

# Contents

<b>Foreword</b>	<b>xxi</b>
<b>Preface</b>	<b>xxiii</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Branch-overlapping Aspects of Multimedia . . . . .	2
1.2 Content . . . . .	3
1.3 Global Structure . . . . .	4
1.4 Multimedia Literature . . . . .	6
<b>2 Multimedia: Media and Data Streams</b>	<b>9</b>
2.1 Medium . . . . .	10
2.1.1 The Perception Medium . . . . .	10
2.1.2 The Representation Medium . . . . .	10
2.1.3 The Presentation Medium . . . . .	11
2.1.4 The Storage Medium . . . . .	11
2.1.5 The Transmission Medium . . . . .	11
2.1.6 The Information Exchange Medium . . . . .	12
2.1.7 Representation Values and Representation Spaces . . . . .	12
2.1.8 Representation Dimensions . . . . .	13
2.2 Main Properties of a Multimedia System . . . . .	14

2.2.1	Multimedia System Definition . . . . .	14
2.2.2	Combination of Media . . . . .	15
2.2.3	Independence . . . . .	15
2.2.4	Computer-supported Integration . . . . .	16
2.2.5	Communication Systems . . . . .	16
2.3	Multimedia . . . . .	17
2.4	Traditional Data Streams Characteristics . . . . .	18
2.4.1	Asynchronous Transmission Mode . . . . .	18
2.4.2	Synchronous Transmission Mode . . . . .	19
2.4.3	Isochronous Transmission Mode . . . . .	19
2.5	Data Stream Characteristics for Continuous Media . . . . .	20
2.5.1	The Time Interval Between a Complete Transmission of Con- secutive Packets . . . . .	20
2.5.2	Variation of Consecutive Packet Amount . . . . .	21
2.5.3	Contiguous Packets . . . . .	23
2.6	Information Units . . . . .	25
<b>3</b>	<b>Sound / Audio</b>	<b>27</b>
3.1	Basic Sound Concepts . . . . .	28
3.1.1	Computer Representation of Sound . . . . .	29
3.1.2	Audio Formats . . . . .	31
3.2	Music . . . . .	32
3.2.1	MIDI Basic Concepts . . . . .	32
3.2.2	MIDI Devices . . . . .	34
3.2.3	MIDI Messages . . . . .	36
3.2.4	MIDI and SMPTE Timing Standards . . . . .	38
3.2.5	MIDI Software . . . . .	39
3.3	Speech . . . . .	41
3.3.1	Speech Generation . . . . .	42

<b>CONTENTS</b>	<b>ix</b>
3.3.2 Speech Analysis . . . . .	47
3.3.3 Speech Transmission . . . . .	51
<b>4 Images and Graphics</b>	<b>55</b>
4.1 Basic Concepts . . . . .	56
4.1.1 Digital Image Representation . . . . .	56
4.1.2 Image Format . . . . .	57
4.1.3 Graphics Format . . . . .	59
4.2 Computer Image Processing . . . . .	61
4.2.1 Image Synthesis . . . . .	61
4.2.2 Image Analysis . . . . .	68
4.2.3 Image Transmission . . . . .	78
4.3 Comments . . . . .	79
<b>5 Video and Animation</b>	<b>81</b>
5.1 Basic Concepts . . . . .	81
5.1.1 Video Signal Representation . . . . .	81
5.1.2 Computer Video Format . . . . .	91
5.2 Television . . . . .	93
5.2.1 Conventional Systems . . . . .	93
5.2.2 Enhanced Definition Systems . . . . .	95
5.2.3 High-Definition Systems . . . . .	98
5.2.4 Transmission . . . . .	101
5.3 Computer-based Animation . . . . .	103
5.3.1 Basic Concepts . . . . .	104
5.3.2 Animation Languages . . . . .	106
5.3.3 Methods of Controlling Animation . . . . .	108
5.3.4 Display of Animation . . . . .	110
5.3.5 Transmission of Animation . . . . .	111

