## **Contents**

st of Figuresxvii
oreword to the Third Editionxxi
oreword to the First Editionxxiii
reface
Why Bother with the UML?
hapter 1: Introduction 1
What Is the UML? .1   Ways of Using the UML .2   How We Got to the UML .7   Notations and Meta-Models .9   UML Diagrams .10   What Is Legal UML? .13   The Meaning of UML .14   UML Is Not Enough .14   Where to Start with the UML .16   Where to Find Out More .16
Chapter 2: Development Process
Iterative and Waterfall Processes.19Predictive and Adaptive Planning.23Agile Processes.24Rational Unified Process.25

	Fitting a Process to a Project	.26
	Fitting the UML into a Process	.29
	Requirements Analysis	.29
	Design	.30
	Documentation	
	Understanding Legacy Code	.32
	Choosing a Development Process	
	Where to Find Out More	
Chapter	3: Class Diagrams: The Essentials	35
	Properties	.35
	Attributes	.36
	Associations	.37
	Multiplicity	
	Programming Interpretation of Properties	.39
	Bidirectional Associations	.41
	Operations	.43
	Generalization	.45
	Notes and Comments	.46
	Dependency	.47
	Constraint Rules	.49
	When to Use Class Diagrams	.51
	Where to Find Out More	.52
Chapter	r 4: Sequence Diagrams	
	Creating and Deleting Participants	.56
	Loops, Conditionals, and the Like	.57
	Synchronous and Asynchronous Calls	.61
	When to Use Sequence Diagrams	.61
Chapter	r 5: Class Diagrams: Advanced Concepts	65
	Keywords	
	Responsibilities	
	Static Operations and Attributes	.66
	Aggregation and Composition	.67
	Derived Properties	.68
	Interfaces and Abstract Classes	.69
	Read-Only and Frozen	.72
	Reference Objects and Value Objects	

	Qualified Associations74
	Classification and Generalization
	Multiple and Dynamic Classification
	Association Class
	Template (Parameterized) Class81
	Enumerations
	Active Class
	Visibility
	Messages84
Chapte	r 6: Object Diagrams 87
-	When to Use Object Diagrams87
Chapte	r 7: Package Diagrams
	Packages and Dependencies91
	Package Aspects93
	Implementing Packages94
	When to Use Package Diagrams
	Where to Find Out More95
Chapte	r 8: Deployment Diagrams
	When to Use Deployment Diagrams
Chapte	r 9: Use Cases
	Content of a Use Case
	Use Case Diagrams
	Levels of Use Cases
	Use Cases and Features (or Stories)
	When to Use Use Cases
	Where to Find Out More
Chapte	r 10: State Machine Diagrams
	Internal Activities
	Activity States
	Superstates
	Concurrent States
	Implementing State Diagrams
	When to Use State Diagrams
	Where to Find Out More

Chapter 1	11: Activity Diagrams	117
Ι	Decomposing an Action	119
P	Partitions	120
	signals	
	Tokens	
	Flows and Edges	
	ins and Transformations	
	Expansion Regions	
	Flow Final	
U	oin Specifications	
	And There's More	
	Where to Find Out More	
_	12: Communication Diagrams	
	When to Use Communication Diagrams	
Chapter 1	13: Composite Structures	135
V	When to Use Composite Structures	137
Chapter 1	14: Component Diagrams	139
7	When to Use Component Diagrams	141
Chapter 1	15: Collaborations	143
7	When to Use Collaborations	146
Chapter 1	16: Interaction Overview Diagrams	147
V	When to Use Interaction Overview Diagrams	147
Chapter 1	17: Timing Diagrams	149
7	When to Use Timing Diagrams	15(
Appendix	x: Changes between UML Versions	151
F	Revisions to the UML	151
	Changes in UML Distilled	152
(	Changes from UML 1.0 to 1.1	
	Type and Implementation Class	
	Complete and Incomplete Discriminator Constraints	
	Composition	
	Immutability and Frozen	154

