

1. Record Nr.	UNINA9910830711503321
Autore	Rupp Markus <1963->
Titolo	Video and multimedia transmissions over cellular networks : analysis, modeling, and optimization in live 3G mobile networks / / Markus Rupp
Pubbl/distr/stampa	Chichester, West Sussex, U.K. ; , : Wiley, , 2009 [Piscataway, New Jersey] : , : IEEE Xplore, , [2009]
ISBN	1-282-29168-8 9786612291685 0-470-74777-3 0-470-74776-5
Descrizione fisica	1 online resource (414 p.)
Disciplina	006.7
Soggetti	Multimedia communications Wireless communication systems Mobile computing Video telephone
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	-- List of Contributors xiii -- About the Contributors xv -- Foreword xix -- Preface xxi -- Acknowledgements xxv -- List of Abbreviations xxvii -- I Cellular Mobile Systems 1 -- 1 Introduction to Radio and Core Networks of UMTS 5 /Philipp Svoboda and Wolfgang Karner -- 1.1 UMTS Network Architecture 7 -- 1.2 UTRAN Architecture 8 -- 1.2.1 UTRAN Protocol Architecture 9 -- 1.2.2 Physical Layer Data Processing in the UTRAN Radio Interface 13 -- 1.3 UMTSPS-core Network Architecture 16 -- 1.4 A Data Session in a 3GNetwork 18 -- 1.4.1 The UMTS (PS-core) Protocol Stack 19 -- 1.4.2 The Protocols 20 -- 1.4.3 Bearer Speed in UMTS 23 -- 1.5 Differences between 2.5G and 3G Core Network Entities 23 -- 1.5.1 GPRS Channels 24 -- 1.5.2 GPRS Core Network Architecture 25 -- 1.5.3 The GPRS Protocol Stack 25 -- 1.5.4 Bearer Speed in GPRS and EDGE 27 -- 1.6 HSDPA: an Evolutionary Step 27 -- 1.6.1 Architecture of HSDPA 28 -- 1.6.2 Difference between UMTS and HSDPA 29 -- 1.6.3 Transport and Control Channels 31 -- References 32 -- II Analysis and Modelling of the Wireless Link 35 -- 2

Measurement-based Analysis of UMTS Link Characteristics	39
/Wolfgang Karner -- 2.1 Measurement Setup	40
-- 2.1.1 General Setup	40
-- 2.1.2 Mobility Scenarios	42
-- 2.2 Link Error Analysis	46
-- 2.2.1 Link Error Probability	46
-- 2.2.2 Number of erroneous TBs in TTIs	48
-- 2.2.3 TTI-burstlength,TTI-gaplength	48
-- 2.2.4 TB Error Bursts, TB Error Clusters	50
-- 2.2.5 The Influence of TPC on Link Error Characteristics	52
-- 2.2.6 Statistical Dependency between Successive Gaps/Bursts	54
-- 2.2.7 Block Error Ratio (BLER)	55
-- 2.3 Dynamic Bearer Type Switching	56
-- 2.3.1 Measurement-based Analysis of Dynamic Bearer Type Switching	57
-- References	60
-- 3 Modelling of Link Layer Characteristics	61
/Wolfgang Karner -- 3.1 Modelling Erroneous Channels / A Literature Survey	61
-- 3.2 Link Error Models for the UMTSDCH	66
-- 3.2.1 Link Error Modelling / 'Dynamic' Case	67
-- 3.2.2 Link Error Modelling / 'Static' Case	69
-- 3.3 Impact of Channel Modelling on the Quality of Services for Streamed Video	75
-- 3.3.1 Compared Models	76
-- 3.3.2 Experimental Setup	76
-- 3.3.3 Simulation Results for H.264 Encoded Video over Error Prone Links	78
-- 3.4 A Dynamic Bearer Type Switching Model	83
-- 3.4.1 Four-state Markov Model	83
-- 3.4.2 Enhanced Four-state Model	84
-- References	86
-- 4 Analysis of Link Error Predictability in the UTRAN	89
/Wolfgang Karner -- 4.1 Prediction of Low Error Probability Intervals	90
-- 4.1.1 Detection of Start of Intervals	90
-- 4.1.2 Interval Length L_i	91
-- 4.2 Estimation of Expected Failure Rate	92
-- References	95
-- III Video Coding and Error Handling	97
-- 5 Principles of Video Coding	101
/Olivia Nemethova -- 5.1 Video Compression	101
-- 5.1.1 Video Sampling	101
-- 5.1.2 Compression Mechanisms	103
-- 5.1.3 Structure of Video Streams	107
-- 5.1.4 Profiles and Levels	108
-- 5.1.5 Reference Software	108
-- 5.2 H.264/AVC Video Streaming in Error-prone Environment	109
-- 5.2.1 Error Propagation	109
-- 5.2.2 Standardized Error Resilience Techniques	110
-- 5.2.3 Alternative Error Resilience Techniques	111
-- 5.3 Error Concealment	112
-- 5.3.1 Spatial Error Concealment	113
-- 5.3.2 Temporal Error Concealment Methods	115
-- 5.4 Performance Indicators	118
-- References	120
-- 6 Error Detection Mechanisms for Encoded Video Streams	125
/Luca Superiori, Claudio Weidmann and Olivia Nemethova -- 6.1 Syntax Analysis	126
-- 6.1.1 Structure of VCL NALUs	126
-- 6.1.2 Rules of Syntax Analysis	128
-- 6.1.3 Error-handling Mechanism	131
-- 6.1.4 Simulation Setup	133
-- 6.1.5 Subjective Quality Comparison	134
-- 6.1.6 Detection Performance	135
-- 6.2 Pixel-domain Impairment Detection	137
-- 6.2.1 Impairments in the Inter Frames	137
-- 6.2.2 Impairments in the Intra Frames	138
-- 6.2.3 Performance Results	139
-- 6.3 Fragile Watermarking	140
-- 6.4 VLC Resynchronization	146
-- 6.4.1 Signalling of Synchronization Points	146
-- 6.4.2 Codes for Length Indicators	148
-- 6.5 From Error Detection to Soft Decoding	151
-- 6.5.1 Sequential CAVLC Decoder	152
-- 6.5.2 Additional Synchronization Points	153
-- 6.5.3 Postprocessing	154
-- 6.5.4 Performance	154
-- References	157
-- IV Error Resilient Video Transmission over UMTS	159
-- 7 3GPP Video Services / Video Codecs, Content Delivery Protocols and Optimization Potentials	163
/Thomas Stockhammer and Jiangtao Wen -- 7.1 3GPP Video Services	163
-- 7.1.1 Introduction	163
-- 7.1.2 System Overview	164
-- 7.1.3 Video Codecs in 3GPP	166
-- 7.1.4 Bearer and Transport QoS	169
-- 7.1.5 QoS using Video Error Resilience	171
-- 7.2 Selected QoS Tools / Principles and Experimental Results	171
-- 7.2.1 3GDedicatedChannelLinkLayer	171
-- 7.2.2 Experimental Results for Conversational Video	173
-- 7.2.3 Experimental Results for Moderate-delay Applications	175
-- 7.2.4 System Design Guidelines	177
-- 7.3	

