





A
Abstract classes, relationship of classes
to interfaces, 69–72
Actions
expansion regions, 126-127
UML version changes, 157
Active classes, 83
Activities, exit, 109
Activity diagrams, 11-12
actions, expansion regions, 126-127
basics, 117-119
decomposing actions, 119-121
edges, 124–125
flow final, 127-128
flows, 124–125
Petri Nets, 130
joins, 118–119
specifications, 128–129
partitions, 120–121, 122
pins, 125
requirement analysis, 29
resources, 130
signals, 121-123
times to use, 129–130
tokens, 124
transformations, 125-126
UML version changes, 156–157,
159
Activity state, 109–110
Actors, 99–100, 143–144
Acyclic Dependency Principle, 91
Aggregation, 67–68
Agile development processes, 24–25
resources, 33
Aliasing, 74
Analysis Patterns, 154
Archetypes, 4

Artifacts, 97-98 UML version changes, 157 Assertions, 50 subclassing, 51 Association classes, 78-80 Associations, class properties, 37-38 bidirectional, 41-43 immutability versus frozen, 154 qualified, 75-76 unidirectional, 41 Associative arrays. See Qualified associations Asynchronous messages, 61 Attributes class properties, 36-37, 39 classes, 66-67 mandatory, 39 Automated regression tests, 22 В Ball and socket notation, 71 Beck, Kent, CRC cards, 63 Bidirectional associations, 41-43 Blueprints, UML as forward engineering, 2-3, 6 reverse engineering, 3, 6 Booch, Grady, UML history, 7-9 Bound elements, 81–82 Branches, 119 Business use cases, 103 C CASE (computer-aided software engineering) tools, 3 UML history, 8 Centralized control of sequence diagramming, 55-57















INDEX

Ceremony, agile processes, 25 Class diagrams, 9, 11-12 abstract classes, 69-72 active classes, 83 aggregation and composition, 67-68 association classes, 78-80 classifications, 75-76 dynamic and multiple, 76-77 comments, 46 constraint rules, 49-50 dependencies, 47-49 design, 30 documentation, 32 generalizations, 45-46, 75-76 keywords, 65–66 messages, 84-85 notes, 46 operations, 43-46 properties (See Class properties) reference objects, 73-74 requirement analysis, 29 resources, 52 responsibilities, 66 starting with UML, 16 static operations and attributes, 66-67 template (parameterized) classes, 81 - 82times to use, 51–52 UML version changes, 158 value objects, 74 versus object diagrams, 88 visibility, 83-84 Class properties. See also Classes associations, 37-38 associations, bidirectional associations, 41-43 associations, immutability versus frozen, 154 associations, qualified, 75-76 attributes, 36–37 basics, 35-38 derived, 68 frozen, 72 generalizations, 45-46 multiplicity, 38-39 program interpretations, 39-41 read-only, 72

Class-Responsibility-Collaboration (CRC) cards, 62-63 Classes. See Class properties abstract, 69-72 association, 78-80 attributes, 66-67 Class-Responsibility-Collaboration (CRC) cards, 62-63 derivation, 81-82 dynamic data types, 153-154 generalizations, 35, 36 implementation, 153-154 presentation, 47 static data types, 153-154 static versus dynamic classifications, 77-78 subclassing, 51 template (parameterized), 81-82 Classifications data types, 153-154 dynamic and multiple, 76-77 implementation classes, 153-154 versus generalizations, 75-76 Clients/suppliers, 47 Coad, Peter, UML history, 7 Cockburn, Alistair, use cases, 105 Collaboration diagram. See Communication diagrams Collaborations roles, 143-144 sequence diagrams, 144 times to use, 146 Comments in class diagrams, 46 Common Closure and Reuse Principles, 91 Common Object Request Broker Architecture (CORBA) standards, 1 Communication diagrams, 11-12 basics, 131-133 times to use, 133 Component diagrams, 11-12 basics, 139-141 times to use, 141 Composite structure diagrams, 11-12 basics, 135-136 times to use, 137 Composition, 67–68 changes between UML versions, 154



















