

1. Record Nr.	UNINA9911019788803321
Titolo	Femtocells : opportunities and challenges for business and technology // by Simon R. Saunders, editor ; Stuart Carlaw ... [et al.]
Pubbl/distr/stampa	Chichester, West Sussex, U.K. ; ; Hoboken, NJ, : Wiley, 2009
ISBN	9786612188909 9781282188907 1282188909 9780470748183 0470748184 9780470748206 0470748206
Edizione	[1st edition]
Descrizione fisica	1 online resource (253 p.)
Collana	Telecoms explained
Altri autori (Persone)	SaundersSimon R CarlawStuart
Disciplina	621.382/1
Soggetti	Home computer networks - Equipment and supplies Wireless LANs - Equipment and supplies Cell phone systems - Equipment and supplies Routers (Computer networks) Radio relay systems Local area networks industry Cell phone equipment industry
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 and index.
Nota di contenuto	-- About the Authors xv -- Foreword xix -- Preface xxi -- Acknowledgements xxiii -- Abbreviations xxv -- List of Figures xxxv -- List of Tables xxxix -- 1 Introduction to Femtocells 1 / Simon Saunders -- 1.1 Introduction 1 -- 1.2 Why Femtocells? The Market Context 1 -- 1.3 The Nature of Mobile Broadband Demand 2 -- 1.4 What is a Femtocell? 4 -- 1.4.1 Femtocell Attributes 6 -- 1.4.2 Femtocell Standards 7 -- 1.4.3 Types of Femtocell 7 -- 1.5 Applications for Femtocells 7 -- 1.6 What a Femtocell is not 8 -- 1.7 The Importance of 'Zero-Touch' 10 -- 1.8 User Benefits 11 -- 1.9

Operator Motivations and Economic Impact	13
1.10 Operator Responses	14
1.11 Challenges	15
1.12 Chapter Overview	15
2 Small Cell Background and Success Factors	17 / Simon Saunders
2.1 Introduction	17
2.2 Small Cell Motivations	17
2.2.1 Cellular Principles	17
2.2.2 Conventional Cell Types: Why 'Femtocells'?	18
2.2.3 Challenges of Achieving Indoor Coverage from Outdoor Macrocells	20
2.2.4 Spectrum Efficiency	21
2.2.5 Geometry Factors	23
2.2.6 The Backhaul Challenge	24
2.3 Other Small-Cell Systems	24
2.3.1 Overview	24
2.3.2 Picocells	24
2.3.3 Distributed Antenna Systems	25
2.3.4 Wireless Local Area Networks	27
2.4 The Small-Cell Landscape	28
2.5 Emergence of the Femtocell / Critical Success Factors	29
2.5.1 Mobile Data Adoption and Revenue Growth	30
2.5.2 Broadband Adoption	30
2.5.3 Connecting Four Billion Users / And Counting	31
2.5.4 Internet Applications	33
2.5.5 Fixed / Mobile Substitution	33
2.5.6 User Device Availability	36
2.5.7 Processing Power and Cost	36
2.6 Conclusions	37
3 Market Issues for Femtocells	39 / Stuart Carlaw
3.1 Key Benefits of a Femtocell from Market Perspective	39
3.1.1 In-Home Coverage	39
3.1.2 Macro Network Capacity Gain	40
3.1.3 Termination Fees	40
3.1.4 Simplistic Handset Approach	41
3.1.5 Home Footprint and the Quadruple Play	41
3.1.6 Maximising Returns on Spectrum Investment	42
3.1.7 Churn Reduction / The Sticky Bundle	42
3.1.8 Positive Impact on Subsidisation Trends	43
3.1.9 Value-Added Services	43
3.1.10 Changing User Behaviour	43
3.1.11 Reducing Energy Consumption	44
3.2 Key Primers	44
3.2.1 Broadband Penetration	44
3.2.2 Saturation	45
3.2.3 Evolution in Carrier Business Model	46
3.2.4 Competition	47
3.2.5 Technical Feasibility	48
3.2.6 Economics	48
3.2.7 Limitations in Other Services	49
3.2.8 Carrier and Manufacturer Support	49
3.2.9 Consumer Demand	50
3.2.10 Supporting the Data Boom	50
3.2.11 Growing Standardisation	50
3.2.12 Air Interface Technology Evolution	52
3.3 Key Market Challenges	52
3.3.1 Cost Pressure	52
3.3.2 Intellectual Property Rights	53
3.3.3 Technology Issues	53
3.3.4 Establishing a 'Sellable' Proposition	54
3.3.5 Disconnect Between OEMs and Carriers	54
3.3.6 Too Much Reliance on Standards	54
3.3.7 Window of Opportunity	55
3.3.8 Developing the Ecosystem	55
3.4 Business Cases for Femtocells	55
3.4.1 Business Case Foundations	55
3.4.2 Exploring the Economics	57
3.5 Air Interface Choices	60
3.5.1 GSM Advantages	60
3.5.2 GSM Disadvantages	61
3.5.3 WCDMA Advantages	61
3.5.4 WCDMA Disadvantages	61
3.5.5 Conclusions	61
3.5.6 HSDPA, HSUPA and HSPA+	62
3.6 Product Feature Sets	62
3.6.1 Stand-Alone	62
3.6.2 Broadband Gateway	63
3.6.3 Wi-Fi Access Point	63
3.6.4 TV Set-Top Box	63
3.6.5 Video Distribution Mechanisms	64
3.6.6 Segmentation	64
3.7 Additional Considerations	64
3.7.1 Enterprise Femtocells	64
3.7.2 Super-Femtocells and Outdoor Femtocells	65
3.8 Adoption Forecasts and Volumes	65
3.8.1 Methodology	65
3.8.2 Forecasts	68
3.9 Conclusions	70
4 Radio Issues for Femtocells	71 / Simon Saunders
4.1 Introduction	71
4.2 Spectrum Scenarios	71
4.3 Propagation in Femtocell Environments	73
4.4 Coverage	74
4.5 Downlink Interference	75
4.6 Interference Challenges and Mitigations	79
4.7 Femtocell-to-Femtocell Interference	80
4.8 System-Level Performance	81
4.9 RF Specifications in WCDMA	84
4.10 Health and Safety Concerns	86
4.11 Conclusions	89
5 Femtocell Networks and Architectures	91 / Andrea Giustina
5.1 Introduction	91
5.2 Challenges	92
5.3 Requirements	93
5.4 Femto	