Selected Service Examples	178
7.3.1 Multimedia Telephony Services	178
7.3.2 Multimedia Download Delivery	180
7.3.3 Multimedia Streaming Services over MBMS	181
7.4 Conclusions	184
References	184
8 Cross-layer Error Resilience Mechanisms	187
/Olivia Nemethova, Wolfgang Karner and Claudio Weidmann	
8.1 Link Layer Aware Error Detection	188
8.1.1 Error Detection at RLC Layer	188
8.1.2 RLC PDU Based VLC Resynchronization	189
8.1.3 Error Detection and VLC Resynchronization Efficiency	191
8.2 Link Error Prediction Based Redundancy Control	192
8.2.1 Redundancy Control	192
8.3 Semantics-aware Scheduling	196
8.3.1 Scheduling Mechanism	196
8.3.2 Performance Evaluation	199
8.4 Distortion-aware Scheduling	202
8.4.1 Scheduling Mechanism	202
8.4.2 Distortion Estimation	203
8.4.3 Performance Evaluation	207
References	209
V Monitoring and QoS Measurement	211
9 Traffic and Performance Monitoring in a Real UMTS Network	215
/Fabio Ricciato	
9.1 Introduction to Traffic Monitoring	215
9.2 Network Monitoring via Traffic Monitoring: the Present and the Vision	216
9.3 A Monitoring Framework for 3G Networks	219
9.4 Examples of Network-centric Applications	220
9.4.1 Optimization in the Core Network Design	220
9.4.2 Parameter Optimization	221
9.4.3 What-if Analysis	222
9.4.4 Detecting Anomalies	223
9.5 Examples of User-centric Applications	224
9.5.1 Traffic Classification	225
9.5.2 QoS and QoE monitoring	226
9.6 Summary	226
References	227
10 Traffic Analysis for UMTS Network Validation and Troubleshooting	229
/Fabio Ricciato and Peter Romirer-Maierhofer	
10.1 Case study: Bottleneck Detection	229
10.1.1 Motivations and Problem Statement	229
10.1.2 Input Traces	233
10.1.3 Diagnosis based on Aggregate Traffic Rate Moments	234
10.1.4 Diagnosis based on TCP Performance Indicators	239
10.2 Case Study: Analysis of One-way Delays	243
10.2.1 Motivations	243
10.2.2 Measurement Methodology	244
10.2.3 Detecting Micro Congestion Caused by High-rate Scanners	245
10.2.4 Revealing Network Equipment Problems	249
10.2.5 Exploiting One-way Delays for Online Anomaly Detection	250
References	254
11 End-to-End Video Quality Measurements	257
/Michal Ries	
11.1 Test Methodology for Subjective Video Testing	260
11.1.1 Video Quality Evaluation	261
11.1.2 Subjective Testing	263
11.1.3 Source Materials	263
11.2 Results of Subjective Quality Tests	265
11.2.1 Subjective Quality Tests on SIF Resolution and H.264/AVC Codec	265
11.3 Video Quality Estimation	267
11.3.1 Temporal Segmentation	267
11.3.2 Video Content Classification	268
11.3.3 Content Sensitive Features	268
11.3.4 Hypothesis Testing and Content Classification	274
11.3.5 Video Quality Estimation for SIF-H.264 Resolution	275
11.3.6 Content Based Video Quality Estimation	276
11.3.7 Ensemble Based Quality Estimation	280
References	283
VI Packet Switched Traffic / Evolution and Modelling	287
12 Traffic Description	291
/Philipp Svoboda	
12.1 Introduction	291
12.1.1 Analysed Traces	291
12.1.2 Daily Usage Profile for UMTS and GPRS	292
12.2 Volume and User Population	293
12.2.1 Volumes and User Population in GPRS and UMTS	293
12.2.2 Fraction of Volume per Service	296
12.2.3 Service Mix Diurnal Profile	298
12.2.4 Grouping Subscribers per Service Access	300
12.2.5 Filtering in the Port Analysis	301
12.3 Analysis of the PDP-context Activity	301
12.3.1 Per-user Activity	302
12.3.2 Distribution of PDP-context Duration	302
12.3.3 The Volume of a PDP-context	307
12.3.4 Total Volume and Number of PDP-contexts per Group	308
12.4 Detecting and Filtering of Malicious Traffic	309
References	311
13 Traffic Flows	313
/Philipp Svoboda	
13.1	