5.3.6	Comments . . . . .	112
<b>6</b>	<b>Data Compression</b>	<b>113</b>
6.1	Storage Space . . . . .	113
6.2	Coding Requirements . . . . .	114
6.3	Source, Entropy and Hybrid Coding . . . . .	118
6.4	Some Basic Compression Techniques . . . . .	121
6.5	JPEG . . . . .	130
6.5.1	Image Preparation . . . . .	132
6.5.2	Lossy Sequential DCT-based Mode . . . . .	137
6.5.3	Expanded Lossy DCT-based Mode . . . . .	142
6.5.4	Lossless Mode . . . . .	144
6.5.5	Hierarchical Mode . . . . .	145
6.6	H.261 (px64) . . . . .	146
6.6.1	Image Preparation . . . . .	147
6.6.2	Coding Algorithms . . . . .	148
6.6.3	Data Stream . . . . .	149
6.7	MPEG . . . . .	150
6.7.1	Video Encoding . . . . .	151
6.7.2	Audio Encoding . . . . .	156
6.7.3	Data Stream . . . . .	157
6.7.4	MPEG-2 . . . . .	160
6.7.5	MPEG-4 . . . . .	164
6.8	DVI . . . . .	165
6.8.1	Audio and Still Image Encoding . . . . .	166
6.8.2	Video Encoding . . . . .	168
6.8.3	Data Stream . . . . .	171
6.9	Comments . . . . .	172

<b>7 Optical Storage Media</b>	<b>175</b>
7.1 History	176
7.2 Basic Technology	177
7.3 Video Disks and Other WORMs	180
7.4 Compact Disk Digital Audio	181
7.4.1 Preliminary Technical Background	181
7.4.2 Eight-to-Fourteen Modulation	183
7.4.3 Error Handling	184
7.4.4 Frames, Tracks, Areas and Blocks of a CD-DA	185
7.4.5 Advantages of Digital CD-DA Technology	188
7.5 Compact Disk Read Only Memory	188
7.5.1 Blocks	188
7.5.2 Modes	189
7.5.3 Logical Data Format	192
7.5.4 Limitations of the CD-ROM Technology	193
7.6 CD-ROM Extended Architecture	194
7.6.1 Form 1 and Form 2	194
7.6.2 Compressed Data of Different Media	196
7.7 Further CD-ROM-based Developments	197
7.7.1 Compact Disk Interactive	197
7.7.2 Compact Disk Interactive Ready Format	201
7.7.3 Compact Disk Bridge Disk	201
7.7.4 Photo Compact Disk	202
7.7.5 Digital Video Interactive	203
7.8 Compact Disk Write Once	204
7.8.1 Principle of the CD-WO	204
7.8.2 Sessions	205
7.9 Compact Disk Magneto Optical	207

7.9.1	Principle of the Magnetic-Optical Method . . . . .	207
7.9.2	Areas of the CD-MO . . . . .	207
7.10	The Prospects of CD Technologies . . . . .	208
<b>8</b>	<b>Computer Technology</b>	<b>211</b>
8.1	Communication Architecture . . . . .	212
8.1.1	Hybrid Systems . . . . .	213
8.1.2	Digital Systems . . . . .	217
8.2	Multimedia Workstation . . . . .	219
8.3	Comments . . . . .	223
<b>9</b>	<b>Multimedia Operating Systems</b>	<b>225</b>
9.1	Introduction . . . . .	225
9.2	Real Time . . . . .	227
9.2.1	The Notion of "Real-Time" . . . . .	227
9.2.2	Real Time and Multimedia . . . . .	230
9.3	Resource Management . . . . .	232
9.3.1	Resources . . . . .	233
9.3.2	Requirements . . . . .	234
9.3.3	Components and Phases . . . . .	235
9.3.4	Allocation Scheme . . . . .	237
9.3.5	Continuous Media Resource Model . . . . .	238
9.4	Process Management . . . . .	244
9.4.1	Real Time Process Management in Conventional Operating Systems: An Example . . . . .	245
9.4.2	Real-time Processing Requirements . . . . .	248
9.4.3	Traditional Real-time Scheduling . . . . .	249
9.4.4	Real-time Scheduling: System Model . . . . .	250
9.4.5	Earliest Deadline First Algorithm . . . . .	252

