

CONTENTS

Preface xv

Section 1: Getting Started 1

Chapter 1: Why We Model 3

The Importance of Modeling 4

Principles of Modeling 7

Object-Oriented Modeling 10

Chapter 2: Introducing the UML 13

An Overview of the UML 14

A Conceptual Model of the UML 17

Architecture 30

Software Development Life Cycle 33

Chapter 3: Hello, World! 37

Key Abstractions 38

Mechanisms 41

Components 43

Section 2: Basic Structural Modeling 45

Chapter 4: Classes 47

Getting Started 47

Terms and Concepts 49

Common Modeling Techniques 54

Modeling the Vocabulary of a System 54

Modeling the Distribution of Responsibilities in a System 56

Modeling Nonsoftware Things 57

Modeling Primitive Types 58

Hints and Tips 59

Chapter 5: Relationships 61

- Getting Started 62
- Terms and Concepts 63
- Common Modeling Techniques 69
 - Modeling Simple Dependencies 69
 - Modeling Single Inheritance 70
 - Modeling Structural Relationships 72
- Hints and Tips 74

Chapter 6: Common Mechanisms 75

- Getting Started 76
- Terms and Concepts 77
- Common Modeling Techniques 83
 - Modeling New Building Blocks 83
 - Modeling Comments 85
 - Modeling New Semantics 86
 - Modeling New Properties 88
- Hints and Tips 89

Chapter 7: Diagrams 91

- Getting Started 92
- Terms and Concepts 93
- Common Modeling Techniques 98
 - Modeling Different Views of a System 98
 - Modeling Different Levels of Abstraction 100
 - Modeling Complex Views 103
- Hints and Tips 103

Chapter 8: Class Diagrams 105

- Getting Started 105
- Terms and Concepts 107
- Common Modeling Techniques 108
 - Modeling Simple Collaborations 108
 - Modeling a Logical Database Schema 110
 - Forward and Reverse Engineering 112
- Hints and Tips 115

Section 3: Advanced Structural Modeling 117**Chapter 9: Advanced Classes 119**

- Getting Started 119
- Terms and Concepts 120
- Common Modeling Techniques 132
 - Modeling the Semantics of a Class 132
- Hints and Tips 133

Chapter 10: Advanced Relationships 135

- Getting Started 136
- Terms and Concepts 137
- Common Modeling Techniques 151
 - Modeling Webs of Relationships 151
- Hints and Tips 152

Chapter 11: Interfaces, Types, and Roles 155

- Getting Started 155
- Terms and Concepts 157
- Common Modeling Techniques 163
 - Modeling the Seams in a System 163
 - Modeling Static and Dynamic Types 165
- Hints and Tips 166

Chapter 12: Packages 169

- Getting Started 170
- Terms and Concepts 171
- Common Modeling Techniques 177
 - Modeling Groups of Elements 177
 - Modeling Architectural Views 179
- Hints and Tips 181

Chapter 13: Instances 183

- Getting Started 183
- Terms and Concepts 185
- Common Modeling Techniques 190
 - Modeling Concrete Instances 190
 - Modeling Prototypical Instances 192
- Hints and Tips 193

Chapter 14: Object Diagrams 195

- Getting Started 195
- Terms and Concepts 197
- Common Modeling Techniques 198
 - Modeling Object Structures 198
 - Forward and Reverse Engineering 200
- Hints and Tips 201

Section 4: Basic Behavioral Modeling 203**Chapter 15: Interactions 205**

- Getting Started 206
- Terms and Concepts 207
- Common Modeling Techniques 216
 - Modeling a Flow of Control 216
- Hints and Tips 217

Chapter 16: Use Cases 219

- Getting Started 219
- Terms and Concepts 222
- Common Modeling Techniques 229
 - Modeling the Behavior of an Element 229
- Hints and Tips 231

Chapter 17: Use Case Diagrams 233

- Getting Started 233
- Terms and Concepts 234
- Common Modeling Techniques 236
 - Modeling the Context of a System 236
 - Modeling the Requirements of a System 237
 - Forward and Reverse Engineering 239
- Hints and Tips 241

