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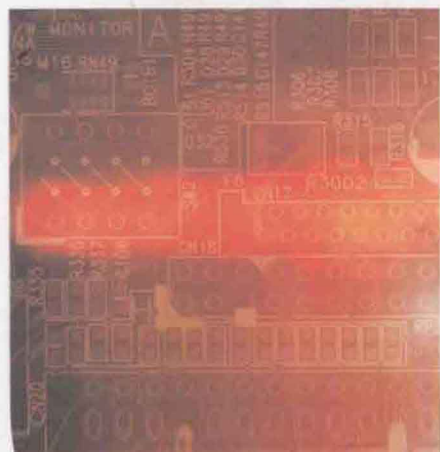
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REGIS J. "BUD" BATES

WITH

DONALD W. GREGORY



VOICE & DATA COMMUNICATION HANDBOOK

Fifth Edition

**Regis (Bud) Bates
Donald Gregory**



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VOICE & DATA COMMUNICATION HANDBOOK

Fifth Edition

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Acknowledgments

Well, here I am again, finalizing the latest update for McGraw-Hill. This one is extra special because it is the fifth edition of the *Voice and Data Communications Handbook*! Things have really changed so we decided to change the structure and the content considerably. We certainly hope that this one meets your needs as we think it will!

This update deals with the issues surrounding the convergence of voice and data. As always, I chose to write the way I think, that is, in a nontechnical fashion. I hope that this is consistent with you the reader, because there is little published geared for the novice and business professional. Besides restructuring the flow of the chapters, we eliminated much of the “old stuff” and added something new this time. We have added more on the “how to do it” with screen shots and some detail lists.

To be fair about this production we owe a lot of credit to many people. Some of the people interacted with us regularly, others only occasionally. First, we must thank Jane Brownlow, McGraw-Hill’s executive editor on this book. Jane had a real task of trying to keep after us to get this book completed, even though every deadline was missed. In addition to Jane, is Jennifer Housh who e-mailed weekly looking for the week’s submission of new chapters to keep the project on schedule. I know that I frustrated Jennifer many times when delays kept slipping into the production. Numerous other people aided in the editing and production of the book—far too many to name. They know who they are and can give themselves a pat on the back for their efforts. Then there are the vendors and manufacturers we talk to daily regarding products, services, and opportunities. All add to the knowledge in this book.

This team of people all pulled together to make this fifth edition of the *Voice and Data Communications Handbook* a reality. They deserve the credit.

Finally, as always, I want to thank you the reader for giving up your time to read this book. I receive many calls and e-mails from readers who just want to let me know that they enjoyed my opinion or the way I present an idea. I hope I can continue to win your support. My best wishes to you all!

Thank you all
Regis J. (Bud) Bates Jr.

Introduction

Welcome to the world of converged telecommunications! We are about to embark on a descriptive and narrative overview of the telecommunications industry. This book is designed to help “clear the air” for you.

Because this is the fifth edition, it is possible that you have ventured down this trail before. Have no fear; we have changed this book considerably, with every attempt to give you more current information. You will still get something out of this book.

No magic exists here, merely an understanding of what converged telecommunications is all about: the principles of voice and data as they converge into a VoIP and IP telephony architecture. Moreover, we use discussions on standards and protocols only as needed to get you up to speed on the technologies. We intend to make things as simple as possible as we cover the various techniques and terminology used throughout this book. Be aware, however, that no matter how simple we attempted to make this information and no matter how smoothly we attempt to steer you through the guides outlined, this is a technical subject.

Therefore, from time to time, we may start sounding a little “techie.” This is not done to impress or confuse you—we just cannot think of a way to make our explanation any more basic without destroying the flow. At any rate, this book is designed to give you a fundamental understanding of the overall concepts used in the telecommunications arena, using voice, data, LAN technologies, and now wireless technologies too. Changes have been occurring at an escalating pace, so we must continue to look back at the history in order to see the future.

The format of this book is arranged to walk you right through the evolution of the industry. We have changed some of the older format by putting a bit more of a “how to” and installation screens shots of the various techniques. We certainly hope you like these changes, as we attempt to satisfy the needs of many customers who have asked for these changes.

