

1. Record Nr.	UNINA9910809220703321
Titolo	Heterogeneous cellular networks // editors, Rose Qingyang Hu, Utah State University, USA, Yi Qian, University of Nebraska-Lincoln, USA
Pubbl/distr/stampa	Chichester, West Sussex, United Kingdom : , : Wiley, , 2013 [Piscataway, New Jersey] : , : IEEE Xplore, , [2013]
ISBN	1-118-55526-0 1-118-55531-7 1-299-46524-2 1-118-55536-8
Descrizione fisica	1 online resource (380 p.)
Disciplina	621.3845/6
Soggetti	Cell phone systems Internetworking (Telecommunication)
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	Contributors xiii -- Preface xv -- 1 Overview of Heterogeneous Networks 1 -- 1.1 Motivations for Heterogeneous Networks 2 -- 1.1.1 Explosive Growth of Data Capacity Demands 2 -- 1.1.2 From Spectral Efficiency to Network Efficiency 3 -- 1.1.3 Challenges in Service Revenue and Capacity Investment 5 -- 1.2 Definitions of Heterogeneous Networks 5 -- 1.3 Economics of Heterogeneous Networks 6 -- 1.3.1 Total Cost of Ownership 7 -- 1.3.2 Heterogeneous Networks Use Scenarios 8 -- 1.3.3 General Trends in Heterogeneous Networks Development 10 -- 1.4 Aspects of Heterogeneous Network Technology 10 -- 1.4.1 RF Interference 10 -- 1.4.2 Radio System Configuration 12 -- 1.4.3 Network Coupling 13 -- 1.4.4 User and Device Credential 14 -- 1.4.5 Interworking 15 -- 1.4.6 Handover 16 -- 1.4.7 Data Routing 18 -- 1.4.8 Quality of Service 19 -- 1.4.9 Security and Privacy 21 -- 1.4.10 Capacity and Performance Evaluation 22 -- 1.5 Future Heterogeneous Network Applications 22 -- References 24 -- Part I Radio Resource and Interference Management -- 2 Radio Resource and Interference Management for Heterogeneous Networks 29 -- 2.1 Introduction 29 -- 2.2 Heterogeneous Networks Deployment

Scenarios and Interference Management Categories Based on Spectrum Usage	31
-- 2.2.1 Heterogeneous Network Deployment Scenarios	31
-- 2.2.2 Interference Management Categories Based on Spectrum Usage	33
-- 2.3 Multi-carrier Inter-cell Interference Management for Heterogeneous Networks	33
-- 2.3.1 Interference Management via Carrier Partitioning	34
-- 2.3.2 Enhanced Carrier Reuse with Power Control	36
-- 2.3.3 Carrier Aggregation Based Inter-cell Interference Coordination	36
-- 2.4 Co-channel Inter-cell Interference Management for Heterogeneous Networks	38
-- 2.4.1 Control Channel Interference Management	39
-- 2.4.2 Data Channel Interference Management	46
-- 2.5 Conclusion	48
-- References	48
-- 3 Capacity and Coverage Enhancement in Heterogeneous Networks	51
-- 3.1 Introduction	52
-- 3.2 Deployment Scenarios	54
-- 3.2.1 Multi-tier Network Elements	54
-- 3.2.2 Multi-radio Techniques	55
-- 3.3 Multi-tier Interference Mitigation	56
-- 3.3.1 Multi-tier Spectral Reuse Scenarios	56
-- 3.3.2 Cross-tier Interference	56
-- 3.3.3 Network Synchronization for IM	57
-- 3.3.4 Overview of Interference Mitigation Techniques	57
-- 3.3.5 Performance Comparison of IM Schemes	60
-- 3.4 Multi-radio Performance	61
-- 3.5 Standardization and Future Research Directions	62
-- 3.5.1 Status of Wireless Standards	62
-- 3.5.2 Future Research Directions	62
-- 3.6 Conclusion	64
-- References	64
-- 4 Cross-tier Interference Management in 3GPP LTE-Advanced Heterogeneous Networks	67
-- 4.1 Introduction	67
-- 4.1.1 Heterogeneous Network Deployments	68
-- 4.1.2 OSG Scenario	68
-- 4.1.3 CSG Scenario	70
-- 4.2 Interference Management for LTE and LTE-Advanced Networks	70
-- 4.2.1 Interference Management Methods for Homogenous Networks	71
-- 4.2.2 Interference Management for Heterogeneous Networks	73
-- 4.2.3 Time Domain Based ICIC Schemes	74
-- 4.2.4 Power Setting for Femtocells	85
-- 4.3 Conclusions	89
-- Appendix: Simulation Models	89
-- References	92
-- 5 Inter-cell Interference Management for Heterogeneous Networks	93
-- 5.1 Introduction	93
-- 5.2 Conventional Inter-cell Interference Coordination	95
-- 5.3 Enhanced Inter-cell Interference Coordination	98
-- 5.3.1 Interference Scenarios in Heterogeneous Networks	98
-- 5.3.2 Enhanced ICIC Solutions for Heterogeneous Networks	100
-- 5.4 Conclusion	116
-- References	116
-- 6 Cognitive Radios to Mitigate Interference in Macro/femto Heterogeneous Networks	119
-- 6.1 Introduction	119
-- 6.2 Information Requirement and Acquisition for Interference Mitigation	122
-- 6.3 Descriptions of System Models	124
-- 6.3.1 Two-tier Network Architecture	124
-- 6.3.2 Channel Model	124
-- 6.3.3 Traffic Model	125
-- 6.3.4 CR-enabled Operations	125
-- 6.4 Cross-tier Interference Mitigation	125
-- 6.4.1 Interference Coordination: Orthogonality in the Time/Frequency Domain	125
-- 6.4.2 Interference Coordination: Orthogonality in the Antenna Spatiality Domain	126
-- 6.4.3 Interference Cancellation: Coding Techniques	129
-- 6.5 Intra-tier Interference Mitigation	130
-- 6.5.1 Strategic Game for Collocated Femtocells	131
-- 6.5.2 Gibbs Sampler for Collocated Femtocells	132
-- 6.6 Interference Mitigation for Machine-to-Machine Communications	136
-- 6.6.1 Background of Compressive Sensing	138
-- 6.6.2 SMRM for Femtocells	138
-- 6.6.3 Compressive Sensing for the Spectrum Map Construction	140
-- 6.6.4 Performance Evaluations	140
-- 6.7 Conclusion	141
-- References	142
-- 7 Game Theoretic Approach to Distributed Bandwidth Allocation in OFDMA-based Self-organizing Femtocell Networks	145
-- 7.1 Introduction	145
-- 7.2 Distributed Bandwidth Allocation	146
-- 7.3 Convergence Analysis	150
-- 7.4 Choice of Utility Function and its Parameters	152
-- 7.5 Simulation Results	155
-- 7.5.1 Convergence Studies	156
-- 7.5.2 Bandwidth Allocation and Network Tuning	156
-- 7.6 Extensions and	