9.4.6	Rate Monotonic Algorithm . . . . .	254
9.4.7	EDF and Rate Monotonic: Context switches . . . . .	256
9.4.8	EDF and Rate Monotonic: Processor Utilizations . . . . .	256
9.4.9	Extensions to Rate Monotonic Scheduling . . . . .	259
9.4.10	Other Approaches for In-Time Scheduling . . . . .	260
9.4.11	Preemptive versus Non-preemptive Task Scheduling . . . . .	262
9.4.12	Scheduling of Continuous Media Tasks: Prototype Operating Systems . . . . .	265
9.5	File Systems . . . . .	268
9.5.1	Traditional File Systems . . . . .	269
9.5.2	Multimedia File Systems . . . . .	276
9.6	Additional Operating System Issues . . . . .	293
9.6.1	Interprocess Communication and Synchronization . . . . .	293
9.6.2	Memory Management . . . . .	294
9.6.3	Device Management . . . . .	295
9.7	System Architecture . . . . .	298
9.7.1	UNIX-based Systems . . . . .	302
9.7.2	QuickTime . . . . .	302
9.7.3	Windows Multimedia Extensions . . . . .	306
9.7.4	OS/2 Multimedia Presentation Manager/2 . . . . .	308
9.8	Concluding Remarks . . . . .	310
<b>10</b>	<b>Networking Systems</b>	<b>313</b>
10.1	Layers, Protocols and Services . . . . .	313
10.2	Networks . . . . .	319
10.3	Local Area Networks (LANs) . . . . .	319
10.3.1	High-speed Ethernet . . . . .	319
10.3.2	Token Ring . . . . .	322
10.3.3	FDDI . . . . .	330

10.3.4	Local ATM Networks . . . . .	344
10.4	Metropolitan Area Networks (MANs) . . . . .	355
10.4.1	Distributed Queue Dual Bus (DQDB) . . . . .	356
10.4.2	Orwell . . . . .	362
10.4.3	MAN Connectivity to ATM Networks . . . . .	363
10.5	Wide Area Networks (WANs) . . . . .	365
10.5.1	Traditional WAN's . . . . .	366
10.5.2	B-ISDN: ATM . . . . .	371
10.6	Conclusion . . . . .	380
<b>11</b>	<b>Multimedia Communication Systems</b>	<b>383</b>
11.1	Application Subsystem . . . . .	384
11.1.1	Collaborative Computing . . . . .	384
11.1.2	Session Management . . . . .	397
11.2	Transport Subsystem . . . . .	401
11.2.1	Requirements . . . . .	401
11.2.2	Transport Layer . . . . .	404
11.2.3	Network Layer . . . . .	410
11.3	Quality of Service and Resource Management . . . . .	418
11.3.1	Basic Concepts . . . . .	418
11.3.2	Establishment and Closing of the Multimedia Call . . . . .	424
11.3.3	Managing Resources during Multimedia Transmission . . . . .	440
11.3.4	Architectural Issues . . . . .	457
11.4	Comments . . . . .	459
11.4.1	Trends in Collaborative Computing . . . . .	459
11.4.2	Trends in Transport Systems . . . . .	462
<b>12</b>	<b>Database Systems</b>	<b>463</b>



12.1 Multimedia Database Management System . . . . .	464
12.2 Characteristics of an MDBMS . . . . .	465
12.3 Data Analysis . . . . .	469
12.4 Data Structure . . . . .	470
12.4.1 Raw Data . . . . .	470
12.4.2 Registering Data . . . . .	471
12.4.3 Descriptive Data . . . . .	471
12.4.4 Examples of Multimedia Structures . . . . .	471
12.4.5 Comments on Data Analysis . . . . .	474
12.5 Operations on Data . . . . .	474
12.6 Integration in a Database Model . . . . .	476
12.6.1 Relational Database Model . . . . .	477
12.6.2 Object-oriented Database Model . . . . .	478
12.7 Comments . . . . .	479
<b>13 Documents, Hypertext and MHEG</b>	<b>481</b>
13.1 Documents . . . . .	481
13.1.1 Document Architecture . . . . .	482
13.1.2 Manipulation of Multimedia Data . . . . .	483
13.2 Hypertext and Hypermedia . . . . .	485
13.2.1 Hypertext, Hypermedia and Multimedia . . . . .	486
13.2.2 Hypermedia Systems: An Example . . . . .	491
13.2.3 History . . . . .	499
13.2.4 Systems: Architecture, Nodes and Pointers . . . . .	502
13.2.5 Some Final Comments about Hypertext Systems . . . . .	507
13.3 Document Architecture SGML . . . . .	510
13.3.1 Some Details . . . . .	511
13.3.2 SGML and Multimedia . . . . .	514