Introduction to Flow Analysis 313 -- 13.1.1 Heavy Tailed 314 -- 13.1.2 The Flow 315 -- 13.1.3 Protocol Shares 317 -- 13.2 Fitting of Distributions to Empirical Data 317 -- 13.2.1 Pre-evaluation of the Dataset 317 -- 13.2.2 Parameter Estimation 318 -- 13.2.3 Goodness of Fit 321 -- 13.3 Flows Statistics 321 -- 13.3.1 Evolution of the TCP/UDP and Application Flow Lengths from 2005 to 2007 321 -- 13.3.2 Example Validation of the Datasets 322 -- 13.3.3 Scaling Analysis of the Heavy Tail Parameter 323 -- 13.3.4 Fitting Flow Size and Duration 324 -- 13.3.5 Mice and Elephants in Traffic Flows 328 -- References 330 -- 14 Adapting Traffic Models for High-delay Networks 333 /Philipp Svoboda -- 14.1 Motivation 333 -- 14.2 Modelling HTTP Browsing Sessions for the Mobile Internet Access 335 -- 14.2.1 HTTP Traffic Model 337 -- 14.3 Modelling FTP Sessions in a Mobile Network 341 -- 14.3.1 Modelling FTP Sessions 342 -- 14.3.2 Fitting the Parameters 343 -- 14.4 Email Traffic Model: An Extension to High-delay Networks 344 -- 14.4.1 Email Protocols of the Internet 344 -- 14.4.2 APOP3EmailModel for High RTT Networks 346 -- 14.4.3 Simulation Setup 350 -- 14.4.4 Simulation Results 352 -- References 352 -- 15 Traffic Models for Specific Services 355 /Philipp Svoboda -- 15.1 Traffic Models for Online Gaming 356 -- 15.1.1 Traffic Model for a Fast Action Game: Unreal Tournament 358 -- 15.1.2 Traffic Model for a Real Time Strategy Game: StarCraft 361 -- 15.1.3 Traffic Model for a Massive Multiplayer Online Game: World of Warcraft 362. 15.2 A Traffic Model for Push-to-Talk (Nokia) 370 -- 15.2.1 AMR: Facts from the Data Sheets 371 -- 15.2.2 Parameters for Artificial Conversational Speech 372 -- 15.2.3 PTT Model 372 -- References 374 -- Index 377.

Sommario/riassunto

This excellent reference provides detailed analysis and optimization aspects of live 3G mobile communication networks Video and Multimedia Transmissions over Cellular Networks describes the state-of-the-art in the transmission of multimedia over cellular networks, evaluates the performance of the running system based on the measurements and monitoring of live networks, and finally presents concepts and methods for improving of the quality in such systems. Key Features: . Addresses the transmission of different media over cellular networks, with a focus on evolving UMTS transmission systems. Provides in-depth coverage of UMTS network architecture, and an overview of 3GPP video services. Describes the characteristics of the link layer errors in the UMTS Terrestrial radio Access Network (UTRAN), obtained by extensive measurements in live UMTS networks. Covers video encoding and decoding, introducing H.264/AVC video codec, as well as addressing various novel concepts for increased error resilience. Discusses the real-time capable algorithms that are suitable for implementation in power and size limited terminals <ul type="disc">. Presents the methods for monitoring quality, as well as analyzing and modelling traffic evolution in the cellular mobile network This book provides a valuable reference for researchers and students working in the field of multimedia transmission over wireless networks. Industry experts and professionals working within the field will also find this book of interest.