Computer-aided software engineering	Development processes
(CASE) tools, 3	agile, 24–25
UML history, 8	DSDM (Dynamic Systems Develop-
Conceptual perspectives of UML,	ment Method), 24–25
5–6	Extreme Programming (XP), 22,
Concurrent states, 111	24–25, 33
Conditionals, 57–61	fitting processes to projects, 26, 28–29
decisions and merges, 119	FOD (Feature Driven Development),
Constraints	24–25
complete/incomplete, 154	iterative, 19–22
rules, 49–50	lightweight, 25
Construction, RUP projects, 26	Manifesto of Agile Software
Continuous integration, 22	Development, 24–25
Conventional use, 13–14	Rational Unified Process (RUP), 25
CORBA (Common Object Request	resources, 33
Broker Architecture), 1	selecting, 33
CRC (Class-Responsibility-Collaboration)	staged delivery, 21
cards, 62–63	waterfall, 19-22
Crystal, agile development process,	Devices, 97–98
24–25	Diagrams
Cunningham, Ward, CRC cards,	activity, 11–12
62–63	actions, expansion regions, 126-127
	basics, 117-119
D	decomposing actions, 119-121
Data tadpoles, 61	edges, 124–125
Data types, 74	flow final, 127–128
dynamic and multiple classifications,	flows, 124–125
153–154	flows, Petri Nets, 130
implementation classes, 153-154	joins, 118–119
Decisions, 119	joins, specifications, 128-129
Dependencies, 47–49	partitions, 120-121, 122
keywords, 48–49	pins, 125
packages, 91–93	requirement analysis, 29
resources, 52	resources, 130
UML version changes, 155	signals, 121-123
Deployment diagrams, 11-12	times to use, 129–130
artifacts, 97–98	tokens, 124
design, 30	transformations, 125-126
devices, 97–98	UML version changes, 156-157, 159
execution environments, 97–98	basics, 10–12
nodes, 97–98	class, 9, 11–12
times to use, 98	abstract classes, 69–72
Derivation of classes, 81–82	active classes, 83
Derived properties, class diagrams, 68	aggregation and composition,
Descriptive rules, UML, 13–14	67–68
Design, 30–31	association classes, 78–80
Development cases, 25	classifications, 75–76



















INDEX

Diagrams, class, continued classifications, dynamic and multiple, 76 - 77comments, 46 constraint rules, 49–50 dependencies, 47-49 design, 30 documentation, 32 generalizations, 45-46, 75-76 keywords, 48-49, 65-66 messages, 84-85 notes, 46 operations, 43-46 properties (See Class properties) reference objects, 73-74 requirement analysis, 29 resources, 52 responsibilities, 66 starting with UML, 16 static operations and attributes, 66-67 template (parameterized) classes, 81 - 82times to use, 51–52 UML version changes, 158 value objects, 74 versus object diagrams, 88 visibility, 83-84 classifications, 12 communication, 11-12, 131-133 component, 11-12, 139-141 composite structure, 11-12 basics, 135-136 times to use, 137 deployment, 11-12 artifacts, 97-98 design, 30 devices, 97-98 execution environments, 97-98 nodes, 97-98 times to use, 98 interaction basics, 53-56, 147-148 CRC cards, 62-63 design, 30 loops and conditionals, 57-61 participants, 53-57 sequence diagrams, 53-56

