

CONTENTS

Preface xi

Chapter 1: An Overview of Digital Signage	1
Imagine the World in 20 Years	1
The Dawn of a New Medium?	3
Digital Signage: A Brief Description	3
How Is Digital Signage Different from Television?	5
How Is Digital Signage Different from a Web Site?	7
Retail Applications for Digital Signage	10
Accessibility of Internet Content	11
Greater Control and Flexibility of Content	12
Current Home Applications of Digital Signage-Like Devices	13
Chapter 2: Display Systems	15
Cathode-Ray Tubes	16
Flat-Panel Displays	18
Liquid Crystal Display Panels	18
Thin Film Transistor LCDs	18
Plasma Screens	21
Organic Light-Emitting Diodes Displays	22
Shelf-Oriented Digital Signage Systems	24
Projectors	25
LCD Projectors	25
Digital Light-Processing Projectors	25
Short-Range Projection Systems	27
Outdoor Display Systems	28
LED Outdoor Display Systems	28
Daylight-Use LCD Display Systems	31
Transreflective and Reflective LCDs	32
Screen Orientation and Aspect Ratios	34
Display Device Resolution	36
Computer Display Devices	37
High-Definition Television	37

v

Other Display Aspects	40
Display System Interfaces	42
Other Kinds of Display Devices	44
Electronic Paper	47
Chapter 3: Making the Best Use of Displays	49
Screens with Regions	51
Dynamic Regions	53
Still Regions	54
Animated Regions	55
Video Regions	55
Aspect Ratios	57
Screens with Layers	58
Transparent Layers	59
Screens with Tickers	59
Audio	60
Combination of Picture Elements using Playlists	61
Optimization of Dynamic Digital Signs	63
Digital Dynamic Signs and Posters	63
Virtual TV Channels	64
Real-Time Video and Live IPTV	67
Near-Real-Time Applications	68
Store Windows	70
Interactive Digital Signage	71
Customer Terminals	71
Motion Detectors	72
Chapter 4: The Media Player and Feeding the Screens	77
Personal Computers as Media Players	77
PowerPoint	78
Digital Signage File Distribution	82
PC-Based Media Players and Playlists	84
Decoding Live Stream Video	87
Dedicated Digital Signage Media Player Software	87
Decoding Picture and Video Files	88
Reading and Executing Playlists	88
Choosing a Digital Signage System	90
PC-Based Digital Signage Systems	91
Dedicated Digital Signage Hardware	93
Operating System Considerations	94
Windows	95
Linux	96
Mac OS X	97
Local Content Storage	97
Output Interfaces	98
Analog Interfaces	98
Analog Audio Interfaces	101
Digital Interfaces	102
Digital Audio Interfaces	104
RF Interfaces: Using the Aerial Input of TV Sets	105

	Input Interfaces	106
	The Interactive Media Player	107
	Single-Channel versus Multichannel Media Players	108
	Feeding Multiple Screens From One Media Player	109
	Splitting the VGA Output Signal	109
	Feeding One Message to Distant Screens	110
	The Screen-Integrated Media Player	112
Chapter 5:	Content Distribution	115
	Manual Content Distribution	115
	Digital Photo Frames with Built-In Flash Memory Readers	119
	Internet-Based Distribution	120
	Manual Downloading and Updating	120
	Automatic Downloading and Updating	122
	The ADSL Broadband Installation	124
	Hubs and Switches	128
	How Communications Across the Internet Really Work	128
	IP Unicasting	129
	Unicast Streaming	130
Chapter 6:	The Edge Server	133
	Individual Media Player Updating	133
	Identities and Grouping	134
	Media Player Traffic	135
	The Edge Server	136
	Retrieving Content from the Edge Server	138
	Edge Server Applications	143
	Interactive Customer Terminals	143
	Complex Environments	144
	Streaming IPTV	146
	Similar Home Applications	150
Chapter 7:	Digital Signage Broadcasting	153
	Unicasting	153
	Peer-to-Peer Networks	155
	Terrestrial Broadband Multicasting	156
	Private Network Multicasting	158
	Internet Group Management Protocol Join Request	159
	Satellite Multicasting	159
	Satellite Distribution	159
	Elevation and Azimuth Angles	166
	Satellite Frequency Band Capacity	171
	Satellite Signal Reception	172
	Digital Video Broadcasting	172
	Internet Protocol via Satellite	175
	Digital Signage and Broadcasting Together	183
	Receiving Satellite IP Signals	184
	Wireless LANs	188
	Other Ways to Use Satellite Transponders	190
	Improvements Using DVB-S2	192

Chapter 8: Content and Content Management	193
The Content Management Server	194
Content as Files	195
Image Formats	196
Video Formats	196
Animation Formats	199
Audio Formats	199
Storing the Content	199
Knowing What Content Is Where	200
Content Management in Practice	201
Creating the Playlists	201
Controlling the Media Players	203
Content Management for Edge Servers and Satellite Multicasting Systems	210
Controlling the System	214
Streaming Real-Time and Live Content	217
The VLC Player as a Streamer	217
Live Streaming in Full-Scale Broadband Networks	218
Streaming in Local Area Networks	220
Streaming with Satellite and Multicast LANs	220
Live Streaming Systems	222
Chapter 9: Content Gathering and Customer Billing	225
Gathering the Content	226
Manually Uploading Content	227
Automated Fetching of Files	227
Handling Various File Formats	228
TV Commercials in Virtual TV Channels	229
Image Files	233
Small Data Files for Continuous Update	233
Combined Media Files	234
Content Creation	234
Authoring	234
The Rendering Server	235
Single File Format	237
Multiple File Formats	240
Splitting a File into Several Files	240
Higher-Level Content Management Systems	242
Outlets for Digital Signage	243
Customer Relations Management Systems	243
Chapter 10: Operational Aspects	249
Content Distribution	249
Physical Media	249
Broadband Networking	251
Satellite Multicasting	253
GPRS and UMTS Content Delivery	259
Hybrid Unicast and Multicast Distribution Systems	260
Which Delivery Method Is Best?	260
The Return Path	262

Content Storage	265
Cleanup Procedures	265
Replacing Hardware	265
Updating Software	267
Preserving Display Devices	268
Chapter 11: Creating Digital Signage Environments	269
Retail Chains	269
Grocery Stores	271
Shelf-Based Digital Signage	272
Cinema Applications	273
Banks and Post Offices	276
Kiosks	276
Customer Terminals	278
Outdoor Digital Signage Environments	281
Outdoor Screens in Three Dimensions	284
Sports Arenas	286
Chapter 12: The Future of Digital Signage Systems	287
Four Development Phases of Digital Signage	288
Phase 1: Manual Duplication and Distribution	288
Phase 2: Terrestrial Broadband Unicasting	288
Phase 3: Network Multicasting	288
Phase 4: In-Home Digital Signage	288
Distribution Media Options	289
Terrestrial Multicasting Using Landlines	290
Terrestrial Transmitters	291
IP Broadcasting	291
Consumer Applications	292
Background TV and Information Display System	292
Customizing Content	292
Digital Art and Information	294
The Digital Newspaper	294
Wallpaper Television	295
The Need for Standardization	297
Important Standardization Issues	297
The Digital Signage Content Provider of Tomorrow	299
Content Customization	301
File and Information Transfer	301
Appendix A: Traffic Capacity Calculations	303
Calculating the Minimum Bitrate	303
Unicast Versus Multicast System Server Load	304
Unicasting Calculations	304
Multicast Calculations	307
Appendix B: More about IP Addressing	311
The MAC Address	313
The OSI Model Used to Describe IP Traffic	313
Glossary	315