Table of Contents

Table of Contents . . . . . **i**

Preface . . . . . **xxiii**

0.1 About the Unified Modeling Language (UML) xxiii

0.2 About the Object Management Group (OMG) xxiv

0.3 About This Document xxiv

0.3.1 Dependencies Between Sections xxv

0.4 Compliance to the UML xxvi

0.4.1 Compliance to the UML Semantics xxvii

0.4.2 Compliance to the UML Notation xxviii

0.4.3 Compliance to the UML Extensions xxix

0.4.4 Compliance to the OA&D CORBAfacility Interface Definitions xxix

0.4.5 Summary of Compliance Points xxix

0.5 Acknowledgements xxx

0.6 References xxx

1. UML Summary **1-1**

Contents 1-1

1.1 Overview 1-1

1.2 Primary Artifacts of the UML 1-2

1.2.1 UML-defining Artifacts 1-2

1.2.2 Development Project Artifacts 1-2

1.3 Motivation to Define the UML 1-3

1.3.1 Why We Model 1-3

1.3.2 Industry Trends in Software 1-3

Contents

1.3.3 Prior to Industry Convergence 1-4
1.4 Goals of the UML 1-4
1.5 Scope of the UML 1-6
1.5.1 Outside the Scope of the UML 1-7
Programming Languages 1-7
Tools 1-7
Process 1-8
1.5.2 Comparing UML to Other Modeling Languages 1-8
1.5.3 Features of the UML 1-9
1.6 UML - Past, Present, and Future 1-11
1.6.1 UML 0.8 - 0.91 1-11
Precursors to UML 1-11
Booch, Rumbaugh, and Jacobson Join Forces 1-11
1.6.2 UML Partners 1-12
1.6.3 UML - Present and Future 1-13
Standardization of the UML 1-13
Industrialization 1-14
Future UML Evolution 1-14

2. UML Semantics 2-1
Contents 2-1
2.1 Introduction 2-2
2.1.1 Purpose and Scope 2-2
2.1.2 Approach 2-2
2.2 Language Architecture 2-4
2.2.1 Four-Layer Metamodel Architecture 2-4
2.2.2 Package Structure 2-5
2.3 Language Formalism 2-7
2.3.1 Levels of Formalism 2-7
2.3.2 Package Specification Structure 2-8
Abstract Syntax 2-8
Well-Formedness Rules 2-9
Semantics 2-9
Standard Elements 2-9
Notes 2-9
2.3.3 Use of a Constraint Language 2-10
2.3.4 Use of Natural Language 2-10
2.3.5 Naming Conventions and Typography 2-10
2.4 Overview 2-11
2.5 Core 2-12
2.5.1 Overview 2-12
2.5.2 Abstract Syntax 2-12
Association 2-14
AssociationClass 2-15

AssociationEnd 2-15
Attribute 2-17
BehavioralFeature 2-18
Class 2-19
Classifier 2-20
Constraint 2-20
DataType 2-21
Dependency 2-21
Element 2-21
ElementOwnership 2-21
Feature 2-22
GeneralizableElement 2-22
Generalization 2-23
Interface 2-24
Method 2-24
ModelElement 2-25
Namespace 2-26
Operation 2-26
Parameter 2-27
StructuralFeature 2-28

2.5.3 Well-Formedness Rules 2-28
Association 2-28
AssociationClass 2-28
AssociationEnd 2-29
Attribute 2-29
BehavioralFeature 2-29
Class 2-30
Classifier 2-31
Constraint 2-33
DataType 2-33
Dependency 2-33
Element 2-33
ElementOwnership 2-33
Feature 2-33
GeneralizableElement 2-33
Generalization 2-34
Interface 2-34
Method 2-35
ModelElement 2-35
Namespace 2-35
Operation 2-36
Parameter 2-36
StructuralFeature 2-37

2.5.4 Semantics 2-37
Inheritance 2-37
Instantiation 2-38
Class 2-39
Interface 2-41
Association 2-42
AssociationClass 2-43
Miscellaneous 2-44