We approach the historical deployment of a network throughout the country on the basis of the original Bell System, and we look at the regulatory scene and the various legal issues that arose. Early on, we discuss the impact of the Telecommunications Act of 1996 and what has changed since the initial decisions. This one act opened the door to competition in the areas of telephony, long distance, cable services, and many other technologies. Many skeletons still lie on the side of the road to competition. Many organizations have been bankrupted; still others are barely surviving.

Next, we touch on the fundamentals of the voice evolution from the telephone company and end-user perspective. We look at the basic characteristics of the human voice and how the telephone network was developed. The discussion of network evolution encompasses the distinct dialing plans and how things have changed to accommodate phenomenal growth. We look at how the telephones have changed over the years. The discussion also shows how the telephone set converts a sound wave into an electrical wave and prepares the electricity for transmission across the network.

We enjoyed coming up with the best way to present certain models. The open system interconnection (OSI) section gets a little comical in the discussion of the standards that we use in just about all aspects of the industry. We think you’ll really enjoy the way we present this very complex model, and how we can try to make all things simple if we take them one step at a time. So, draw your own conclusions and see whether this doesn’t make more sense after you get through this chapter.

We discuss the explosion of the Internet around the world and how it works. This should be rewarding to read and will help you understand why things happen so slowly when you dial into the World Wide Wait!

We next consider the changes following the introduction of digital standards. The old network was built as an analog system. It served us well. We hope that you will understand the differences between digital and analog after reading this.

We explore the use of a digital network instead of an analog network, attempting to make this discussion simple, but again, there are some parts that get a bit complicated. Read this one in earnest; it is your future.

Many of our chapters look to moving data across a communications system called a local area network (LAN). The LAN evolves into a campus area network (CAN), a metropolitan area network (MAN), a wide area network (WAN), and a foreign area network (FAN). Is your head still spinning? An area that will probably be of deep concern is the LAN and now the wireless LAN (WLAN) technologies. These have become so commonplace that most of us take them for granted. We also show you how you might use some of the TCP/IP tools to determine if you are connected. Read this one with the knowledge that when it breaks, we can help!

ATM (not the automated teller machines) and frame relay are fast packet systems. They mimic packet switching on steroids. But if you read this section and don't scream, "I want it now," you missed something. You'll see!

Following the discussions of these networking concepts, we discuss the newer competitive way to access the high-speed communications services through xDSL and CATV company services. Using this springboard, we will look at the speeds and capacities of these wired services.

Our discussion leads to some of the finer points of networks, such as the SS7 evolution for call setup and teardown. However, this is only one part of what SS7 brings to the networking strategies, because we can use SS7 for all the features and functions that bring new capabilities.

The speed of fiber brings us closer to the terabit throughput. With all the emphasis on SONET and dense wave-division multiplexing (DWDM), we get the higher multiplexed rates and the benefits of different colors of light (so to speak).

We discuss a subject that normally causes even the strong of heart to shudder: the use of an analog telephone line to transmit critical data. How can we make digital data look like a voice call? What are the tools that will enable us to get the information in a usable and understandable form? This section gets quite lengthy and, from time to time, a bit technical; however, you need to understand this concept.

We also look at the demand rising for Voice over IP protocols and Voice over the Internet. Our intent is to get you talking and thinking about the services; then do more individualized research on your own.

Also the convergence of voice and data paves the way for the VoIP PBX and Voice over the LAN. See how we have attempted to simplify this form of connection. If all else fails, there is always a VoIP provider who promises the world of savings and instant connectivity. All you have to do is install their box.

Sounds like a new form of monopoly, doesn't it? But wait for the sixth edition of this book, we are sure that the telephone companies (remember the old monopolies) still have a few tricks up their sleeves to attract you back to their services. The words are triple and quadruple play (voice, data, video, and IM) as the carriers offer you the old network in a new way!

After all this discussion of the wired network solutions, we then take a different approach. This is a discussion of connectivity without wires. We look at cellular communications and personal communications. The world is heading for an unconnected mode. Wireless voice and data are the rave of the industry (well almost!). Enjoy learning how the wired and wireless future will share the same trail. Discussions will also look at the third generation (3G) of wireless communications.

We hope that you are intrigued and will read on.

