh Mukherjee,Mun Choon Chan,Sandip Chakraborty,Abhinav Kumar,Giridhar Mandyam,Rajeev Shorey,2019-01-16 This book constitutes the refereed proceedings of the 10th International Conference on Communication Systems and Networks COMSNETS 2018 held in Banaglore India in January 2018 The 12 revised full papers presented in this book were carefully reviewed and selected from 134 submissions They cover various topics in networking and communications systems **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 Passive and Active Measurement David Choffnes,Marinho Barcellos,2019-03-12 This book constitutes the proceedings of the 20th International Conference on Passive and Active Measurement PAM 2019 held in Puerto Varas Chile in March 2019 The 20 full papers presented were carefully reviewed and selected from 75 submissions The papers cover a wide range of important networking measurement and analysis topics from low layers of the network stack up to applications using measurements at scales large and small and covering important aspects of the network ecosystem such as routing DNS privacy security and performance They are organized in the following topical sections mobile networks measurement at Internet scale measuremen at other scales domain names failures security and privacy and Web *5G Mobile*

Communications Saad Asif,2018-07-20 This book will help readers comprehend technical and policy elements of telecommunication particularly in the context of 5G It first presents an overview of the current research and standardization practices and lays down the global frequency spectrum allocation process It further lists solutions to accommodate 5G spectrum requirements The readers will find a considerable amount of information on 4G LTE Advanced LTE 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   Key Technologies for 5G Wireless Systems Vincent W. S. Wong,Robert Schober,Derrick Wing Kwan Ng,Li-Chun Wang,2017-03-02 Get up to speed with the protocols network architectures and techniques for 5G wireless networks with this comprehensive guide   **HSPA+ Evolution to Release 12** Harri Holma,Antti Toskala,Pablo Tapia,2014-07-08 A comprehensive reference book codifying the various standards releases for High Speed Packet Access HSPA wireless technology HSPA evolution has maintained its prominence through Releases 7 11 but the evolution is coming to an end with Release 12 with the focus moving to LTE However HSPA network and terminal sales will continue for many years HSPA is expected to remain as the number one radio access technology from the sales point of view far beyond 2015 This timely book examines the complete HSPA evolution and will be the ultimate long term reference for HSPA evolution Headed by the successful editing team of Holma Toskala and Tapia industry experts look at HSPA evolution including complete Release 11 and the main additions in Release 12 They describe 3GPP definitions field measurement expected performance practical optimization guidelines and the implications to the devices and to the networks The book also covers MIMO antenna solutions and multicarrier evolution to provide higher data rates Dedicated chapters include Continuous Packet Connectivity and High Speed Common Channels which provide major improvement to the smartphone capacity end user performance and power consumption The book assumes basic understanding of mobile communications yet the material

is presented in an understandable way which can be enjoyed without any pre information about MIMO or other technology solutions A comprehensive reference book codifying the various standards releases for High Speed Packet Access HSPA wireless technology Leading editor and contributor team focusing their expertise on 3GPP features and performance including Self Organizing Networks LTE Interworking Smartphone Optimization and Voice Evolution Dedicated chapter covering VoIP over HSPA recognizing that telephony will continue to bring most of the revenues to mobile operators in the near future Includes tables figures and plots illustrating the concepts or simulation results to aid readers understanding of the topic An essential resource for R D engineers by network terminal and chip set vendors network engineers with operators application developers regulators   LPWAN Technologies for IoT and M2M Applications Bharat S Chaudhari,Marco Zennaro,2020-03-19 Low power wide area network LPWAN is a promising solution for long range and low power Internet of Things IoT and machine to machine M2M communication applications The LPWANs are resource constrained networks and have critical requirements for long battery life extended coverage high scalability and low device and deployment costs There are several design and deployment challenges such as media access control spectrum management link optimization and adaptability energy harvesting duty cycle restrictions coexistence and interference interoperability and heterogeneity security and privacy and others LPWAN Technologies for IoT and M2M Applications is intended to provide a one stop solution for study of LPWAN technologies as it covers a broad range of topics and multidisciplinary aspects of LPWAN and IoT Primarily the book focuses on design requirements and constraints channel access spectrum management coexistence and interference issues energy efficiency technology candidates use cases of different applications in smart city healthcare and transportation systems security issues hardware software platforms challenges and future directions   *5G System Design* Patrick Marsch,Ömer Bulakci,Olav Queseth,Mauro Boldi,2018-03-28 This book provides a comprehensive overview of the latest research and standardization progress towards the 5th generation 5G of mobile communications technology and beyond It covers a wide range of topics from 5G use cases and their requirements to spectrum 5G end to end E2E system architecture including core network CN transport network TN and radio access network RAN architecture network slicing security and network management It further dives into the detailed functional design and the evaluation of different 5G concepts and provides details on planned trials and pre commercial deployments across the globe While the book naturally captures the latest agreements in 3rd Generation Partnership Project 3GPP New Radio NR Release 15 it goes significantly beyond this by describing the likely developments towards the final 5G system that will ultimately utilize a wide range of spectrum bands address all envisioned 5G use cases and meet or exceed the International Mobile Telecommunications IMT requirements for the year 2020 and beyond IMT 2020 5G System Design Architectural and Functional Considerations and Long Term Research is based on the knowledge and consensus from 158 leading researchers and standardization experts from 54 companies or institutes around the globe representing key mobile network operators network vendors academic

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