2.5.5 Standard Elements 2-45

2.5.6 Notes 2-45

Contents

2.6 Auxiliary Elements 2-46
2.6.1 Overview 2-46
2.6.2 Abstract Syntax 2-46
Binding 2-48
Comment 2-49
Component 2-49
Dependency (from Core) 2-49
ModelElement (from Core) 2-50
Node 2-51
Presentation 2-51
Refinement 2-51
Trace 2-52
Usage 2-52
ViewElement 2-52
2.6.3 Well-Formedness Rules 2-53
Binding 2-53
Comment 2-53
Component 2-53
Dependency 2-53
ModelElement 2-53
Node 2-54
Presentation 2-54
Refinement 2-54
Trace 2-54
Usage 2-54
ViewElement 2-54
2.6.4 Semantics 2-55
Template 2-55
ViewElement 2-55
2.6.5 Standard Elements 2-56
2.7 Extension Mechanisms 2-56
2.7.1 Overview 2-56
2.7.2 Abstract Syntax 2-58
Constraint 2-59
ModelElement (as extended) 2-60
Stereotype 2-61
TaggedValue 2-62
2.7.3 Well-Formedness Rules 2-62
Constraint 2-62
Stereotype 2-63
ModelElement 2-63
TaggedValue 2-64
2.7.4 Semantics 2-64
2.7.5 Standard Elements 2-65
2.7.6 Notes 2-65
2.8 Data Types 2-65
2.8.1 Overview 2-65
2.8.2 Abstract Syntax 2-65
AggregationKind 2-67

Boolean 2-67
BooleanExpression 2-67
ChangeableKind 2-67
Enumeration 2-67
EnumerationLiteral 2-67
Expression 2-67
Geometry 2-67
GraphicMarker 2-67
Integer 2-68
Mapping 2-68
MessageDirectionKind 2-68
Multiplicity 2-68
MultiplicityRange 2-68
Name 2-68
ObjectSetExpression 2-68
OperationDirectionKind 2-68
ParameterDirectionKind 2-69
Primitive 2-69
ProcedureExpression 2-69
PseudostateKind 2-69
ScopeKind 2-69
String 2-69
Structure 2-69
SynchronousKind 2-69
Time 2-69
TimeExpression 2-70
Uninterpreted 2-70
VisibilityKind 2-70

2.9 Overview 2-70

2.10 Common Behavior 2-71

2.10.1 Overview 2-71

2.10.2 Abstract Syntax 2-71

Action 2-74
ActionSequence 2-75
Argument 2-75
AttributeLink 2-75
CallAction 2-76
CreateAction 2-76
DestroyAction 2-76
DataValue 2-77
Exception 2-77
Instance 2-77
Link 2-78
LinkEnd 2-78
LinkObject 2-78
LocalInvocation 2-79
MessageInstance 2-79
Object 2-79
Reception 2-79
Request 2-80
ReturnAction 2-80
SendAction 2-80
Signal 2-81

Contents

TerminateAction 2-81
UninterpretedAction 2-81
2.10.3 Well-Formedness Rules 2-81
AttributeLink 2-81
CallAction 2-82
CreateAction 2-82
DestroyAction 2-82
DataValue 2-82
Instance 2-82
Link 2-83
LinkEnd 2-84
LinkObject 2-84
MessageInstance 2-84
Object 2-84
Signal 2-84
Reception 2-84
Request 2-84
SendAction 2-85
TerminateAction 2-85
2.10.4 Semantics 2-85
Object and DataValue 2-85
Link 2-86
Request, Signal, Exception and Message Instance 2-86
Action 2-87
2.10.5 Standard Elements 2-88
2.11 Collaborations 2-88
2.11.1 Overview 2-88
2.11.2 Abstract Syntax 2-89
AssociationEndRole 2-89
AssociationRole 2-90
ClassifierRole 2-90
Collaboration 2-91
Interaction 2-92
Message 2-92
2.11.3 Well-Formedness Rules 2-92
AssociationEndRole 2-92
AssociationRole 2-93
ClassifierRole 2-93
Collaboration 2-93
Interaction 2-94
Message 2-94
2.11.4 Semantics 2-95
Collaboration 2-95
Interaction 2-97
2.11.5 Standard Elements 2-98
2.11.6 Notes 2-98
2.12 Use Cases 2-98
2.12.1 Overview 2-98
2.12.2 Abstract Syntax 2-99