## List of Figures

Figure 1.1: Figure 1.2: Figure 1.3:	A small piece of the UML meta-model	
Figure 3.1:	A simple class diagram	
Figure 3.2:	Showing properties of an order as attributes	
Figure 3.3:	Showing properties of an order as associations	
Figure 3.4:	A bidirectional association	
Figure 3.5:	Using a verb phrase to name an association	42
Figure 3.6:	A note is used as a comment on	
	one or more diagram elements	46
Figure 3.7:	Example dependencies	
Figure 4.1:	A sequence diagram for centralized control	54
Figure 4.2:	A sequence diagram for distributed control	55
Figure 4.3:	Creation and deletion of participants	57
Figure 4.4:	Interaction frames	58
Figure 4.5:	Older conventions for control logic	60
Figure 4.6:	A sample CRC card	62
Figure 5.1:	Showing responsibilities in a class diagram	<b>.</b> 67
Figure 5.2:	Static notation	
Figure 5.3:	Aggregation	
Figure 5.4:	Composition	68
Figure 5.5:	Derived attribute in a time period	69
Figure 5.6:	A Java example of interfaces and an abstract class	70
Figure 5.7:	Ball-and-socket notation	71
Figure 5.8:	Older dependencies with lollipops	
Figure 5.9:	Using a lollipop to show polymorphism	
	in a sequence diagram	

## LIST OF FIGURES

XVIII
-------

Figure 5.11:	Multiple classification
Figure 5.12:	Association class
Figure 5.13:	Promoting an association class to a full class78
Figure 5.14:	Association class subtleties (Role should probably
C	not be an association class)
Figure 5.15:	Using a class for a temporal relationship80
Figure 5.16:	«Temporal» keyword for associations
Figure 5.17:	Template class
Figure 5.18:	Bound element (version 1)82
Figure 5.19:	Bound element (version 2)82
Figure 5.20:	Enumeration
Figure 5.21:	Active class
Figure 5.22:	Classes with messages
Figure 6.1:	Class diagram of Party composition structure88
Figure 6.2:	Object diagram showing example instances of Party88
Figure 7.1:	Ways of showing packages on diagrams
Figure 7.2:	Package diagram for an enterprise application92
Figure 7.3:	Separating Figure 7.2 into two aspects
Figure 7.4:	A package implemented by other packages
Figure 7.5:	Defining a required interface in a client package
Figure 8.1:	Example deployment diagram98
Figure 9.1:	Example use case text
Figure 9.2:	Use case diagram
Figure 10.1:	A simple state machine diagram108
Figure 10.2:	Internal events shown with the typing state of a text field
Figure 10.3:	A state with an activity
Figure 10.4:	Superstate with nested substates
Figure 10.5:	Concurrent orthogonal states
Figure 10.6:	A C# nested switch to handle the state
Ü	transition from Figure 10.1
Figure 10.7:	A State pattern implementation for Figure 10.1114
Figure 11.1:	A simple activity diagram
Figure 11.2:	A subsidiary activity diagram120
	-

Figure 11.3:	The activity of Figure 11.1 modified
	to call Figure 11.2
Figure 11.4:	Partitions on an activity diagram122
Figure 11.5:	Signals on an activity diagram123
Figure 11.6:	Sending and receiving signals
Figure 11.7:	Four ways of showing an edge125
Figure 11.8:	Transformation on a flow
Figure 11.9:	Expansion region
Figure 11.10:	Shorthand for a single action in an expansion region
Figure 11.11:	Flow finals in an activity
Figure 11.12:	Join specification
Figure 12.1:	Communication diagram for centralized control132
Figure 12.2:	Communication diagram with nested
0	decimal numbering
Figure 13.1:	Two ways of showing a TV viewer and its interfaces136
Figure 13.2:	Internal view of a component
- 10	(example suggested by Jim Rumbaugh)
Figure 13.3:	A component with multiple ports
C: 1 / 1	Notation for components
Figure 14.1:	
Figure 14.2:	An example component diagram140
Figure 15.1:	A collaboration with its class diagram of roles
Figure 15.2:	A sequence diagram for the auction collaboration144
Figure 15.3:	A collaboration occurrence
Figure 15.4:	A nonstandard way of showing pattern
8	use in JUnit (junit.org)145
Figure 16.1:	Interaction summary diagram
Figure 17.1:	Timing diagram showing states as lines
Figure 17 2:	Timing diagram showing states as areas