synchronous and asynchronous messages, 61 times to use, 147, 150 interactive overview, 11-12 object, 11-12 times to use, 87-88 package, 11-12 basics, 89-91 design, 30 documentation, 32 resources, 95 times to use, 95 UML version changes, 157 sequence, 11-12 basics, 53-56 centralized and distributed control, 55-57 collaborations, 144 CRC cards, 62-63 interaction diagrams, 53-56 loops and conditionals, 57–61 participants, 53-57 returns, 154 starting with UML, 16 synchronous and asynchronous messages, 61 times to use, 61–63 UML version changes, 158 shortcomings, 14-16 starting point, 16 state machine, 11-12 activity status, 109-110 basics, 107-109 concurrent states, 111 implementing, 111-114 initial pseudostate, 107 internal activities, 109 requirement analysis, 29 resources, 115 superstates, 110-111 times to use, 114-115 transitions, 107-108, 111 UML version changes, 159 timing, 11-12 basics, 149–150 types, 11 types, UML version changes, 157-158

















use case
basics, 102–103
requirement analysis, 29
viewpoints, 6
Dictionaries. See Qualified associations
Distributed control of sequence
diagramming, 55–57
Do-activities, 110
Documentation, 31–32
Domain objects, 47
DSDM (Dynamic Systems Development
Method), 24–25
Dynamic classifications, 77–78
data types, 153–154

E Edges, 124-125 Eiffel programming language, 50 Engineering, forward UML as blueprints, 2–3, 6 UML as programming languages, 3 UML as sketches, 2 Entry activities, 109 Enumerations, 82 Event switches, 111 Evolutionary development process. See Iterative development process Executable UML, 4–5 Execution environments, 97–98 Exit activities, 109 Expansion regions, 126-127 Extensions, 100-102 Extreme Programming (XP) agile development process, 24-25

F
Facades, 90–91
Features of use cases, 104
Fish-level use cases, 103–104
Flows, 124–125
flow final, 127–128
Petri Nets, 130
FDD (Feature Driven Development), 24–25
Forks, 117, 119
UML version changes, 156

resources, 33

technical practices, 22

Forward engineering
UML as blueprints, 2–3, 6
UML as programming languages, 3
UML as sketches, 2
Found messages, 55
Frozen property, 72, 154
Fully qualified names, 89

G
Gang of Four, 27–28
Generalizations, 35, 36
class properties, 45–46
sets, 76–77
UML version changes, 155
versus classifications, 75–76
Getting methods, 45
Graphical modeling languages, 1
Guarantees, 102
Guards, 59

H Hashes. See Qualified associations History pseudostate, 111–112

Implementation classes, data types, 153-154 Include relationships, 101 Incremental development process. See Iterative development process Initial node actions, 117, 119 Initial pseudostate, 107 Instance specifications, 87 Integration, continuous, 22 Interaction diagrams basics, 53-56, 147-148 CRC cards, 62-63 design, 30 loops and conditionals, 57-61 participants, 53-57 sequence diagrams, 53–56 synchronous and asynchronous messages, 61 times to use, 147, 150 Interaction frames loops and conditionals, 58-59 operators, 59

Interactive overview diagrams, 11-12



















Interfaces, 65
relationship to classes, 69–72
Internal activities, entry and exit, 109
Internal activities, exit activities, 109
Invariants, 51
Iteration markers, 59
Iteration retrospective, 28
Iterations, 20
timeboxing, 21–22
Iterative development process, 19–22

Jacobson, Ivar
UML history, 7–8
use cases, 105
Jacuzzi development process. See Iterative
development process
Joins, 118–119
specifications, 128–129
UML version changes, 156

K Keywords, class diagrams, 48–49, 65–66 Kite-level use cases, 103–104

L Legacy code, 32 Lightweight development processes, 25 Lollipop notation, 71–72, 73 Loomis, Mary, UML history, 8 Loops, 57–61

M

Main success scenario, 100–102
Mandatory attributes, 39
Manifesto of Agile Software
Development, 24–25
Maps. See Qualified associations
Markers, iteration, 59
MDA (Model Driven Architecture), 4
Mellor, Steve
Executable UML, 4
UML history, 7
Merges, 119
Messages, 84–85
asynchronous and synchronous, 61
class diagrams, 84–85

found, 55
pseudomessages, 60
Meta-models
definitions, 9–10
UML version changes, 157
Methods
implementation of actions, 119
versus operations, 45
Meyer, Bertrand, Design by Contract, 50
Model compilers, 4
Modifiers, 44
Multiple classifications, 77–78
data types, 153–154
Multiplicity of properties, 38–39
Multivalued attributes, 39