Chapter 18: Interaction Diagrams 243

- Getting Started 244
- Terms and Concepts 245
- Common Modeling Techniques 251
 - Modeling Flows of Control by Time Ordering 251
 - Modeling Flows of Control by Organization 253
 - Forward and Reverse Engineering 255
- Hints and Tips 256

Chapter 19: Activity Diagrams 257

- Getting Started 258
- Terms and Concepts 259
- Common Modeling Techniques 268
 - Modeling a Workflow 268
 - Modeling an Operation 270
 - Forward and Reverse Engineering 272
- Hints and Tips 273

Section 5: Advanced Behavioral Modeling 275**Chapter 20: Events and Signals 277**

- Getting Started 277
- Terms and Concepts 278
- Common Modeling Techniques 283
 - Modeling a Family of Signals 283
 - Modeling Exceptions 284
- Hints and Tips 286

Chapter 21: State Machines 287

- Getting Started 288
- Terms and Concepts 290
- Common Modeling Techniques 304
 - Modeling the Lifetime of an Object 304
- Hints and Tips 306

Chapter 22: Processes and Threads 309

- Getting Started 310
- Terms and Concepts 311
- Common Modeling Techniques 317
 - Modeling Multiple Flows of Control 317
 - Modeling Interprocess Communication 319
- Hints and Tips 320

Chapter 23: Time and Space 321

- Getting Started 321
- Terms and Concepts 322
- Common Modeling Techniques 326
 - Modeling Timing Constraints 326
 - Modeling the Distribution of Objects 327
 - Modeling Objects that Migrate 328
- Hints and Tips 330

Chapter 24: Statechart Diagrams 331

- Getting Started 332
- Terms and Concepts 333
- Common Modeling Techniques 335
 - Modeling Reactive Objects 335
 - Forward and Reverse Engineering 338
- Hints and Tips 339

Section 6: Architectural Modeling 341**Chapter 25: Components 343**

- Getting Started 343
- Terms and Concepts 345
- Common Modeling Techniques 351
 - Modeling Executables and Libraries 351
 - Modeling Tables, Files, and Documents 353
 - Modeling an API 354
 - Modeling Source Code 355
- Hints and Tips 357

Chapter 26: Deployment 359

- Getting Started 359
- Terms and Concepts 360
- Common Modeling Techniques 364
 - Modeling Processors and Devices 364
 - Modeling the Distribution of Components 365
- Hints and Tips 367

Chapter 27: Collaborations 369

- Getting Started 369
- Terms and Concepts 371
- Common Modeling Techniques 376
 - Modeling the Realization of a Use Case 376
 - Modeling the Realization of an Operation 378
 - Modeling a Mechanism 379
- Hints and Tips 380

Chapter 28: Patterns and Frameworks 381

- Getting Started 381
- Terms and Concepts 383
- Common Modeling Techniques 387
 - Modeling Design Patterns 387
 - Modeling Architectural Patterns 389
- Hints and Tips 391

Chapter 29: Component Diagrams 393

- Getting Started 393
- Terms and Concepts 394
- Common Modeling Techniques 396
 - Modeling Source Code 396
 - Modeling an Executable Release 398
 - Modeling a Physical Database 400
 - Modeling Adaptable Systems 402
 - Forward and Reverse Engineering 403
- Hints and Tips 405

Chapter 30: Deployment Diagrams 407

- Getting Started 407
- Terms and Concepts 409
- Common Modeling Techniques 411
 - Modeling an Embedded System 411
 - Modeling a Client/Server System 412
 - Modeling a Fully Distributed System 414
 - Forward and Reverse Engineering 416
- Hints and Tips 417

Chapter 31: Systems and Models 419

Getting Started 419

Terms and Concepts 421

Common Modeling Techniques 424

Modeling the Architecture of a System 424

Modeling Systems of Systems 426

Hints and Tips 426

Section 7: Wrapping Up 429**Chapter 32: Applying the UML 431**

Transitioning to the UML 431

Where to Go Next 433

Appendix A: UML Notation 435**Appendix B: UML Standard Elements 441****Appendix C: Rational Unified Process 449****Glossary 457****Index 469**