Actor 2-99
UseCase 2-100
UseCaseInstance 2-100
2.12.3 Well-FormednessRules 2-100
Actor 2-101
UseCase 2-101
UseCaseInstance 2-102
2.12.4 Semantics 2-102
Actor 2-102
UseCase 2-103
2.12.5 Standard Elements 2-106
2.12.6 Notes 2-106
2.13 State Machines 2-107
2.13.1 Overview 2-107
2.13.2 Abstract Syntax 2-107
CallEvent 2-108
ChangeEvent 2-109
CompositeState 2-109
Event 2-110
Guard 2-110
PseudoState 2-111
SignalEvent 2-111
SimpleState 2-111
State 2-111
StateMachine 2-112
StateVertex 2-113
SubmachineState 2-113
TimeEvent 2-114
Transition 2-114
2.13.3 Well-FormednessRules 2-115
CompositeState 2-115
Guard 2-115
LocalInvocation 2-115
PseudoState 2-115
StateMachine 2-116
Transition 2-117
2.13.4 Semantics 2-118
StateMachine 2-119
State 2-122
CompositeState 2-122
Pseudostate 2-123
SubmachineState 2-124
Transitions 2-125
(Compound) Transition execution 2-126
2.13.5 Standard Elements 2-127
2.13.6 Notes 2-127
Example: Modeling Class Behavior 2-127
Example: State machine refinement 2-128
Subtyping 2-129
(Strict) Inheritance 2-130
General Refinement 2-130

Contents

Classical statecharts 2-131
2.13.7 Activity Models 2-131
ActivityModel 2-133
ActionState 2-134
ActivityState 2-134
ClassifierInState 2-135
ObjectFlowState 2-135
Partition 2-136
PseudoState 2-136
ActivityModel 2-136
ActionState 2-137
ObjectFlowState 2-137
PseudoState 2-137
ActivityModel 2-138
ActionState 2-138
ObjectFlowState 2-138
2.14 Model Management 2-139
2.14.1 Overview 2-139
2.14.2 Abstract Syntax 2-140
ElementReference 2-140
Model 2-141
Package 2-141
Subsystem 2-142
2.14.3 Well-Formedness Rules 2-142
ElementReference 2-142
Model 2-143
Package 2-143
2.14.4 Semantics 2-146
Package 2-146
Subsystem 2-148
Model 2-150
2.14.5 Standard Elements 2-150
2.14.6 Notes 2-151

3. UML Notation Guide 3-1
Contents 3-1
3.1 Introduction 3-5
3.2 Graphs and Their Contents. 3-6
3.3 Drawing Paths 3-7
3.4 Invisible Hyperlinks and the Role of Tools 3-7
3.5 Background Information 3-8
3.5.1 Presentation Options. 3-8
3.6 String 3-8
3.6.1 Semantics 3-8
3.6.2 Notation 3-8
3.6.3 Presentation Options. 3-9
3.6.4 Example 3-9

3.6.5 Mapping . . . 3-9
3.7 Name . . . 3-9
3.7.1 Semantics . . . 3-9
3.7.2 Notation . . . 3-9
3.7.3 Example . . . 3-10
3.7.4 Mapping . . . 3-10
3.8 Label . . . 3-10
3.8.1 Semantics . . . 3-10
3.8.2 Notation . . . 3-10
3.8.3 Presentation Options . . . 3-11
3.8.4 Example . . . 3-11
3.9 Keywords . . . 3-11
3.10 Expression . . . 3-11
3.10.1 Semantics . . . 3-11
3.10.2 Notation . . . 3-12
3.10.3 Example . . . 3-12
3.10.4 Mapping . . . 3-12
3.10.5 OCL Expressions . . . 3-12
3.10.6 Selected OCL Notation . . . 3-13
3.10.7 Example . . . 3-13
3.11 Note . . . 3-13
3.11.1 Semantics . . . 3-13
3.11.2 Notation . . . 3-13
3.11.3 Presentation Options . . . 3-14
3.11.4 Example . . . 3-14
3.11.5 Mapping . . . 3-14
3.12 Type-Instance Correspondence . . . 3-14
3.13 Packages and Model Organization . . . 3-15
3.13.1 Semantics . . . 3-15
3.13.2 Notation . . . 3-16
3.13.3 Presentation Options . . . 3-16
3.13.4 Style Guidelines . . . 3-17
3.13.5 Example . . . 3-17
3.13.6 Mapping . . . 3-17
3.14 Constraint and Comment . . . 3-18
3.14.1 Semantics . . . 3-18
3.14.2 Notation . . . 3-18
3.14.3 Example . . . 3-19
3.14.4 Mapping . . . 3-20