13.3.3	Closing Comments about SGML . . . . .	515
13.4	Document Architecture ODA . . . . .	516
13.4.1	Some Details on ODA . . . . .	516
13.4.2	ODA and Multimedia . . . . .	523
13.5	MHEG . . . . .	527
13.5.1	Example of an Interactive Multimedia Presentation . . . . .	528
13.5.2	Derivation of a Class Hierarchy . . . . .	530
13.5.3	Contents . . . . .	532
13.5.4	Behavior . . . . .	534
13.5.5	User Interaction . . . . .	537
13.5.6	Container . . . . .	539
13.5.7	Closing Comments . . . . .	541
<b>14</b>	<b>User Interfaces</b>	<b>543</b>
14.1	General Design Issues . . . . .	544
14.1.1	Architectural Issues . . . . .	545
14.1.2	Information Characteristics for Presentation . . . . .	545
14.1.3	Presentation Function . . . . .	547
14.1.4	Presentation Design Knowledge . . . . .	547
14.1.5	Effective Human-Computer Interaction . . . . .	549
14.2	Current Work . . . . .	549
14.3	Extension through Video and Audio . . . . .	551
14.4	Video at the User Interface . . . . .	552
14.4.1	Hardware for Visualization of Motion Pictures . . . . .	553
14.4.2	Example: Remote Camera Control Application . . . . .	553
14.5	Audio at the User Interface . . . . .	556
14.6	User-friendliness as the Primary Goal . . . . .	557
14.6.1	Easy to Learn Instructions . . . . .	559

14.6.2	Context-sensitive Help Functions . . . . .	559
14.6.3	Easy to Remember Instructions . . . . .	559
14.6.4	Effective Instructions . . . . .	560
14.6.5	Aesthetics . . . . .	560
14.6.6	Effective Implementation Support . . . . .	561
14.6.7	Entry Elements . . . . .	561
14.6.8	Meaningful Location of Functions . . . . .	562
14.6.9	Presentation . . . . .	562
14.6.10	Dialogue Boxes . . . . .	563
14.6.11	Additional Design Criteria . . . . .	563
14.6.12	Design-specific Criteria . . . . .	564
14.7	Comments . . . . .	566
<b>15</b>	<b>Synchronization</b>	<b>567</b>
15.1	Introduction . . . . .	567
15.2	Notion of Synchronization . . . . .	570
15.2.1	Multimedia Systems . . . . .	570
15.2.2	Basic Synchronization Issues . . . . .	572
15.2.3	Intra- and Inter-object Synchronization . . . . .	574
15.2.4	Live and Synthetic Synchronization . . . . .	581
15.2.5	Comment . . . . .	585
15.3	Presentation Requirements . . . . .	585
15.3.1	Lip Synchronization Requirements . . . . .	588
15.3.2	Pointer Synchronization Requirements . . . . .	593
15.3.3	Elementary Media Synchronization . . . . .	595
15.4	A Reference Model for Multimedia Synchronization . . . . .	599
15.4.1	Existing Classification Approaches . . . . .	600
15.4.2	The Synchronization Reference Model . . . . .	601

15.4.3	Synchronization in a Distributed Environment . . . . .	608
15.4.4	Aggregate Characteristics of the Synchronization Reference Model . . . . .	615
15.5	Synchronization Specification . . . . .	615
15.5.1	Quality of Service . . . . .	618
15.5.2	Multimedia Synchronization Specification Methods . . . . .	624
15.5.3	Interval-based Specifications . . . . .	625
15.5.4	Axes-based Synchronization . . . . .	628
15.5.5	Control Flow-based Specification . . . . .	631
15.5.6	Event-based Synchronization . . . . .	639
15.5.7	Scripts . . . . .	640
15.5.8	Comment . . . . .	644
15.6	Case Studies . . . . .	645
15.6.1	Synchronization in MHEG . . . . .	645
15.6.2	HyTime . . . . .	648
15.6.3	Firefly System . . . . .	652
15.6.4	MODE . . . . .	656
15.6.5	Multimedia Tele-orchestra . . . . .	660
15.6.6	Littles Framework . . . . .	663
15.6.7	ACME . . . . .	665
15.6.8	Further Synchronization-related Systems . . . . .	666
15.6.9	Comment . . . . .	668
15.7	Summary and Outlook . . . . .	668
15.7.1	Summary . . . . .	668
15.7.2	Future Topics . . . . .	670
15.7.3	Conclusion . . . . .	670
<b>16</b>	<b>Abstractions for Programming</b>	<b>671</b>
16.1	Abstraction Levels . . . . .	672

