

1. Record Nr.	UNINA9910820093203321
Autore	Sauter Martin
Titolo	From GSM to LTE-advanced : an introduction to mobile networks and mobile broadband // Martin Sauter, WirelessMoves, Germany
Pubbl/distr/stampa	Chichester, West Sussex, United Kingdom : , : John Wiley & Sons Inc., , 2014 [Piscataqay, New Jersey] : , : IEEE Xplore, , [2014]
ISBN	1-118-86194-9 1-118-86193-0
Edizione	[Revised second Edition.]
Descrizione fisica	1 online resource (458 p.)
Disciplina	621.3845/6
Soggetti	Mobile communication systems Wireless metropolitan area networks Wireless LANs
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	-- Preface xiii -- 1 Global System for Mobile Communications (GSM) 1 -- 1.1 Circuit-Switched Data Transmission 1 -- 1.1.1 Classic Circuit Switching 2 -- 1.1.2 Virtual Circuit Switching over IP 3 -- 1.2 Standards 4 -- 1.3 Transmission Speeds 5 -- 1.4 The Signaling System Number 7 6 -- 1.4.1 The Classic SS-7 Protocol Stack 7 -- 1.4.2 SS-7 Protocols for GSM 9 -- 1.4.3 IP-Based SS-7 Protocol Stack 10 -- 1.5 The GSM Subsystems 11 -- 1.6 The Network Subsystem 12 -- 1.6.1 The Mobile Switching Center (MSC), Server and Gateway 12 -- 1.6.2 The Visitor Location Register (VLR) 16 -- 1.6.3 The Home Location Register (HLR) 17 -- 1.6.4 The Authentication Center 20 -- 1.6.5 The Short Messaging Service Center (SMSC) 23 -- 1.7 The Base Station Subsystem (BSS) and Voice Processing 25 -- 1.7.1 Frequency Bands 25 -- 1.7.2 The Base Transceiver Station (BTS) 27 -- 1.7.3 The GSM Air Interface 28 -- 1.7.4 The Base Station Controller (BSC) 36 -- 1.7.5 The TRAU for Voice Encoding 40 -- 1.7.6 Channel Coder and Interleaver in the BTS 44 -- 1.7.7 Ciphering in the BTS and Security Aspects 46 -- 1.7.8 Modulation 50 -- 1.7.9 Voice Activity Detection 50 -- 1.8 Mobility Management and Call Control 52 -- 1.8.1 Cell Reselection and Location

Area Update 52 -- 1.8.2 The Mobile-Terminated Call 53 -- 1.8.3 Handover Scenarios 56 -- 1.9 The Mobile Device 58 -- 1.9.1 Architecture of a Voice-Centric Mobile Device 59 -- 1.9.2 Architecture of a Smartphone 60 -- 1.10 The SIM Card 62 -- 1.11 The Intelligent Network Subsystem and CAMEL 67 -- Questions 70 -- References 70 -- 2 General Packet Radio Service (GPRS) and EDGE 73 -- 2.1 Circuit-Switched Data Transmission over GSM 73 -- 2.2 Packet-Switched Data Transmission over GPRS 74 -- 2.3 The GPRS Air Interface 77 -- 2.3.1 GPRS vs. GSM Timeslot Usage on the Air Interface 77 -- 2.3.2 Mixed GSM/GPRS Timeslot Usage in a Base Station 79 -- 2.3.3 Coding Schemes 79 -- 2.3.4 Enhanced Datarates for GSM Evolution (EDGE) 81 -- 2.3.5 Mobile Device Classes 84 -- 2.3.6 Network Mode of Operation 85.