Contents

3.15 Element Properties 3-20
3.15.1 Semantics 3-20
3.15.2 Notation 3-21
3.15.3 Presentation Options 3-21
3.15.4 Style Guidelines 3-21
3.15.5 Example 3-21
3.15.6 Mapping 3-21
3.16 Stereotypes 3-22
3.16.1 Semantics 3-22
3.16.2 Notation 3-22
3.16.3 Example 3-23
3.16.4 Mapping 3-23
3.17 Class Diagram 3-25
3.17.1 Semantics 3-25
3.17.2 Notation 3-25
3.17.3 Mapping 3-25
3.18 Object Diagram 3-26
3.19 Classifier 3-26
3.20 Class 3-26
3.20.1 Semantics 3-26
3.20.2 Basic Notation 3-26
References 3-27
3.20.3 Presentation Options 3-27
3.20.4 Style Guidelines 3-27
3.20.5 Example 3-28
3.20.6 Mapping 3-28
3.21 Name Compartment 3-28
3.21.1 Notation 3-28
3.21.2 Mapping 3-29
3.22 List Compartment 3-29
3.22.1 Notation 3-29
Group properties 3-30
Compartment name 3-30
3.22.2 Presentation Options 3-30
3.22.3 Example 3-31
3.22.4 Mapping 3-32
3.23 Attribute 3-32
3.23.1 Semantics 3-32
3.23.2 Notation 3-33
3.23.3 Presentation Options 3-34

3.23.4 Style Guidelines . . . 3-34
3.23.5 Example . . . 3-34
3.23.6 Mapping . . . 3-35
3.24 Operation . . . 3-35
3.24.1 Operation . . . 3-35
3.24.2 Notation . . . 3-35
3.24.3 Presentation Options . . . 3-37
3.24.4 Style Guidelines . . . 3-37
3.24.5 Example . . . 3-37
3.24.6 Mapping . . . 3-37
3.24.7 Signal Reception . . . 3-38
3.25 Type Vs. Implementation Class . . . 3-38
3.25.1 Semantics . . . 3-38
3.25.2 Notation . . . 3-38
3.25.3 Example . . . 3-39
3.25.4 Mapping . . . 3-39
3.26 Interfaces . . . 3-39
3.26.1 Semantics . . . 3-39
3.26.2 Notation . . . 3-40
3.26.3 Example . . . 3-41
3.26.4 Mapping . . . 3-41
3.27 Parameterized Class (Template) . . . 3-41
3.27.1 Semantics . . . 3-41
3.27.2 Notation . . . 3-42
3.27.3 Presentation Options . . . 3-42
3.27.4 Example . . . 3-43
3.27.5 Mapping . . . 3-43
3.28 Bound Element . . . 3-43
3.28.1 Semantics . . . 3-43
3.28.2 Notation . . . 3-43
3.28.3 Style Guidelines . . . 3-44
3.28.4 Example . . . 3-44
3.28.5 Mapping . . . 3-44
3.29 Utility . . . 3-45
3.29.1 Semantics . . . 3-45
3.29.2 Notation . . . 3-45
3.29.3 Example . . . 3-45
3.29.4 Mapping . . . 3-45
3.30 Metaclass . . . 3-45
3.30.1 Semantics . . . 3-45

