

1. Record Nr.	UNINA9910131133303321
Autore	Cambron G. Keith
Titolo	Global networks : their design, engineering, and operation / / G. Keith Cambron
Pubbl/distr/stampa	Hoboken [New Jersey] : , : Wiley, , 2012 [Piscataway, New Jersey] : , : IEEE Xplore, , [2012]
ISBN	1-118-39452-6 1-118-39457-7 1-118-39451-8
Descrizione fisica	1 online resource (415 p.)
Collana	Wiley - IEEE
Classificazione	TEC061000
Disciplina	384.5
Soggetti	Wireless communication systems Telecommunication Globalization
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 Figures xv -- About the Author xix -- Foreword xxi -- Preface xxiii -- Acknowledgments xxv -- List of Acronyms xxvii -- Part I NETWORKS -- 1 Carrier Networks 3 -- 1.1 Operating Global Networks 3 -- 1.1.1 The Power of Redundancy 4 -- 1.1.2 The Virtuous Cycle 6 -- 1.1.3 Measurement and Accountability 7 -- 1.2 Engineering Global Networks 8 -- 1.2.1 Architecture 8 -- 1.2.2 Systems Engineering 8 -- 1.2.3 Capacity Management 8 -- 1.3 Network Taxonomy 10 -- 1.3.1 Voice Systems 10 -- 1.3.2 Data Systems 12 -- 1.3.3 Networks 13 -- 1.3.4 Network Systems 13 -- 1.4 Summary 14 -- References 14 -- 2 Network Systems Hardware 15 -- 2.1 Models 15 -- 2.2 Telco Systems Model 16 -- 2.2.1 Form and Function 16 -- 2.2.2 Frames and Shelves 20 -- 2.2.3 Chassis 20 -- 2.2.4 Line I/O 21 -- 2.2.5 Power Supply Cards 25 -- 2.2.6 Network Fabric Cards 25 -- 2.2.7 Application Processing 28 -- 2.3 Modular Computing - Advanced Telecommunications Computing Architecture (AdvancedTCA*) 29 -- 2.3.1 Chassis 29 -- 2.4 Blade Center Model 30 -- 2.4.1 Midplane Design 31 -- 2.4.2 Flexible High Speed Interconnection 32 -- 2.4.3 Management Controller 32 -- 2.4.4 Power and Fans 33 -- 2.5 Summary

33 -- References 33 -- 3 Network Systems Software 35 -- 3.1 Carrier Grade Software 35 -- 3.1.1 Real-Time 35 -- 3.1.2 Reliable 36 -- 3.1.3 Scalable 36 -- 3.1.4 Upgradable and Manageable 38 -- 3.2 Defensive Programming 38 -- 3.2.1 Are You Really Sure? 38 -- 3.2.2 Default Parameters 39 -- 3.2.3 Heap Management 39 -- 3.2.4 Exception Handling and Phased Recovery 39 -- 3.2.5 Last Gasp Forensics 40 -- 3.2.6 Buffer Discards and Dumps 40 -- 3.3 Managed Objects 40 -- 3.3.1 Administrative States 42 -- 3.3.2 Service States 42 -- 3.4 Operational Tests and Fault Conditions 43 -- 3.4.1 Service Turn Up 43 -- 3.4.2 Interrupt or Fault Induced 43 -- 3.4.3 Out of Service Retries 43 -- 3.4.4 On Demand 44 -- 3.5 Alarms 44 -- 3.5.1 Notifications 44 -- 3.5.2 Severity 44 -- 3.5.3 Scope 45 -- 3.5.4 Creation and Persistence 46 -- 3.5.5 Ethernet NIC Example 46.