16.2 Libraries . . . . .	674
16.3 System Software . . . . .	675
16.3.1 Data as Time Capsules . . . . .	676
16.3.2 Data as Streams . . . . .	677
16.4 Toolkits . . . . .	678
16.5 Higher Programming Languages . . . . .	679
16.5.1 Media as Types . . . . .	679
16.5.2 Media as Files . . . . .	683
16.5.3 Media as Processes . . . . .	684
16.5.4 Programming Language Requirements . . . . .	686
16.6 Object-oriented Approaches . . . . .	688
16.6.1 Application-specific Metaphors as Classes . . . . .	691
16.6.2 Application-generic Metaphors as Classes . . . . .	691
16.6.3 Devices as Classes . . . . .	692
16.6.4 Processing Units as Classes . . . . .	693
16.6.5 Media as Classes . . . . .	702
16.6.6 Communication-specific Metaphors as Classes . . . . .	705
16.7 Comments . . . . .	706
<b>17 Multimedia Applications</b>	<b>709</b>
17.1 Introduction . . . . .	709
17.1.1 Programs . . . . .	710
17.1.2 Structure . . . . .	712
17.2 Media Preparation . . . . .	713
17.2.1 Means . . . . .	713
17.2.2 Remarks on the Current Status . . . . .	717
17.3 Media Composition . . . . .	717
17.3.1 Text and Graphics Editors . . . . .	718

17.3.2	Image Editors . . . . .	720
17.3.3	Animation Editors . . . . .	722
17.3.4	Sound Editors . . . . .	723
17.3.5	Video Editors . . . . .	724
17.4	Media Integration . . . . .	725
17.4.1	Multimedia Editors . . . . .	725
17.4.2	Hypermedia/Hypertext Editors . . . . .	727
17.4.3	Authoring Tools . . . . .	728
17.5	Media Communication . . . . .	731
17.5.1	Tele-Services . . . . .	732
17.5.2	Implementation of Conversational Services . . . . .	737
17.5.3	Implementation of Messaging Services . . . . .	740
17.5.4	Implementation of Retrieval Services . . . . .	741
17.5.5	Implementation of Tele-action Services . . . . .	745
17.5.6	Implementation of Tele-operation Services . . . . .	747
17.5.7	Applications of Tele-services . . . . .	747
17.6	Media Consumption . . . . .	752
17.6.1	Viewing Multimedia Documents . . . . .	753
17.6.2	Books, Proceedings and Newspapers . . . . .	754
17.6.3	Kiosks . . . . .	755
17.6.4	Tele-shopping . . . . .	756
17.7	Media Entertainment . . . . .	756
17.7.1	Virtual Reality . . . . .	757
17.7.2	Interactive Video . . . . .	759
17.7.3	Interactive Audio . . . . .	761
17.7.4	Games . . . . .	762
17.8	Trends . . . . .	764

<b>18 Future Directions</b>	<b>767</b>
18.1 Where Are We Today? . . . . .	767
18.1.1 User Interface . . . . .	767
18.1.2 Operating Systems . . . . .	768
18.1.3 Multimedia Documents . . . . .	768
18.1.4 Synchronization . . . . .	769
18.1.5 Programming . . . . .	769
18.2 What Are the Next Steps? . . . . .	770
18.2.1 Devices . . . . .	771
18.2.2 Visualization . . . . .	774
18.2.3 Mobility . . . . .	774
18.2.4 Interactivity . . . . .	775
18.2.5 Operating Systems . . . . .	775
18.2.6 Further Issues in Virtual Environments . . . . .	776
18.2.7 Multimedia User Interface . . . . .	776
18.2.8 Hypermedia . . . . .	777
18.2.9 Multimedia Applications . . . . .	777
18.3 What Are the Multimedia Research Issues? . . . . .	779
<b>A Abbreviations</b>	<b>781</b>
<b>Bibliography</b>	<b>791</b>
<b>Index</b>	<b>842</b>





# Foreword

Multimedia computing and communications are areas of intense current interest, software and hardware development, and future promise. Residential, institutional and business applications are emerging at a fast pace. Multimedia standards organizations are actively producing new standards for the field. Yet, the term "multimedia" and the subject areas it covers remain, to many people who hear, read and even use the term, clouded in mystery. Some recent books have attempted to define the essential elements of this fascinating area with various degrees of success.