Contents

3.30.2 Notation . . . 3-46
3.30.3 Mapping . . . 3-46
3.31 Class Pathnames . . . 3-46
3.31.1 Notation . . . 3-46
3.31.2 Example . . . 3-46
3.31.3 Mapping . . . 3-47
3.32 Importing a Package . . . 3-47
3.32.1 Semantics . . . 3-47
3.32.2 Notation . . . 3-47
3.32.3 Example . . . 3-48
3.32.4 Mapping . . . 3-48
3.33 Object . . . 3-48
3.33.1 Semantics . . . 3-48
3.33.2 Notation . . . 3-48
3.33.3 Presentation Options . . . 3-49
3.33.4 Style Guidelines . . . 3-50
3.33.5 Variations . . . 3-50
3.33.6 Example . . . 3-50
3.33.7 Mapping . . . 3-50
3.34 Composite Object . . . 3-51
3.34.1 Semantics . . . 3-51
3.34.2 Notation . . . 3-51
3.34.3 Example . . . 3-51
3.34.4 Mapping . . . 3-52
3.35 Association . . . 3-52
3.36 Binary Association . . . 3-52
3.36.1 Semantics . . . 3-52
3.36.2 Notation . . . 3-52
association name 3-52
association class symbol 3-53
3.36.3 Presentation Options . . . 3-53
3.36.4 Style Guidelines . . . 3-53
3.36.5 Options . . . 3-53
Or-association 3-53
3.36.6 Example . . . 3-54
3.36.7 Mapping . . . 3-54
3.37 Association End . . . 3-55
3.37.1 Semantics . . . 3-55
3.37.2 Notation . . . 3-55
multiplicity 3-55
ordering 3-55

qualifier 3-56
navigability 3-56
aggregation indicator 3-56
rolename 3-56
interface specifier 3-56
changeability 3-57
visibility 3-57

3.37.3 Presentation Options . . . 3-57
3.37.4 Style Guidelines . . . 3-58
3.37.5 Example . . . 3-58
3.37.6 Mapping . . . 3-58
3.38 Multiplicity . . . 3-59
3.38.1 Semantics . . . 3-59
3.38.2 Notation . . . 3-59
3.38.3 Style Guidelines . . . 3-59
3.38.4 Example . . . 3-60
3.38.5 Mapping . . . 3-60
3.39 Qualifier . . . 3-60
3.39.1 Semantics . . . 3-60
3.39.2 Notation . . . 3-60
3.39.3 Presentation Options . . . 3-61
3.39.4 Style Guidelines . . . 3-61
3.39.5 Example . . . 3-61
3.39.6 Mapping . . . 3-61
3.40 Association Class . . . 3-62
3.40.1 Semantics . . . 3-62
3.40.2 Notation . . . 3-62
3.40.3 Presentation Options . . . 3-62
3.40.4 Style Guidelines . . . 3-62
3.40.5 Example . . . 3-63
3.40.6 Mapping . . . 3-63
3.41 N-ary Association . . . 3-63
3.41.1 Semantics . . . 3-63
3.41.2 Notation . . . 3-64
3.41.3 Style Guidelines . . . 3-64
3.41.4 Example . . . 3-64
3.41.5 Mapping . . . 3-65
3.42 Composition . . . 3-65
3.42.1 Semantics . . . 3-65
3.42.2 Notation . . . 3-65
3.42.3 Design Guidelines . . . 3-66
3.42.4 Example . . . 3-67

Contents

3.42.5 Mapping . . . 3-68
3.43 Links . . . 3-68
3.43.1 Semantics . . . 3-68
3.43.2 Notation . . . 3-68
Implementation stereotypes 3-68
N-ary link 3-69
3.43.3 Example . . . 3-69
3.43.4 Mapping . . . 3-69
3.44 Generalization . . . 3-70
3.44.1 Semantics . . . 3-70
3.44.2 Notation . . . 3-70
3.44.3 Presentation Options . . . 3-70
3.44.4 Details . . . 3-70
3.44.5 Example . . . 3-72
3.44.6 Mapping . . . 3-73
3.45 Dependency . . . 3-74
3.45.1 Semantics . . . 3-74
3.45.2 Notation . . . 3-74
3.45.3 Presentation Options . . . 3-75
3.45.4 Example . . . 3-75
3.45.5 Mapping . . . 3-76
3.46 Derived Element . . . 3-76
3.46.1 Semantics . . . 3-76
3.46.2 Notation . . . 3-76
3.46.3 Style Guidelines . . . 3-76
3.46.4 Example . . . 3-77
3.46.5 Mapping . . . 3-77
3.47 Use Case Diagram . . . 3-77
3.47.1 Semantics . . . 3-77
3.47.2 Notation . . . 3-78
3.47.3 Example . . . 3-78
3.47.4 Mapping . . . 3-78
3.48 Use Case . . . 3-79
3.48.1 Semantics . . . 3-79
3.48.2 Notation . . . 3-79
3.48.3 Presentation Options . . . 3-79
3.48.4 Style Guidelines . . . 3-79
3.48.5 Mapping . . . 3-79
3.49 Actor . . . 3-79
3.49.1 Semantics . . . 3-79