CAUTION This is not a novel; it is not intended to be read from cover to cover. So, allot some time each day and take a chapter or a group of chapters together to gain an appreciation for the overall world of telecommunications. There is no reason this book cannot give you the tools necessary to deal with the novice or pro alike. Take some time to familiarize yourself with the ideas of the book; use the examples and analogies. Enjoy the stories and heed their message.

ONE CLOSING THOUGHT Many of our readers have sent us messages (e-mail, voice mail, letters) stating that we were technically incorrect with some of our concepts. Upon discussing this with them, we find that we are not incorrect, but we did not provide sufficient technical or engineering specific detail for their needs or their liking. Wonderful! That is exactly what we were trying to do. Our philosophy with this book is the KISS method (keep it silly and simple). If you are looking for techno-babble as designed by propeller heads, there are many other books on the market.

If you want to learn the basics without having a degree in engineering or in tech-speak, you came to the right place. Let's have some fun!

Contents at a Glance

Chapter 1	Voice Communications	1
Chapter 2	The Open Systems Interconnect Model (OSI)	35
Chapter 3	Regulation in the Industry	65
Chapter 4	Signaling System 7 (SS7)	87
Chapter 5	Switching Systems	115
Chapter 6	Modulation and Multiplexing	143
Chapter 7	Wireless Communications	179
Chapter 8	Optical Communications	221
Chapter 9	Data Communications	251
Chapter 10	TCP/IP	293
Chapter 11	Frame Relay, ATM, and MPLS	325
Chapter 12	The Internet	359

Chapter 13 Local Area Networks (LANs) 393

Chapter 14 Wireless LANs 447

Chapter 15 Digital Subscriber Line (DSL) and CATV 483

Chapter 16 Routers and Switches in the Networking Role 517

Chapter 17 Voice over Internet Protocols (VoIP) 543

Chapter 18 Session Initiation Protocol (SIP) 573

Chapter 19 IP Telephony 593

Index 617

Contents

Acknowledgments	xxi
Introduction	xxiii
Format	xxv
 Chapter 1 Voice Communications	 1
The Medium	2
Sound	2
What Is Bandwidth?	4
Voices	7
Other Services	7
The Telephone Network	8
A Topology of Connections Is Used	9
The Local Loop	10
The Network Hierarchy (Pre-1984)	12
The Network Hierarchy (Post-1984)	14
The Public-Switched Network	16
The North American Numbering Plan	16
Wiring Connections: Hooking Things Up	18
The Telephone Set	19
The Function of the Telephone Set	20
The Pieces	21
Newer Sets	30
Questions	31
 Chapter 2 The Open Systems Interconnect Model (OSI)	 35
Introduction to the OSI Model	35
The SNA architecture	37
Other Network Architectures	57
Internet Protocols (TCP/IP)	58
IP	58
TCP	61
Questions	61

Chapter 3 Regulation in the Industry	65
The Importance of the Telephone	65
The Initial Formulation of the Carrier Network	66
Legal Battles and Regulation	68
Sherman Antitrust Act of 1890	68
Kingsbury Commitment	69
1914 Clayton Antitrust Act	69
Graham-Willis Act	70
The Radio Act of 1927	70
Communications Act of 1934	71
Hush-a-Phone	71
The 1956 Consent Decree	72
The Carterfone Decision	72
1975 FCC Registration Program	73
The Execunet Decision	73
The Bell Network Hierarchy (Pre-1984)	74
The End Office	74
The Toll Center	74
The Primary Center	75
The Sectional Center	76
The Regional Center	76
The Divestiture Agreement	76
Incumbent Local Exchange Carriers	76
Provisions of Divestiture	78
The Network Hierarchy (Post-1984)	80
The Telecom Act of 1996	81
Cable TV Companies as CLECs	82
Creation of the Internet Service Providers (ISPs)	82
The Canadian Marketplace	83
International Organizations	84
Others	84
Questions	85
Chapter 4 Signaling System 7 (SS7)	87
Evolution of Signaling Systems	87
Pre-SS7	88
Channel-Associated Signaling (CAS)	89
Introduction to SS7	90
Purpose of the SS7 Network	90
What Is Out-of-Band Signaling?	91
Why Out-of-Band Signaling?	92
The SS7 Network Architecture	92
SS7 Interconnection	94
Basic Functions of the SS7 Network	94
Signaling Links	95