This book is fully successful in its enterprise; it will certainly fill a void in the emerging field of multimedia. The book covers all the important topics involved in the new area, from the operating system and hardware aspects to the user interface, the applications and the programming abstractions. Such a wealth of information is not found in any of the few other books published thus far in the field.

The book is organized in 18 chapters, all of which are very informative and essential. The first five chapters define multimedia terminology and review the fundamentals of sound/audio, images and graphics, video and animation. An excellent treatise on image and video data compression follows, introducing and describing in detail such important standards as H.261, JPEG, MPEG-1 and MPEG-2. Chapters in optical storage media and computer technology give the reader up-to-date information about CD standards and pertinent hardware technology.

The chapter on operating system issues really makes this book unique. Resource and process management are covered in detail. All the important algorithms for real-time scheduling (rate monotonic, earliest-deadline-first and so on) are given.

File systems management is discussed in detail, and future aspects of multimedia operating systems are also covered.

Networking systems are the subject of another chapter. All the technologies relevant to multimedia networking are described. A chapter on protocols and quality of service issues follows, giving an overview of important multimedia protocols.

A brief description of multimedia databases is followed by a complete treatment of document architectures and standards such as ODA, SGML, hypertext and MHEG. Important design issues concerning multimedia interfaces are then presented. A very rich chapter on multimedia synchronization describes the heart of a multimedia system. This treatment is another major contribution of the authors that cannot be found in other books. A discussion of important programming abstractions follows, and the book concludes with an interesting chapter on multimedia applications and one on future directions.

We expect that this book will become a standard text in multimedia courses as well as a standard reference for all people working in the field. We congratulate the authors for their laborious but worthwhile and successful endeavor, and wish the readers a most pleasant journey into the field of multimedia!

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# Preface

There has been an explosive growth of multimedia computing, communication and applications during the last decade. Computers and networks process and transmit currently more than just text and images. Video, audio and other continuous media data, as well as additional discrete media such as graphics, became part of integrated computer applications. In the future, all computers and networks will support multimedia computing and communication to provide appropriate services for multimedia applications.

This book aims to achieve a complete and balanced view on the multimedia field covering three main domains: *devices*, *systems* and *applications*. In the device domain, basic concepts for processing of video, audio, graphics and images are presented (Chapters 2 through 5). Because of the currently available technology and quality requirements, the original data rates of these media demand compression methods. The corresponding approaches are described in Chapter 6. Chapter 7 presents the optical storage media which have contributed significantly to the current development of computer-based multimedia systems. On the other hand, the high-speed networks, described in Chapter 10, with their higher bandwidth and transmission possibilities of all media kinds, have led to networked multimedia systems. In the system domain, Chapters 8 through 12 provide information on *computer technology* as an interface between the device and the system domain, *operating system*, *communication system* and *database system*. The application domain includes topics such as *programming abstractions* (Chapter 16), which represent the interface between the application and the system domain, *document handling* (Chapter 13), *tools and applications* (Chapter 17), and *user interfaces* through which the document handling, tools and applications are made accessible to humans. To all three

domains, one area is common: the *synchronization* of multimedia. This topic is covered separately in Chapter 15.

This book has the character of a *reference book*, covering a wide scope. It has evolved from the first multimedia technology book, published in German in 1993 [Ste93b] (Figures from this book were reused with permission of the Springer Verlag). However, substantial areas have changed and enhancements have been made. The results, presented in this book, serve as groundwork for the development of individual components of a multimedia system. The book can be used by computer professionals who are interested in multimedia systems and applications. The book can also be used as a text for beginning or advanced graduate students in computer science, and related disciplines, although the absence of exercises for each chapter may put more load on the instructor. All discussions present the handling of multimedia in the corresponding domains and assume that the reader is familiar with the basic concepts of the systems: for example, scheduling in operating systems, layering in communication systems, etc. Since the amount of material in the book is too much for a one-semester course, it can be taught during two or more semesters. For example, the instructor could choose to emphasize the multimedia computing or communication aspect, including synchronization and application issues.

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