2.3.7 GPRS Logical Channels on the Air Interface 86 -- 2.4 The GPRS State Model 88 -- 2.5 GPRS Network Elements 91 -- 2.5.1 The Packet Control Unit (PCU) 91 -- 2.5.2 The Serving GPRS Support Node (SGSN) 93 -- 2.5.3 The Gateway GPRS Support Node (GGSN) 95 -- 2.6 GPRS Radio Resource Management 96 -- 2.7 GPRS Interfaces 100 -- 2.8 GPRS Mobility Management and Session Management (GMM/SM) 105 -- 2.8.1 Mobility Management Tasks 105 -- 2.8.2 GPRS Session Management 108 -- 2.9 Session Management from a User's Point of View 110 -- 2.10 Small Screen Web Browsing over GPRS and EDGE 114 -- 2.10.1 WAP 1.1 Used in Early GPRS Devices 114 -- 2.10.2 WAP 2.0 117 -- 2.10.3 Small Screen Web Browsing with Network Side Compression 118 -- 2.10.4 Small Screen Web Browsing / Quality of Experience 119 -- 2.11 The Multimedia Messaging Service (MMS) over GPRS 120 -- 2.12 Web Browsing via GPRS 125 -- 2.12.1 Impact of Delay on the Web-Browsing Experience 125 -- 2.12.2 Web Browser Optimization for Mobile Web Browsing 127 -- Questions 128 -- References 128 -- 3 Universal Mobile Telecommunications System (UMTS) and High-Speed Packet Access (HSPA) 129 -- 3.1 Overview, History and Future 130 -- 3.1.1 3GPP Release 99: The First UMTS Access Network Implementation 131 -- 3.1.2 3GPP Release 4: Enhancements for the Circuit-Switched Core Network 133 -- 3.1.3 3GPP Release 5: IMS and High-Speed Downlink Packet Access 134 -- 3.1.4 3GPP Release 6: High-Speed Uplink Packet Access (HSUPA) 137 -- 3.1.5 3GPP Release 7: Even Faster HSPA and Continued Packet Connectivity 137 -- 3.1.6 3GPP Release 8: LTE, Further HSPA Enhancements and Femtocells 138 -- 3.1.7 3GPP Release 9: Digital Dividend and Dual Cell Improvements 139 -- 3.1.8 3GPP Releases 10 and 11: LTE-Advanced 139 -- 3.2 Important New Concepts of UMTS 140 -- 3.2.1 The Radio Access Bearer (RAB) 141 -- 3.2.2 The Access Stratum and Nonaccess Stratum 141 -- 3.2.3 Common Transport Protocols for CS and PS 142 -- 3.3 Code Division Multiple Access (CDMA) 143 -- 3.3.1 Spreading Factor, Chip Rate and Process Gain 146.

3.3.2 The OVSF Code Tree 147 -- 3.3.3 Scrambling in Uplink and Downlink Direction 149 -- 3.3.4 UMTS Frequency and Cell Planning 151 -- 3.3.5 The Near / Far Effect and Cell Breathing 151 -- 3.3.6 Advantages of the UMTS Radio Network Compared to GSM 153 -- 3.4 UMTS Channel Structure on the Air Interface 154 -- 3.4.1 User Plane and Control Plane 154 -- 3.4.2 Common and Dedicated Channels 155 -- 3.4.3 Logical, Transport and Physical Channels 155 -- 3.4.4 Example: Network Search 159 -- 3.4.5 Example: Initial Network Access Procedure 162 -- 3.4.6 The Uu Protocol Stack 164 -- 3.5 The UMTS Terrestrial Radio Access Network (UTRAN) 168 -- 3.5.1 Node-B, Iub Interface, NBAP and FP 168 -- 3.5.2 The RNC, Iu, Iub and Iur Interfaces, RANAP and RNSAP 170 -- 3.5.3 Adaptive Multirate (AMR) NB and WB