N Namespaces, 89 Navigability arrows, 42 Nodes, 97–98 Normative use, 13–14 Notation ball and socket, 71 definitions, 9–10 Lollipop, 71–72, 73

Object diagrams, 11-12

documentation, 32

O

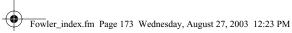
times to use, 87–88 OCL (Object Constraint Language), 49-50 Odell, Jim, UML history, 7–8 OMG (Object Management Group) control of UML, 1 MDA (Model Driven Architecture), 4 revisions to UML versions, 151-152 UML history, 7-9 OO (object-oriented) programming, 1 paradigm shift, 56 Operations, versus methods, 45 Operators, interaction frames, 59 Optional attributes, 39 Package diagrams, 11-12 basics, 89-91 design, 30

















resources, 95	attributes, 36–37
times to use, 95	basics, 35-38
UML version changes, 157	derived, 68
Packages	frozen, 72
aspects, 93–94	multiplicity, 38-39
Common Closure and Reuse Principles,	program interpretations, 39-41
91	read-only, 72
definitions, 89	Protected elements, 83
dependencies, 91-93	Proxy projects, 27
fully qualified names, 89	Pseudomessages, 60
implementing, 94–95	PSM (Platform Specific Model), 4
namespaces, 89	Public elements, 83
Participants, sequence diagrams, 53-57	
Partitions, activity diagrams, 120-121,	Q
122	Qualified associations, 75-76
Patterns	Queries, 44
definition, 27–28	
Separated Interface, 94	R
State, 111–114	Rational Unified Process (RUP)
using, 145	development cases, 25
Petri Nets (flow-oriented techniques), 130	phases, 25–26
PIM (Platform Independent Model), 4	resources, 33
Pins, 125	Read-only property, 72
Planning, adaptive <i>versus</i> predictive,	Rebecca Wirfs-Brock, UML history, 7
23–24	Refactoring, 22
Platform Specific Model (PSM), 4	Reference objects, 73–74
Post-conditions, Design by Contract, 50	Relationships
Pre-conditions	abstract classes to interfaces, 69–72
Design by Contract, 50	include, 101–103
use cases, 102	temporal, 80
Predictive planning, versus adaptive	transitive, 48
planning, 23–24	Releases, 20
Prescriptive rules, UML, 13–14	Requirement Analysis, 29–30
Presentation classes, 47	Requirements churn, 23
Private elements, 83	Responsibilities of classes, 66
Profiles, 66	Retrospectives
UML version changes, 157	iteration, 28
Programming languages, UML as, 3, 5	project, 28–29
forward engineering, 3	Reusable archetypes, 4
MDA (Model Driven Architecture), 4	Reverse engineering
reverse engineering, 3	UML as blueprints, 3, 6
value, 5	UML as programming languages, 3
Project retrospective, 28–29	UML as sketches, 2
Properties of classes	Revisions by versions (UML)
associations, 37–38	from 0.8 through 2.0, general history
bidirectional associations, 41–43	151–152
qualified, 75–76	from 1.0 to 1.1, 153–155



















INDEX

Revisions by versions (UML), continued from 1.2 to 1.3, 155–157 from 1.3 to 1.4, 157 from 1.4 to 1.5, 157 from 1.x through 2.0, 157-159 Roles. See Actors Round-trip tools, 3 Rumbaugh, Jim aggregation, 67 composite structures, 137 UML history, 7-9 RUP (Rational Unified Process) development cases, 25 phases, 25-26 resources, 33