3.49.2 Notation . . . 3-79
3.49.3 Style Guidelines . . . 3-80
3.49.4 Mapping . . . 3-80
3.50 Use Case Relationships . . . 3-80
3.50.1 Semantics . . . 3-80
3.50.2 Notation . . . 3-80
3.50.3 Example . . . 3-81
3.50.4 Mapping . . . 3-81
3.51 Kinds of Interaction Diagrams . . . 3-81
3.52 Sequence Diagram . . . 3-82
3.52.1 Semantics . . . 3-82
3.52.2 Notation . . . 3-82
3.52.3 Presentation Options . . . 3-82
3.52.4 Example . . . 3-83
3.52.5 Mapping . . . 3-85
Sequence diagram 3-85
3.53 Object Lifeline . . . 3-86
3.53.1 Semantics . . . 3-86
3.53.2 Notation . . . 3-86
3.53.3 Example . . . 3-86
3.53.4 Mapping . . . 3-86
3.54 Activation . . . 3-87
3.54.1 Semantics . . . 3-87
3.54.2 Notation . . . 3-87
3.54.3 Example . . . 3-87
3.54.4 Mapping . . . 3-87
3.55 Message . . . 3-87
3.55.1 Semantics . . . 3-87
3.55.2 Notation . . . 3-88
3.55.3 Presentation options . . . 3-88
3.55.4 Mapping . . . 3-89
3.56 Transition Times . . . 3-89
3.56.1 Semantics . . . 3-89
3.56.2 Notation . . . 3-89
3.56.3 Example . . . 3-90
3.56.4 Mapping . . . 3-90
3.57 Collaboration . . . 3-90
3.57.1 Semantics . . . 3-90
3.57.2 Notation . . . 3-91
3.58 Collaboration Diagram . . . 3-91

Contents

3.58.1 Semantics . . . 3-91
3.58.2 Notation . . . 3-91
3.58.3 Example . . . 3-92
3.58.4 Mapping . . . 3-93
3.59 Pattern Structure . . . 3-93
3.59.1 Semantics . . . 3-93
3.59.2 Notation . . . 3-93
3.59.3 Mapping . . . 3-94
3.60 Collaboration Contents . . . 3-94
3.60.1 Semantics . . . 3-94
3.60.2 Notation . . . 3-95
Methods 3-95
Classes 3-95
3.61 Interactions . . . 3-96
3.61.1 Semantics . . . 3-96
3.61.2 Notation . . . 3-96
3.61.3 Example . . . 3-96
3.62 Collaboration Roles . . . 3-96
3.62.1 Semantics . . . 3-96
3.62.2 Notation . . . 3-97
3.62.3 Presentation options . . . 3-97
3.62.4 Example . . . 3-97
3.62.5 Mapping . . . 3-97
3.63 Multiobject . . . 3-98
3.63.1 Semantics . . . 3-98
3.63.2 Notation . . . 3-98
3.63.3 Example . . . 3-99
3.63.4 Mapping . . . 3-99
3.64 Active object . . . 3-99
3.64.1 Semantics . . . 3-99
3.64.2 Notation . . . 3-99
3.64.3 Example . . . 3-100
3.64.4 Mapping . . . 3-100
3.65 Message flows . . . 3-101
3.65.1 Semantics . . . 3-101
3.65.2 Notation . . . 3-101
Control flow type 3-101
Message label 3-101
Predecessor 3-102
Sequence expression 3-102
Signature 3-103

