

Contents

About the Author	xv
About the Technical Reviewer	xvii
Acknowledgments	xix
Introduction	xxi

Part One Introducing Peer-to-Peer..... 1

Chapter 1 The Evolution of Peer-to-Peer..... 3

A Brief History of Programming	3
The Birth of Client-Server	4
Distributed Computing	5
Peer-to-Peer Appears	6
Evaluating the Peer-to-Peer Model	8
Benefits and Challenges	8
Peer-to-Peer and Security	10
The Peer-to-Peer Niche	10
The Evolution of the Internet	13
The Early Internet	13
The Client-Server Internet	13
The Return of Peer-to-Peer	14
The “Death” of Peer-to-Peer	19
Peer-to-Peer Technologies in .NET	20
The Last Word	21

Chapter 2 Peer-to-Peer Architecture..... 23

Peer-to-Peer Characteristics	23
Peer Identity	23
Peer Discovery	24
The Server-Mode/Client-Mode Model	25
Network Addressing Challenges	26
Peer-to-Peer Topology	27
Peer-to-Peer with a Discovery Server	27
Peer-to-Peer with a Coordination Server	28
Pure Peer-to-Peer	29
The Last Word	31

Part Two Peer-to-Peer with a Coordination Server	33
Chapter 3 Remoting Essentials	35
Inter-Process Communication	35
Introducing Remoting	37
Remoting Advantages	37
Remoting Drawbacks	38
Remoting Architecture	39
Serializable Types	41
Remotable Types	44
Remoting Hosts	45
Configuration Files	47
A Basic Remoting Example	49
The Remote Object	50
The Server	50
The Server Configuration File	51
The Client	53
The Client Configuration File	54
The Application in Action	55
Remote Object Lifetime	58
A Bidirectional Remoting Example	59
The Remote Objects	60
The Configuration Files	62
The Client	63
Configuring Remoting	64
Formatters and Channels	65
Dynamic Registration	67
The Last Word	69
 Chapter 4 Building a Simple Messenger	 71
Envisioning Talk .NET	71
Defining the Interfaces	73
Creating the TraceComponent	74
The Coordination Server	77
Tracking Clients	80
Sending Messages	81
The TalkClient	82
The Remotable ClientProcess Class	84
The Talk Form	90

Enhancing Talk .NET	95
Cleaning Up After Clients	95
Toward Decentralization	97
Adding a File Transfer Feature	100
Scalability Challenges with the Simple Implementation	107
Databases and a Stateless Server	108
OneWay Methods	108
Optional Features	109
Firewalls, Ports, and Other Issues	109
Remoting and Network Address Translation	110
The Last Word	111
 Chapter 5 Threading the Coordination Server.....	113
Threading Essentials	113
Threading and the Coordination Server	114
Synchronizing Collection Access	115
Creating a Delivery Service	118
Deadlocks and Other Threading Nightmares	126
Using the ThreadPool	127
Cleaning Up Disconnected Clients	130
Threading and the Client	131
Refining Talk .NET	134
Client Lifetime	134
Duplicate Users	136
Using a Windows Service	138
The Last Word	144
 Chapter 6 Building a Distributed Task Manager.....	147
Distributed Computing Issues	147
Defining the Task Interface	149
The TaskComponent Interfaces	150
Message Objects	152
The Task Logic	154
Creating the Work Manager	155
Tracking Workers	156
Tasks	158
Dispatching Tasks	161
Completing Tasks	163
Creating the Task Worker	165
The System Tray Interface	165
The ClientProcess	167
The Main Form	171

Enhancing the Work Manager	175
Queuing	175
Performance Scoring	176
Writing Directly to a Result Store	177
A Generic Task Client	178
A Configurable Sandbox	180
Toward a Pure Peer-to-Peer Task Manager	185
The Last Word	186