The Link Architecture	97
Links and Linksets	98
Combined Linksets	98
Routes and Routesets	99
SS7 Protocol Stack	99
Basic Call Setup with ISUP	101
Functions of the Message Signaling Units	102
The Fill-In Signal Unit (FISU)	103
Link Status Signal Units (LSSU)	104
Message Signaling Units (MSU)	104
ANSI versus ITU Standards for the SIO/SIF	105
SS7 Applications	107
Local Number Portability (LNP)	107
Seamless Roaming	107
SS7 over IP (S7IP)	108
Performance Considerations for SS7 over IP	108
Stream Control Transmission Protocol	109
Transporting MTP over IP	109
MTP2 User Adaptation Layer (M2UA)	110
MTP2 User Peer-to-Peer Adaptation Layer (M2PA)	110
MTP Level 3 User Adaptation Layer (M3UA)	111
Transporting SCCP over IP	111
Questions	112

Chapter 5 Switching Systems 115

Analog Systems	121
Digital PBX	123
Central Office Centrex	126
Centrex Service	128
Peripheral Devices	128
Key Telephone Systems	129
Why Key Systems?	132
The Vendor Proposal	138
Questions	139

Chapter 6 Modulation and Multiplexing 143

Modulation	143
Modem Modulation and Demodulation	145
Amplitude Modulation	146
Frequency Modulation	146
Phase Modulation	147
Pulse Modulation	148
Multiplexing	149
SDM	149
FDM	150
TDM	152

Evolution of the T-Carrier System	152
Analog Transmission Basics	154
The Evolution to Digital	155
Analog-to-Digital Conversion	157
The Movement to End Users	159
T1 Basics	160
Bipolar Format	162
Byte-Synchronous Transmission	162
Channelized or Nonchannelized	164
Digital Capacities	165
Signaling	167
Clocking (Network Synchronization)	169
Bit Synchronization	169
Time Slot	169
Frame Synchronization	170
Potential Synchronization Problems	170
Performance Issues	170
D3/D4 Framing	171
Maintenance Issues	171
Error Detection	172
ESF—A Step to Correct the Problem	173
What Does ESF Do?	173
Framing	173
CRC-6	174
The Facility Data Link	174
Benefits of ESF	175
Problems with ESF	175
Questions	176

Chapter 7 Wireless Communications 179

Radio-Based Systems	181
Free Space Communication	181
Radio Frequency (RF)	182
The Radio Frequency Spectrum	183
Antennas	185
Radio Propagation	186
Microwave Radio	188
The Path	190
Satellite Radio Communications	190
Laser Communications	192
Dynamics of Laser Transmission	192
Vehicular Communications	193
Problems with the Mobile Telephone Service	193
Cellular Communications	195
Digital Transmission	198
Digital	198
GSM	199

GSM Architecture	199
Subscriber Identity Module	200
Frequencies Allocated	201
TDMA Frames	201
GSM FDMA/TDMA Combination	202
CDMA	203
Spread Spectrum Goals	205
Principles of Spread Spectrum	205
Shannon's Equation	206
Orthogonal Sequences	206
Walsh Codes	206
The Move to 3G	208
Enter the Data	208
What to Call the Data Systems of the Future	209
What About the CDMA Folks?	210
IS-2000-A/cdma2000 3X	212
Third Generation (3G) Wireless	212
Applications for 3G	214
What Does It All Mean?	216
Questions	217
Chapter 8 Optical Communications	221
Fiber Optics	224
Types of Fiber	226
Fiber-Based Networks	227
Background Leading to SONET Development	228
The SONET Line Rates	228
SONET Frame Format	231
SONET Topologies	233
Point to Point	233
Point to Multipoint	234
Hub and Spoke	234
Ring	235
Synchronous Digital Hierarchy (SDH)	236
Synchronous Communications	237
Plesiochronous	237
SDH Frame	237
Different Waves of Light on the Fiber	239
Growing Demands	240
Wave-Division Multiplexing	240
Benefits of Fiber Compared to Other Forms of Media	243
Wave-Division Multiplexing	243
Why DWDM though?	245
Questions	248