3.6 Network System Data Management 49 -- 3.6.1 Management Information Bases (MIBs) 51 -- 3.6.2 Syslog 52 -- 3.6.3 Audits 53 -- 3.7 Summary 54 -- References 54 -- 4 Service and Network Objectives 55 -- 4.1 Consumer Wireline Voice 55 -- 4.1.1 Service Request 55 -- 4.1.2 Address Signaling 56 -- 4.1.3 Call Setup 56 -- 4.1.4 Alerting 56 -- 4.1.5 Call Completion 56 -- 4.1.6 Disconnect 56 -- 4.1.7 Network Service Objectives 57 -- 4.1.8 Consumer Wireline Voice Network Model 57 -- 4.1.9 Local Loops 58 -- 4.1.10 Originating Office A 58 -- 4.1.11 Toll Connect Group A-C 59 -- 4.1.12 Tandem Office C 60 -- 4.1.13 Toll Completing Group C-B 60 -- 4.1.14 Terminating Office B 60 -- 4.1.15 Long Term Downtime 60 -- 4.1.16 Measurement Summary 60 -- 4.2 Enterprise Voice over IP Service 61 -- 4.2.1 Five 9's 61 -- 4.2.2 Meaningful and Measurable Objectives 61 -- 4.3 Technology Transitions 65 -- 4.4 Summary 66 -- References 66 -- 5 Access and Aggregation Networks 69 -- 5.1 Wireline Networks 70 -- 5.1.1 Voice Services 70 -- 5.1.2 Broadband Services 74 -- 5.1.3 DSL 74 -- 5.1.4 DSL Design and Engineering 76 -- 5.1.5 DSL Operations 79 -- 5.1.6 DSL Objectives, Metrics, and Line Management 80 -- 5.1.7 ADSL Aggregation Networks 82 -- 5.1.8 ADSL2+ and VDSL Aggregation Networks 82 -- 5.1.9 Fiber to the Home (FTTH) 83 -- 5.1.10 Fiber to the Curb (FTTC) 87 -- 5.1.11 Fiber to the Node (FTTN) 87 -- 5.1.12 FTTH Design and Engineering 87 -- 5.1.13 FTTH Operations 90 -- 5.1.14 FTTH Aggregation Networks 91 -- 5.2 Hybrid Fiber Coax (HFC) Networks 92 -- 5.2.1 Node Design 93 -- 5.2.2 Digital TV 93 -- 5.2.3 DOCSIS 94 -- 5.2.4 HFC Design and Engineering 94 -- 5.2.5 HFC Operations 95 -- 5.3 Wireless Mobile Networks 96 -- 5.3.1 GSM 97 -- 5.3.2 Universal Mobile Telecommunications Systems (UMTS) 106 -- 5.3.3 Long Term Evolution (LTE) 111 -- 5.4 Wireless Design and Engineering 118 -- 5.4.1 Air Interface 118 -- 5.4.2 Mobility 121 -- 5.4.3 Inter-Radio Access Technology (IRAT) 122 -- 5.4.4 Device Behavior 122 -- 5.5 Summary 123.

References 123 -- 6 Backbone Networks 125 -- 6.1 Transport 127 -- 6.1.1 Transport Services 127 -- 6.1.2 Transport Resiliency and Protection 130 -- 6.2 IP Core 135 -- 6.2.1 Regional IP Backbones 136 -- 6.2.2 Points of Presence (POPs) 137 -- 6.2.3 Multiprotocol Label Switching (MPLS) 137 -- 6.2.4 Route Reflectors 143 -- 6.3 Backbone Design and Engineering 143 -- 6.3.1 Location and Size of POPs 144 -- 6.3.2 Fault Recovery 144 -- 6.3.3 Quality of Service QoS 145 -- 6.3.4 Traffic Demand 146 -- 6.3.5 Control Plane 146 -- 6.4 Summary 147 -- References 147 -- 7 Cloud Services 149 -- 7.1 Competition 149 -- 7.2 Defining the Cloud 150 -- 7.2.1 Architecture 150 -- 7.2.2 Infrastructure 151 -- 7.2.3 Intelligent Networks and Intelligent Clouds 152 -- 7.2.4 Internet Protocol Multimedia Subsystem (IMS) 156 -- 7.2.5 Application Servers and Enablers 162 -- 7.2.6 IMS Design and Engineering 164 -- 7.3 Cloud Services 166 -- 7.3.1 Network-Based