3.65.3 Presentation Options. . . . 3-104
3.65.4 Example 3-104
3.65.5 Mapping 3-104
3.66 Creation/Destruction Markers 3-105
3.66.1 Semantics 3-105
3.66.2 Notation 3-105
3.66.3 Presentation options 3-105
3.66.4 Example 3-105
3.66.5 Mapping 3-105
3.67 Statechart Diagram. . . . 3-106
3.67.1 Semantics 3-106
3.67.2 Notation 3-106
3.67.3 Mapping 3-107
3.68 States 3-107
3.68.1 Semantics 3-107
3.68.2 Notation 3-108
3.68.3 Example 3-109
3.68.4 Mapping 3-109
3.69 Composite States 3-109
3.69.1 Semantics 3-109
3.69.2 Notation 3-110
3.69.3 Example 3-110
3.69.4 Mapping 3-111
3.70 Events. . . . 3-111
3.70.1 Semantics 3-111
3.70.2 Notation 3-112
3.70.3 Example 3-113
3.70.4 Mapping 3-113
3.71 Simple Transitions 3-114
3.71.1 Semantics 3-114
3.71.2 Notation 3-114
Branches 3-115
Transition times 3-115
3.71.3 Example 3-115
3.71.4 Mapping 3-115
3.72 Complex Transitions 3-116
3.72.1 Semantics 3-116
3.72.2 Notation 3-116
3.72.3 Example 3-116
3.72.4 Mapping 3-116

Contents

3.73 Transitions to Nested States . . . 3-117
3.73.1 Semantics . . . 3-117
3.73.2 Notation . . . 3-117
3.73.3 Presentation options . . . 3-118
Stubbed transitions 3-118
3.73.4 Example . . . 3-118
3.73.5 Mapping . . . 3-119
3.74 Sending Messages . . . 3-120
3.74.1 Semantics . . . 3-120
3.74.2 Notation . . . 3-120
3.74.3 Example . . . 3-121
3.74.4 Mapping . . . 3-122
3.75 Internal Transitions . . . 3-123
3.75.1 Semantics . . . 3-123
3.75.2 Notation . . . 3-123
3.75.3 Mapping . . . 3-123
3.76 Activity Diagram . . . 3-124
3.76.1 Semantics . . . 3-124
3.76.2 Notation . . . 3-124
3.76.3 Example . . . 3-125
3.76.4 Mapping . . . 3-126
3.77 Action state . . . 3-126
3.77.1 Semantics . . . 3-126
3.77.2 Notation . . . 3-126
3.77.3 Presentation options . . . 3-126
3.77.4 Example . . . 3-126
3.77.5 Mapping . . . 3-127
3.78 Decisions . . . 3-127
3.78.1 Semantics . . . 3-127
3.78.2 Notation . . . 3-127
3.78.3 Example . . . 3-127
3.78.4 Mapping . . . 3-128
3.79 Swimlanes . . . 3-128
3.79.1 Semantics . . . 3-128
3.79.2 Notation . . . 3-128
3.79.3 Example . . . 3-129
3.79.4 Mapping . . . 3-129
3.80 Action-Object Flow Relationships . . . 3-130
3.80.1 Semantics . . . 3-130
3.80.2 Notation . . . 3-130

Object responsible for an action 3-130
Object flow 3-130
Object in state 3-130
3.80.3 Example . . . 3-131
3.80.4 Mapping . . . 3-131
3.81 Control Icons . . . 3-132
3.81.1 Stereotypes . . . 3-132
Signal receipt 3-132
Signal sending 3-132
Deferred events 3-133
3.81.2 Mapping . . . 3-134
3.82 Component Diagram . . . 3-135
3.82.1 Semantics . . . 3-135
3.82.2 Notation . . . 3-135
3.82.3 Example . . . 3-136
3.82.4 Mapping . . . 3-136
3.83 Deployment Diagrams . . . 3-136
3.83.1 Semantics . . . 3-136
3.83.2 Notation . . . 3-136
3.83.3 Example . . . 3-137
3.83.4 Mapping . . . 3-137
3.84 Nodes . . . 3-138
3.84.1 Semantics . . . 3-138
3.84.2 Notation . . . 3-138
3.84.3 Example . . . 3-138
3.84.4 Mapping . . . 3-139
3.85 Components . . . 3-139
3.85.1 Semantics . . . 3-139
3.85.2 Notation . . . 3-140
3.85.3 Example . . . 3-140
3.85.4 Mapping . . . 3-140
3.86 Location of Components and Objects within Objects . . . 3-141
3.86.1 Semantics . . . 3-141
3.86.2 Notation . . . 3-141
3.86.3 Example . . . 3-141
3.86.4 Mapping . . . 3-141