Architectures and Interfaces	94
5.5 Key Architectural Choices	96
5.5.1 Connecting Remote Femtocells	96
5.5.2 Integrating the Femto Network with the Macro Network	98
5.5.3 Functional Split between the FAP and the FGW	100
5.6 Other Important Femto Solution Aspects	101
5.6.1 End-to-End Quality of Service	102
5.6.2 Local Access (Data and Voice)	103
5.6.3 Femtozone Services	105
5.6.4 Mobility	106
5.6.5 Femtocell Location	108
5.6.6 Enterprise and Open Spaces	109
5.7 UMTS Femtos	110
5.7.1 Iuh Protocol Stacks	110
5.8 CDMA	112
5.9 WiMAX	113
5.10 GSM	114
5.11 LTE	115
5.12 Conclusions	116
6 Femtocell Management	117
6.1 Introduction	117
6.2 Femtocell FCAPS Requirements	118
6.2.1 Fault and Event Management	119
6.2.2 Configuration Management	119
6.2.3 Accounting and Administration Management	119
6.2.4 Performance Management	120
6.2.5 Security Management	120
6.3 Broadband Forum Auto-Configuration Architecture and Framework	120
6.4 Auto-Configuration Data Organisation	121
6.4.1 Data Hierarchy	121
6.4.2 Profiles	123
6.5 CPE WAN Management Protocol Overview	123
6.5.1 Protocol Stack and Operation	124
6.6 FAP Service Data Model	126
6.6.1 Control Object Group	126
6.6.2 Configuration Object Group	126
6.6.3 Monitoring Object Group	128
6.6.4 Management Object Group	129
6.7 DOCSIS OSS Architecture and Framework	129
6.8 Conclusions	132
7 Femtocell Security	133
7.1 Why is Security Important?	133
7.1.1 Viewpoint: Continuity	133
7.1.2 Viewpoint: (Contained) Change	134
7.2 The Threat Model	134
7.2.1 Threats from 'Outsiders' / Third Parties	135
7.2.2 Threats from 'Insiders' / Device Owners	135
7.3 Countering the Threats	136
7.3.1 Radio Link Protection	136
7.3.2 Protecting the (IP) Backhaul	138
7.3.3 Device Integrity / Tamper Resistance	143
7.4 Conclusions	145
8 Femtocell Standards and Industry Groups	147
8.1 The Importance of Standards	147
8.2 GSM	148
8.3 WCDMA	148
8.3.1 TSG RAN WG2 / Radio Layer 2 and Radio Layer 3 RR	149
8.3.2 TSG RAN WG3 Architecture	149
8.3.3 TSG RAN WG4 Radio Performance and Protocol Aspects RF Parameters and BS Conformance	150
8.3.4 TSG SA WG1 / Services	150
8.3.5 TSG SA WG3 / Security	150
8.3.6 TSG SA WG5 Telecom Management	151
8.3.7 Summary of WCDMA Standards	151
8.4 TD-SCDMA	151
8.5 LTE	151
8.6 CDMA	153
8.7 Mobile WiMAX	155
8.8 The Femto Forum	156
8.9 The Broadband Forum	157
8.10 GSMA	157
8.11 Conclusions	157
9 Femtocell Regulation	159
9.1 Introduction	159
9.2 Regulatory Benefits of Femtocells	159
9.3 Spectrum Efficiency	160
9.4 Economic Efficiency	160
9.5 Enabling Competition	160
9.6 Broadening Access to Services	161
9.7 Enabling Innovation	161
9.8 Environmental Goals	161
9.9 Spectrum Licensing Issues	162
9.10 Location	163
9.11 Authentication	163
9.12 Emergency Calls	163
9.13 Lawful Interception and Local IP Access	164
9.14 Backhaul Challenges	165
9.15 Mobile Termination Rates	165
9.16 Competition Concerns	166
9.17 Equipment Approvals	166
9.18 Examples of Femtocell Regulations	166
9.19 Conclusions	168
10 Femtocell Implementation Considerations	169
10.1 Introduction	169
10.2 Signal Processing	170
10.3 Location	170
10.4 Frequency and Timing Control	171
10.5 Protocol Implementation	172
10.6 RF Implementation	172
10.7 System Design and Cost	173
10.8 Mobile Device Challenges and Opportunities	175
10.9 Conclusions	176
11 Business and Service Options for Femtocells	177
Simon Saunders and Stuart Carlaw.	