Security 166 -- 7.3.2 Voice over IP (VoIP) Services 167 -- 7.3.3 Conferencing 170 -- 7.3.4 Compute and Storage 170 -- 7.3.5 The Mobile Cloud 170 -- 7.4 Summary 171 -- References 171 -- 8

Network Peering and Interconnection 173 -- 8.1 Wireline Voice 173 -- 8.1.1 Interexchange Carriers (IXCs) 174 -- 8.1.2 Competitive Local Exchange Carriers (CLECs) 177 -- 8.2 SS7 Interconnection 178 -- 8.2.1 Services 178 -- 8.3 IP Interconnection 180 -- 8.3.1 VPN Peering 180 -- 8.3.2 Internet Peering 180 -- 8.3.3 Public Peering 183 -- 8.3.4 Mobility Peering 185 -- 8.4 Summary 187 -- References 188 -- Part II TEAMS AND SYSTEMS -- 9 Engineering and Operations 191 -- 9.1 Engineering 192 -- 9.1.1 Systems Engineers 192 -- 9.1.2 Network Planning 196 -- 9.1.3 Network and Central Office Engineers 196 -- 9.1.4 Outside Plant Engineers 197 -- 9.1.5 Common Systems Engineers 197 -- 9.2 Operations 197 -- 9.2.1 Network Operations Center (NOCs) 198 -- 9.2.2 Tiered Maintenance 202 -- 9.3 Summary 204 -- References 205 -- 10 Customer Marketing, Sales, and Care 207 -- 10.1 Industry Markets 207.

10.1.1 Competitive Local Exchange Carriers (CLECs) 207 -- 10.1.2 Interexchange Carriers (IXCs) 210 -- 10.2 Consumer Markets 211 -- 10.2.1 Product Marketing 212 -- 10.2.2 Consumer Care 214 -- 10.3 Enterprise Markets 218 -- 10.3.1 Pre-Sales Support 219 -- 10.3.2 Sales Support 220 -- 10.3.3 Engineering and Implementation 220 -- 10.4 Summary 220 -- References 221 -- 11 Fault Management 223 -- 11.1 Network Management Work Groups 223 -- 11.2 Systems Planes 224 -- 11.2.1 Bearer Planes 224 -- 11.2.2 Control Planes 225 -- 11.2.3 Management Planes 226 -- 11.3 Management Systems 227 -- 11.3.1 Network Management Systems 227 -- 11.3.2 Element Management Systems 230 -- 11.3.3 Network Elements 231 -- 11.3.4 Management Interfaces 231 -- 11.3.5 Specialized Management Systems 240 -- 11.4 Management Domains 244 -- 11.4.1 Optical Networks 245 -- 11.4.2 IP/MPLS Networks 246 -- 11.4.3 Other Domains 247 -- 11.5 Network Management and the Virtuous Cycle 247 -- 11.5.1 Notifications 247 -- 11.5.2 Sectionalization 249 -- 11.5.3 Fault Isolation 249 -- 11.6 Summary 250 -- References 251 -- 12 Support Systems 253 -- 12.1 Support Systems Standards and Design 253 -- 12.2 Capacity Management Systems 255 -- 12.2.1 Work Groups 256 -- 12.2.2 Data Collection 257 -- 12.2.3 Engineering Rules 259 -- 12.2.4 Capacity Management Applications 260 -- 12.2.5 Supply Chain Management 261 -- 12.3 Service Fulfillment 261 -- 12.3.1 Offers and Proposals 262 -- 12.3.2 Service Ordering 264 -- 12.3.3 Service Activation 267 -- 12.4 Design and Engineering 268 -- 12.5 Summary 268 -- References 268 -- Part III TRANSFORMATION -- 13 Integration and Innovation 271 -- 13.1 Technology Integration 271 -- 13.1.1 Technology Scanning 272 -- 13.1.2 Technology Selection 273 -- 13.1.3 Network System Testing and Verification 277 -- 13.1.4 Support Systems Integration 287 -- 13.2 Lifecycle Support 288 -- 13.3 Invention and Innovation 290 -- 13.3.1 The Role of Research 291 -- 13.3.2 The Bridge to Research 292 -- 13.4 Summary 295 -- References 296.