Part Three Peer-to-Peer with a Discovery Server

Chapter 7 Networking Essentials

Network Basics	189
Internet Protocol	191
IP Addresses	192
Tracing, Pinging, and More	194
Transmission Control Protocol and User Datagram Protocol	196
Ports	197
Application-Level Protocols	199
Networking in .NET	199
The Dns Class	200
Network Streams	201
Communicating with TCP	202
Handling Multiple Connections	208
Communicating with UDP	209
Broadcasts and Multicasts	212
The Last Word	214

Chapter 8 Building a Discovery Web Service

The Discovery Service	215
Stateful and Stateless Discovery Services	217
Web Service Essentials	218
The Anatomy of a Web-Service Request	219
The Least You Need to Know About IIS	220
The Web-Service Class	222
The Web-Service Client	223
The Registration Database	224
Creating the Database	225
Stored Procedures	226
Creating the Database Class	229

The Discovery Service	236
Testing the Discovery Service	238
The Last Word.....	240
 Chapter 9 Building a File Sharer	241
An Overview of FileSwapper.....	241
The Discovery Service Web Reference	244
Global Data and Tasks	245
Utility Functions	249
Thread-Safe ListViewItem Updates	253
The Main Form.....	255
FileSwapper Configuration	258
Searches	259
Uploads.....	263
The FileServer Class	264
The FileUpload Class	269
Downloads	272
The FileDownloadQueue Class	275
The FileDownloadClient Class	279
Possible Enhancements.....	284
The Last Word.....	285
 Chapter 10 Using a Discovery Service with Remoting.....	287
The Registration Database	287
Stored Procedures	288
The Database Class	291
The Discovery Service	293
The Talk .NET Peers.....	296
Adding Caching	299
Adding E-mail Validation	301
The Last Word.....	302
 <i>Part Four Advanced Peer-to-Peer</i>	<i>303</i>
 Chapter 11 Security and Cryptography	305
Security and Peer-to-Peer	305
Security Challenges	306
Design Choices	307

Understanding Cryptography	308
Understanding Hash Codes	308
Understanding Encryption	309
Understanding Digital Signatures	312
Asserting Identity with Digital Signatures.....	313
The Server Database.....	313
The Client Login	315
The SignedObject Class	317
The Login Process on the Client Side	321
The Login Process on the Web-Server Side	322
Weaknesses in This Approach	323
Trust Decisions	324
Hiding Information with Encryption.....	324
The EncryptedObject Class	324
Sending and Receiving Encrypted Messages	327
Chaining Encryption and Signing	329
Using Session Keys	331
The Last Word.....	333
 Chapter 12 Working with Messenger and Groove.....	335
Using Windows Messenger	335
Creating a Windows Messenger Client	337
Understanding the Groove Platform.....	345
Creating a Simple Groove Application	347
The Groove Designer Code	348
The Groove Application Logic	352
Debugging a Groove Application	356
Enhancing the Groove Application	357
Other Peer-to-Peer Platforms.....	361
Gnutella	361
DirectPlay	362
Windows Peer-to-Peer Networking	362
The Last Word.....	363
 Chapter 13 The Intel Peer-to-Peer Accelerator Kit.....	365
About the Intel Peer-to-Peer Accelerator Kit	366
The Messaging Enhancements	367
The Intel Peer-to-Peer Daemon	367
Peer-to-Peer URLs and Remoting	369

The Discovery Service	370
Intel Peer-to-Peer Drawbacks	371
Installing the Intel Peer-to-Peer Accelerator Kit	372
Configuring the Peer Service	374
Creating a Messenger that Uses Intel Peer-to-Peer	379
Changes to the Talk Component	379
Changes to the TalkServer	380
Changes to the Talk Client	383
Adding Security	385
Dissecting the Samples	389
FileCopy	389
Messenger	390
Scribble	391
SharedCyclesP2P	392
ShareBaby2	393
Peer ASP Host	394
The Last Word	394
Index	395