Codecs for Voice Calls 174 -- 3.5.4 Radio Resource Control (RRC) States 176 -- 3.6 Core Network Mobility Management 181 -- 3.7 Radio Network Mobility Management 182 -- 3.7.1 Mobility Management in the Cell-DCH State 182 -- 3.7.2 Mobility Management in Idle State 191 -- 3.7.3 Mobility Management in Other States 193 -- 3.8 UMTS CS and PS Call Establishment 194 -- 3.9 UMTS Security 198 -- 3.10 High-Speed Downlink Packet Access (HSDPA) and HSPA+ 199 -- 3.10.1 HSDPA Channels 200 -- 3.10.2 Shorter Delay Times and Hybrid ARQ (HARQ) 202 -- 3.10.3 Node-B Scheduling 204 -- 3.10.4 Adaptive Modulation and Coding, Transmission Rates and Multicarrier Operation 204 -- 3.10.5 Establishment and Release of an HSDPA Connection 207 -- 3.10.6 HSDPA Mobility Management 208 -- 3.11 High-Speed Uplink Packet Access (HSUPA) 209 -- 3.11.1 E-DCH Channel Structure 210 -- 3.11.2 The E-DCH Protocol Stack and Functionality 213 -- 3.11.3 E-DCH Scheduling 215 -- 3.11.4 E-DCH Mobility 217 -- 3.11.5 E-DCH-Capable Devices 218 -- 3.12 Radio and Core Network Enhancements: CPC and One Tunnel 219 -- 3.12.1 A New Uplink Control Channel Slot Format 219 -- 3.12.2 CQI Reporting Reduction and DTX and DRX 220 -- 3.12.3 HS-SCCH Discontinuous Reception 221. 3.12.4 HS-SCCH-less Operation 221 -- 3.12.5 Enhanced Cell-FACH and Cell-/URA-PCH States 222 -- 3.12.6 Radio Network Enhancement: One Tunnel 223 -- 3.13 HSPA Performance in Practice 225 -- 3.13.1 Throughput in Practice 225 -- 3.13.2 Radio Resource State Management 226 -- 3.13.3 Power Consumption 226 -- 3.13.4 Web-Browsing Experience 228 -- 3.14 UMTS and CDMA2000 229 -- Questions 232 -- References 232 -- 4 Long Term Evolution (LTE) and LTE-Advanced 235 -- 4.1 Introduction and Overview 235 -- 4.2 Network Architecture and Interfaces 237 -- 4.2.1 LTE Mobile Devices and the LTE Uu Interface 238 -- 4.2.2 The eNode-B and the S1 and X2 Interfaces 240 -- 4.2.3 The Mobility Management Entity (MME) 244 -- 4.2.4 The Serving Gateway (S-GW) 245 -- 4.2.5 The PDN-Gateway 245 -- 4.2.6 The Home Subscriber Server (HSS) 247 -- 4.2.7 Billing, Prepaid and Quality of Service 248 -- 4.3 FDD Air Interface and Radio Network 249 -- 4.3.1 OFDMA for Downlink Transmission 250 -- 4.3.2 SC-FDMA for Uplink Transmission 252 -- 4.3.3 Symbols, Slots, Radio Blocks and Frames 253 -- 4.3.4 Reference and Synchronization Signals 254 -- 4.3.5 The LTE Channel Model in Downlink Direction 255 -- 4.3.6 Downlink Management Channels 256 -- 4.3.7 System Information Messages 257 -- 4.3.8 The LTE Channel Model in Uplink Direction 257 -- 4.3.9 MIMO Transmission 260 -- 4.3.10 HARQ and Other Retransmission Mechanisms 263 -- 4.3.11 PDCP Compression and Ciphering 266 -- 4.3.12 Protocol Layer Overview 267 -- 4.4 TD-LTE Air Interface 268 -- 4.5 Scheduling 269 -- 4.5.1 Downlink Scheduling 269 -- 4.5.2 Uplink Scheduling 273 -- 4.6 Basic Procedures 274 -- 4.6.1 Cell Search 274 -- 4.6.2 Attach and Default Bearer Activation 276 -- 4.6.3 Handover Scenarios 281 -- 4.6.4 Default and Dedicated Bearers 286 -- 4.7 Mobility Management and Power Optimization 286 -- 4.7.1 Mobility Management in Connected State 286 -- 4.7.2 Mobility Management in Idle State 288 -- 4.7.3 Mobility Management And State Changes In Practice 291 -- 4.8 LTE Security Architecture 291. 4.9 Interconnection with UMTS and GSM 292 -- 4.9.1 Cell Reselection between LTE and GSM/UMTS 293 -- 4.9.2 RRC Connection Release with Redirect between LTE and GSM/UMTS 295 -- 4.9.3 Handover between LTE and GSM/UMTS 296 -- 4.10 Interworking with CDMA2000 Networks 296 -- 4.10.1 Cell Reselection between LTE and CDMA2000 Networks 297 -- 4.10.2 RRC Connection Release with Redirect between LTE and CDMA2000 297 -- 4.10.3 Handover between LTE and