Scenario sets, 99 Scrum, 24–25 Sea-level use cases, 103-104 Searching state, 110 Separated Interface, 94 Sequence diagrams, 11–12 basics, 53-56 centralized and distributed control, 55-57 collaborations, 144 CRC cards, 62–63 interaction diagrams, 53-56 loops and conditionals, 57-61 participants, 53-57 returns, 154 starting with UML, 16 synchronous and asynchronous messages, 61 times to use, 61-63 UML version changes, 158 Setting methods, 45 Shlaer, Sally, UML history, 7 Signals, 121–123 Single classification, 76–77 implementation classes, 153-154 Single-valued attributes, 39 Sketches, UML as, 6 forward engineering, 2

reverse engineering, 2

Smalltalk, 5

Software development processes. See Development processes Software perspectives, UML, 5-6 Spiral development process. See Iterative development process Stable Abstractions Principle, 92 Stable Dependencies Principle, 91 Staged delivery development process, 21 Standard use, 13-14 State diagrams. See State machine diagrams State machine diagrams, 11-12 activity status, 109-110 basics, 107-109 concurrent states, 111 implementing, 111-114 initial pseudostate, 107 internal activities, 109 requirement analysis, 29 resources, 115 superstates, 110–111 times to use, 114-115 transitions, 107-108, 111 UML version changes, 159 State tables, 111-112, 114 Static classifications implementation classes, 153-154 versus dynamic classifications, 77-78 Static operations of classes, 66–67 Stereotypes, 66 Stories. See Features of use cases Subactivities, 119-121 Subclassing, 46 assertions, 51 Substitutability, 45-46 Subtypes, 46 Superstates, 110-111 Suppliers/clients, 47 Swim lanes. See Partitions Synchronous messages, 61 System use cases, 103

Т Temporal relationships, 80 Three Amigos, 8 Time signals, 121 Timeboxing, 21–22



















Tilling diagrams, 11–12	110111 1.2 to 1.3, 133–137
basics, 149-150	from 1.3 to 1.4, 157
Tokens, 124	from 1.4 to 1.5, 157
Transformations, 125–126	from 1.x through 2.0, 157-159
Transitions, 26, 107–108, 111	Unidirectional associations, 41
state, 113	Unified Method documentation, 7–8
Transitive relationships, 48	Unified Modeling Language. See UML
Trigger, 102	UP (Unified Process). See RUP
Types. See Data types	Use case diagrams
71	basics, 102–103
U	requirement analysis, 29
UML	Use cases
conventional use, 13-14	actors, 99–100
definition, 1	business, 103
descriptive rules, 13–14	extensions, 100–102
fitting into processes, 29–32	features, 104
history, 7–9	include relationships, 101–103
meaning, 14	levels, 103–104
prescriptive rules, 13–14	MSS (main success scenario), 100–102
resources, 16–17	resources, 105
software and conceptual perspectives,	scenario sets, 99
5–6	times to use, 104–105
standards, legal versus illegal use,	UML version changes, 155–156
13–14	User Guide, 115
UML as blueprints	User stories. See Features of use cases
forward engineering, 2–3, 6	
reverse engineering, 3, 6	V
UML as programming language, 3, 5	Value objects, 74
forward engineering, 3	Visibility, 83–84
MDA (Model Driven Architecture), 4	,
reverse engineering, 3	W
value, 5	Warehousing systems, Platform
UML as sketches, 6	Independent Model and Platform
forward engineering, 2	Specific Model, 4
reverse engineering, 2	Waterfall development process, 19–22
UML diagrams. See Diagrams and	Well formed UML
specific diagram types	definition, 14
UML Distilled, book editions and	legal UML, 13–14
corresponding UML versions,	,
153–155	X
UML revisions by versions	XP (Extreme Programming)
from 0.8 through 2.0, general history,	agile development process, 24–25
151–152	resources, 33
from 1.0 to 1.1, 153–155	technical practices, 22