14 Disasters and Outages 297 -- 14.1 Disasters 297 -- 14.1.1 Carrier Teams 298 -- 14.1.2 Disaster Response 300 -- 14.1.3 Engineering and Design 300 -- 14.2 Outages 302 -- 14.2.1 Anatomy of an Outage 302 -- 14.2.2 Congestion Onset 307 -- 14.2.3 Congestion Propagation 307 -- 14.2.4 Root Cause 308 -- 14.2.5 Contributing Cause 309 -- 14.2.6 Triggering Events 309 -- 14.2.7 Teams in an Outage 309 -- 14.2.8 Press and External Affairs 311 -- 14.3 The Vicious Cycle 313 -- 14.3.1 Engineering and Operational Defense 314 -- 14.4 Summary 316 -- References 316 -- 15 Technologies that Matter 317 -- 15.1

Convergence or Conspiracy? 317 -- 15.1.1 Enter the World Wide Web 318 -- 15.1.2 Silicon Valley - A Silent Partner 318 -- 15.1.3 US Telecommunication Policy 318 -- 15.1.4 The Conspiracy - A Confluence of Events 319 -- 15.1.5 Local Phone Service in Jeopardy 320 -- 15.1.6 Technologies in Response 322 -- 15.2 Technologies Beyond 2012 324 -- 15.2.1 IPv6 324 -- 15.2.2 Invisible Computing 332 -- 15.2.3 Beyond 400G 334 -- 15.3 HTML5 and WEBRTC 335 -- 15.3.1 Video Evolution 337 -- 15.3.2 High Definition Voice 338 -- 15.4 Summary 340 -- References 341 -- 16 Carriers Transformed 343 -- 16.1 Historical Transformations 343 -- 16.1.1 Stored Program Control Switching 1965-1985 343 -- 16.1.2 Digital Wireline Communications 1975-2000 344 -- 16.1.3 Digital Wireless Communication 1990-Onwards 345 -- 16.2 Regulation and Investment 346 -- 16.2.1 Regulation 346 -- 16.2.2 Investment 347 -- 16.3 Consumer Wireline Networks and Services 347 -- 16.3.1 Market Trends 347 -- 16.3.2 Technology 348 -- 16.4 Wireless Networks and Services 351 -- 16.4.1 Market Trends 351 -- 16.4.2 Technology 352 -- 16.5 Backbone Networks 352 -- 16.6 Science and Technology Matter 353 -- References 353 -- Appendix A: IPv6 Technologies 355 -- Appendix B: The Next Generation Network and Why We'll Never See It 361 -- Index 367.

Sommario/riassunto

An extensive reference and a practical guide to global network design, operations and engineering practices. The telecommunications industry has advanced in rapid, significant and unpredictable ways into the 21st century. *Global Networks: Engineering, Operations and Design* is an in-depth look at current and developing trends, and addresses the complex issues of designing, introducing, and managing cutting-edge communications technologies for networks of scale. The author draws upon his considerable experience in the telecommunications industry to educate engineers designing equipment and systems on the hardware and software features essential to fault tolerant operation. Design practices for network elements, management systems and IT systems are addressed in detail, and how they enable scalable engineering and operations practices. *Global Networks* is a complete and thorough assessment of communications networks and technologies today, written by an author of international renown. Key features: . Comprehensive treatment of the key design practices and technologies associated with the design of data, wireline and wireless networks, including equipment, systems and network design. Analysis of network outages, highlighting design and operating practices that prevent them. Written in an accessible style and fully illustrated, it offers a complete and up-to-date picture of communications technologies from initial design through to service introduction and operation. Examines future challenges such as the Exabyte traffic growth and an assessment of the dual roles of IPV4 and IPV6.