CDMA2000 298 -- 4.11 Network Planning Aspects 298 -- 4.11.1
Single Frequency Network 298 -- 4.11.2 Cell Edge Performance 299 --
4.11.3 Self-Organizing Network Functionality 300 -- 4.12 CS-Fallback
for Voice and SMS Services with LTE 301 -- 4.12.1 SMS over SGs 302 --
4.12.2 CS Fallback 303 -- 4.13 Voice in Combined LTE and CDMA 2000
Networks (SV-LTE) 305 -- 4.14 Voice over LTE (VoLTE) 306 -- 4.14.1
The Session Initiation Protocol (SIP) 306 -- 4.14.2 The IP Multimedia
Subsystem (IMS) and VoLTE 311 -- 4.14.3 Single Radio Voice Call
Continuity 314 -- 4.14.4 Internet-Based Alternatives 316 -- 4.14.5 LTE
Bearer Configurations for VoIP 317 -- 4.15 Backhaul Considerations
318 -- 4.16 LTE-Advanced (3GPP Release 10 / 12) 319 -- 4.16.1
Carrier Aggregation 319 -- 4.16.2 8 x 8 Downlink and 4 x 4 Uplink
MIMO 320 -- 4.16.3 Relays 321 -- 4.16.4 HetNets, ICIC and eICIC 321
-- 4.16.5 Coordinated Multipoint Operation 322 -- 4.16.6 Future LTE
Uses: Machine Type Communication and Public Safety 324 -- Questions
324 -- References 325 -- 5 Wireless Local Area Network (WLAN) 327
-- 5.1 Wireless LAN Overview 327 -- 5.2 Transmission Speeds and
Standards 328 -- 5.3 WLAN Configurations: From Ad Hoc to Wireless
Bridging 329 -- 5.3.1 Ad Hoc, BSS, ESS and Wireless Bridging 329 --
5.3.2 SSID and Frequency Selection 333 -- 5.4 Management Operations
335 -- 5.5 The MAC Layer 340 -- 5.5.1 Air Interface Access Control
340 -- 5.5.2 The MAC Header 343 -- 5.6 The Physical Layer and MAC
Extensions 343 -- 5.6.1 IEEE 802.11b / 11 Mbit/s 343 -- 5.6.2 IEEE
802.11g with up to 54 Mbit/s 347.
5.6.3 IEEE 802.11a with up to 54 Mbit/s 349 -- 5.6.4 IEEE 802.11n with
up to 600 Mbits/s 349 -- 5.6.5 802.11ac Gigabit Wireless 358 -- 5.7
Wireless LAN Security 362 -- 5.7.1 Wired Equivalent Privacy (WEP) 362
-- 5.7.2 WPA and WPA2 Personal Mode Authentication 363 -- 5.7.3
WPA and WPA2 Enterprise Mode Authentication 365 -- 5.7.4 EAP-SIM
Authentication 367 -- 5.7.5 WPA and WPA2 Encryption 368 -- 5.7.6
Wi-Fi-Protected Setup (WPS) 369 -- 5.8 IEEE 802.11e and WMM /
Quality of Service 371 -- 5.9 Comparison of Wireless LAN and LTE 376
-- Questions 379 -- References 379 -- 6 Bluetooth 381 -- 6.1
Overview and Applications 381 -- 6.2 Physical Properties 382 -- 6.3
Piconets and the Master/Slave Concept 385 -- 6.4 The Bluetooth
Protocol Stack 387 -- 6.4.1 The Baseband Layer 387 -- 6.4.2 The Link
Controller 393 -- 6.4.3 The Link Manager 395 -- 6.4.4 The HCI
Interface 397 -- 6.4.5 The L2CAP Layer 398 -- 6.4.6 The Service
Discovery Protocol 400 -- 6.4.7 The RFCOMM Layer 402 -- 6.4.8
Overview of Bluetooth Connection Establishment 404 -- 6.5 Bluetooth
Security 405 -- 6.5.1 Pairing up to Bluetooth 2.0 405 -- 6.5.2 Pairing
with Bluetooth 2.1 (Secure Simple Pairing) 406 -- 6.5.3 Authentication
408 -- 6.5.4 Encryption 408 -- 6.5.5 Authorization 409 -- 6.5.6
Security Modes 411 -- 6.6 Bluetooth Profiles 411 -- 6.6.1 Basic
Profiles: GAP, SDP and the Serial Profile 413 -- 6.6.2 Object Exchange
Profiles: FTP, Object Push and Synchronize 414 -- 6.6.3 Headset,
Hands-Free and SIM Access Profile 416 -- 6.6.4 High-Quality Audio
Streaming 420 -- 6.6.5 The Human Interface Device (HID) Profile 422
-- Questions 424 -- References 424 -- Index 427.

Sommario/riassunto

This revised edition 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". Therefore 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 import