Discussions 159 -- 7.7 Conclusion 162 -- Acknowledgement 162 --
References 162 -- Part II Mobility and Handover Management -- 8
Mobility Management and Performance Optimization in Next
Generation Heterogeneous Mobile Networks 167 -- 8.1 Introduction
167 -- 8.2 Overview of Mobility Management in RRC-connected State
168 -- 8.3 Mobility Robustness Optimization 171 -- 8.4 Mobility Load
Balancing Optimization 176 -- 8.4.1 Related Works 177 -- 8.4.2
Problem Description 177 -- 8.4.3 Load Balancing Algorithm with
Penalized Handovers 180 -- 8.4.4 Numerical Examples 182 -- 8.5
Cooperation of MRO and MLB 185 -- 8.5.1 Achieve Load Balance by
Adjusting CI O 186 -- 8.5.2 Coordination Rules between MRO and MLB
186 -- 8.5.3 Jointly Consider MRO and MLB 187 -- 8.5.4 Simulation
Results 188 -- 8.6 Mobility Enhancement for Femtocells 192 -- 8.7
Conclusion 194 -- Acknowledgements 195 -- References 195 -- 9
Connected-mode Mobility in LTE Heterogeneous Networks 199 -- 9.1
Introduction 199 -- 9.2 Cell Selection and Problem Statement 200 --
9.3 Simulation Methodology 202 -- 9.4 Handover Modelling 207.
9.5 Results 210 -- Reference 214 -- 10 Cell Selection Modes in LTE
Macro / Femtocell Deployment 215 -- 10.1 Introduction 215 -- 10.2
Distinction of Cells 216 -- 10.3 Access Control 219 -- 10.3.1 Access
Control Scenarios 220 -- 10.3.2 Access Control Executor 220 -- 10.3.3
Access Control Mechanisms 223 -- 10.3.4 Performance of Access
Control Mechanisms 225 -- 10.4 Cell Selection and Cell Reselection
231 -- 10.4.1 UE in Idle Mode 232 -- 10.4.2 PLMN Selection 234 --
10.4.3 Cell Selection 235 -- 10.4.4 Cell Reselection 239 -- 10.4.5 Cell
Reselection with Femtocells 241 -- References 244 -- 11 Distributed
Location Management for Generalized HetNets. Case Study of All-
wireless Networks of Femtocells 247 -- 11.1 Introduction 247 --
11.1.1 Motivation 248 -- 11.1.2 Approach 249 -- 11.1.3 On Location
Management in Generalized HetNets 250 -- 11.2 Background on
Geographic Routing and Geographic Location Management 250 -- 11.3
All-wireless Networks of Femtocells 252 -- 11.3.1 Challenges of All-
wireless Networks of Femtocells 253 -- 11.4 Architecture for
Geographic-based All-wireless Networks of Femtocells 254 -- 11.4.1
Overview of the Architecture 254 -- 11.4.2 Network Entities Supporting
Networks of Femtocells 255 -- 11.4.3 Operation of the Network of
Femtocells 256 -- 11.4.4 Sample Protocol Stacks for Wifi-based All-
wireless NoFs 257 -- 11.4.5 Other Relevant Issues 257 -- 11.5
Location Management Procedures 258 -- 11.5.1 Paging 259 -- 11.5.2
Handoff 260 -- 11.6 Summary and Conclusions 262 --
Acknowledgements 263 -- References 263 -- 12 Vertical Handover in
Heterogeneous Networks: a Comparative Experimental and Simulation-
based Investigation 265 -- 12.1 Introduction 265 -- 12.2 Preliminaries
on VHO 266 -- 12.3 Experimental Investigation 267 -- 12.3.1 VHO
Decision Algorithms 267 -- 12.3.2 Experimental Setup and Results 270
-- 12.4 Simulation-based Investigation 274 -- 12.4.1 The OPNET
Simulator 274 -- 12.4.2 Performance Results 276 -- 12.5 Discussion
on the VHO in HetNets 283 -- 12.5.1 Role of the (Internal) Decision
Algorithm 283.
12.5.2 Role of the Authentication Procedures 283 -- 12.5.3 Impact of
VHO on HetNet Coverage 284 -- 12.5.4 Impact of VHO on HetNet
Capacity 284 -- 12.6 Conclusions 284 -- Acknowledgment 285 --
References 285 -- Part III Deployment, Standardization and Field Trials
-- 13 Evolution of HetNet Technologies in LTE-advanced Standards 289
-- 13.1 Introduction 289 -- 13.2 Deployment Scenarios for LTE-
advanced HetNet 290 -- 13.2.1 Macro / Femto Scenario 291 -- 13.2.2
Macro / Pico Scenario 292 -- 13.3 Inter-cell Interference Coordination
for HetNet 292 -- 13.3.1 Rel-8/9 ICIC 293 -- 13.3.2 Rel-10 Enhanced