4. UML Extensions . . . 4-1

Contents 4-1

4.1 Overview . . . 4-2
4.2 Introduction . . . 4-2
4.3 Summary of Extension . . . 4-2

Contents

4.3.1 TaggedValues 4-3
4.3.2 Constraints 4-3
4.3.3 Prerequisite Extensions 4-3
4.4 Stereotypes and Notation 4-3
4.4.1 Model, Package, and Subsystem Stereotypes . . 4-3
Use Case 4-4
Analysis 4-4
Design 4-4
Implementation 4-4
Notation 4-5
4.4.2 Class Stereotypes 4-5
Entity 4-5
Control 4-6
Boundary 4-6
Notation 4-6
4.4.3 Association Stereotypes 4-6
Communicates 4-6
Subscribes 4-7
Notation 4-7
4.5 Well-Formedness Rules 4-7
4.5.1 Generalization 4-7
4.5.2 Association 4-7
4.6 Introduction 4-8
4.7 Summary of Extension 4-8
4.7.1 Stereotypes 4-8
4.7.2 Tagged Values 4-9
4.7.3 Constraints 4-9
4.7.4 Prerequisite Extensions 4-9
4.8 Stereotypes and Notation 4-9
4.8.1 Model, Package, and Subsystem Stereotypes . . 4-9
Use Case 4-9
Object 4-9
Organization Unit 4-10
Work Unit 4-10
Notation 4-10
4.8.2 Class Stereotypes 4-10
Worker 4-10
Case Worker 4-10
Internal Worker 4-11
Entity 4-11
Notation 4-11
Example of Alternate Notations 4-11
4.8.3 Association Stereotypes 4-12
Communicates 4-12
Subscribes 4-12
Notation 4-12
4.9 Well-Formedness Rules 4-12

4.9.1 Generalization 4-13
4.9.2 Association 4-13

5. OA&D CORBAfacility Interface Definition 5-1

Contents 5-1

5.1 Service Description 5-2
5.1.1 Tool Sharing Options 5-3
General-purpose Repository 5-3
Model Transfer 5-3
Model Access 5-3

5.2 Mapping of UML Semantics to Facility Interfaces 5-4
5.2.1 Transformation of UML Semantics Metamodel into Interfaces Metamodel 5-4
Transformation for Association Classes 5-5
MOF Generic Interfaces 5-6
DataTypes for Interface 5-6
5.2.2 Mapping of Interface Model into MOF 5-7
5.2.3 Mapping from MOF to IDL 5-9

5.3 Facility Implementation Requirements 5-9

5.4 IDL Modules 5-10
5.4.1 Reflective 5-10
5.4.2 UMLModelManagement 5-63
5.4.3 UMLAuxiliaryElements 5-69
5.4.4 UMLCollaborations 5-80
5.4.5 UMLCommonBehavior 5-101
5.4.6 UMLStateMachines 5-134
5.4.7 UMLUseCases 5-168

Appendix A. UML Standard Elements A-1

Appendix B. Object Constraint Language B-1

Missing Rolenames B-11
Navigation over Associations with Multiplicity Zero or One B-11
Combining Properties B-12
Shorthand for Collect B-21
OclType B-24
OclAny B-24
OclExpression B-25
Real B-26
Integer B-27
String B-28
Boolean B-29
Enumeration B-30
Collection B-30
Set B-32
Bag B-34

Contents

Sequence B-36

Index Index-1