11.1 Introduction 177 -- 11.2 Ways of being a Femtocell Operator 177 -- 11.3 Femtocells for Fixed-Line Operators 180 -- 11.4 Types of Femtocell Service 181 -- 11.5 Service Examples 182 -- 11.5.1 Femtozone Services 182 -- 11.5.2 Connected Home Services 184 -- 11.6 Service Enablers 185 -- 11.6.1 Service Implementation 186 -- 11.7 Stages of Femtocell Service Introduction 186 -- 11.7.1 Stage 1 / Supporting Fixed Mobile Substitution 187 -- 11.7.2 Stage 2 / Prompting Mobile Data Uptake 187 -- 11.7.3 Stage 3 / Bringing the Mobile Phone into the Connected Home Concept 187 -- 11.7.4 Stage 4 / Taking the Connected Home into the Wider World 187 -- 11.8 Conclusions 188 -- 12 Summary: The Status and Future of Femtocells 189 / Simon Saunders -- 12.1 Summary 189 -- 12.2 Potential Future Femtocell Landscape 191 -- 12.2.1 Growth of Femtocell Adoption 191 -- 12.2.2 Femtocells in Homes and Offices 192 -- 12.2.3 Femtocells in Developing and Rural Markets 192 -- 12.2.4 Femtocells Outdoors 192 -- 12.2.5 Femtocell-Only Operators 193 -- 12.2.6 Femtos Enabling Next-Generation Mobile Networks 193 -- 12.2.7 When is a Femtocell not a Femtocell? 195 -- 12.3 Concluding Remarks 195 -- References 197 -- Further Reading 203 -- Appendix: A Brief Guide to Units and Spectrum 205 -- Index 207.

Sommario/riassunto

Femtocells are low-power wireless access points used in the home and office. They operate in licensed spectrum to connect standard mobile phones (WCDMA, LTE, WiMAX, CDMA and GSM) and other mobile devices to a mobile operator's network via standard broadband internet connections. This technology is of high interest for mobile operators and for millions of users who will benefit from enhanced access to mobile broadband services. Femtocells outlines how wireless access points can be used by mobile operators to provide high-speed wireless access, enhancing coverage and capacity and delivering entirely new services, while maximising the benefits of licensed spectrum. The book examines the market, exploring commercial and technical factors which are critical in the initial deployment and long-term success of femtocells. Business, standards and regulatory aspects are also considered to provide a complete but concise overview. . One of the first authoritative texts to concentrate on femtocells. Written by expert authors from industry including leading analysts, femtocell and system vendors. Covers both technology and business aspects in detail. Provides overview of the relevant standards across WCDMA, LTE, CDMA, WiMAX and GSM air interfaces.