ICIC 294 -- 13.3.3 System-level Performance of HetNet with Time-domain eICIC 299 -- 13.4 Ongoing Work in Rel-11 LTE-A 305 -- 13.4.1 Support of Non-zero Power ABS 306 -- 13.4.2 Network-assisted Cell Acquisition for CRE UE in Low Geometry 308 -- 13.4.3 Mitigation of CRS Interference for CRE UE in Low Geometry 309 -- 13.5 Conclusion 310 -- References 310 -- 14 Macro / Femto Heterogeneous Network Deployment and Management 313 -- 14.1 Introduction 314 -- 14.2 Frameworks for Macro / Femto Network Deployment and Management 315 -- 14.2.1 Joint-deployment Framework 315 -- 14.2.2 WSP-deployment Framework 318 -- 14.2.3 User-deployment Framework 318 -- 14.3 Revenue Maximization with WSP-deployed Femto-BSs 319 -- 14.3.1 On Cross-tier Channel Allocation 320 -- 14.3.2 On Optimal Pricing and Spectrum Partition 326 -- 14.4 Summary 332 -- References 333 -- 15 Field Trial of LTE Technology 335 -- 15.1 Introduction 335 -- 15.2 Field Trial Overview 336 -- 15.2.1 UE Antennas 337 -- 15.2.2 Network Configuration and Field Trial Setup 338 -- 15.3 Measurement Results 338 -- 15.4 Summary Comparison 344 -- 15.5 Conclusion 346 -- References 347 -- Index 349.

Sommario/riassunto

A timely publication providing coverage of radio resource management, mobility management and standardization in heterogeneous cellular networks. The topic of heterogeneous cellular networks has gained momentum in industry and the research community, attracting the attention of standardization bodies such as 3GPP LTE and IEEE 802.16j, whose objectives are looking into increasing the capacity and coverage of the cellular networks. This book focuses on recent progresses, covering the related topics including scenarios of heterogeneous network deployment, interference management in the heterogeneous network deployment, carrier aggregation in a heterogeneous network, cognitive radio, cell selection/reselection and load balancing, mobility and handover management, capacity and coverage optimization for heterogeneous networks, traffic management and congestion control. This book enables readers to better understand the technical details and performance gains that are made possible by this state-of-the-art technology. It contains the information necessary for researchers and engineers wishing to build and deploy highly efficient wireless networks themselves. To enhance this practical understanding, the book is structured to systematically lead the reader through a series of case-studies of real world scenarios. Key features: . Presents this new paradigm in cellular network domain: a heterogeneous network containing network nodes with different characteristics such as transmission power and RF coverage area. Provides a clear approach by containing tables, illustrations, industry case studies, tutorials and examples to cover the related topics. Includes new research results and state-of-the-art technological developments and implementation issues.
