ISO/IEC 19514:2017-03 (E)

Information technology - Object management group systems modeling language (OMG SysML)

Contents

Page

FOREWORD xix

INTRODUCTION xx

1 Scope 1

1.1 General 1

2 Normative References 1

3 Additional Information 2

3.1 Relationships to Other Standards 2

3.2 How to Read this International Standard 2

3.2.1 Organization 3

3.3 Acknowledgments 4

4 Language Architecture 7

4.1 General 7

4.2 Design Principles 10

4.3 Architecture 10

4.4 Extension Mechanisms 13

4.5 SysML Diagrams 13

5 Conformance 15

5.1 Overview 15

5.2 Conformance Types 15

6 Language Formalism 17

6.1 Levels of Formalism 17

6.2 Clause Structure 17

6.2.1 Overview 17

6.2.2 Diagram Elements 17

6.2.3 UML Extensions 17

6.2.4 Usage Examples 18

6.3 Conventions and Typography 18

STRUCTURAL CONSTRUCTS 19

7 Model Elements 21
7.1 Overview 21
7.1.1 View and Viewpoint 21
7.2 Diagram Elements 22
7.3 UML Extensions 25
7.3.1 Diagram Extensions 25
7.3.1.1 UML Diagram Elements not Included in SysML 25
7.3.2 Stereotypes 26
7.3.2.1 Conform 26
7.3.2.2 ElementGroup 27
7.3.2.3 Expose 28
7.3.2.4 Problem 28
7.3.2.5 Rationale 29
7.3.2.6 Stakeholder 29
7.3.2.7 View 29
7.3.2.8 Viewpoint 30
7.4 Usage Examples 30
8 Blocks 33
8.1 Overview 33
8.2 Diagram Elements 34
8.2.1 Block Definition Diagram 34
8.2.2 Internal Block Diagram 40
8.3 UML Extensions 42
8.3.1 Diagram Extensions 42
8.3.1.1 Block Definition Diagram 42
8.3.1.2 Internal Block Diagram 44
8.3.1.3 UML Diagram Elements not Included in SysML Block Definition Diagrams 46
8.3.1.4 UML Diagram Elements not Included in SysML Internal Block Diagrams 46
8.3.2 Stereotypes 47
8.3.2.1 AdjunctProperty 49
8.3.2.2 Binding Connector 50
8.3.2.3 Block 51
8.3.2.4 Bound Reference 53
8.3.2.5 ClassifierBehaviorProperty 54
8.3.2.6 ConnectorProperty 54
8.3.2.7 DirectedRelationshipPropertyPath 55
8.3.2.8 DistributedProperty 56
8.3.2.9 ElementPropertyPath 56
8.3.2.10 EndPathMultiplicity 56
8.3.2.11 NestedConnectorEnd 57
8.3.2.12 ParticipantProperty 57
8.3.2.13 PropertySpecificType 58
8.3.2.14 ValueType 58
8.3.3 Model Libraries 59

8.3.3.1 Package PrimitiveValueTypes 59
8.3.3.2 Package UnitAndQuantityKind 60
8.4 Usage Examples 62
8.4.1 Wheel Hub Assembly 62
8.4.2 Example Value Type Definitions 64
8.4.3 Design Configuration for SUV EPA Fuel Economy Test 65
8.4.4 Water Delivery 65
8.4.5 Constraining Decomposition 65
8.4.6 Units and Quantity Kinds 67
9 Ports and Flows 71
9.1 Overview 71
9.1.1 Ports 71
9.1.2 Flow Properties, Provided and Required Features, and Nested Ports 71
9.1.3 Proxy Ports and Full Ports 71
9.1.4 Item Flows 72
9.1.5 Deprecation of Flow Ports and Flow Specifications 72
9.2 Diagram Elements 73
9.2.1 Block Definition Diagram 73
9.2.2 Internal Block Diagram 76
9.3 UML Extensions 78
9.3.1 Diagram Extensions 78
9.3.1.1 DirectedFeature 78
9.3.1.2 FlowProperty 78
9.3.1.3 FullPort 78
9.3.1.4 InvocationOnNestedPortAction 78
9.3.1.5 ItemFlow 78
9.3.1.6 Port 78
9.3.1.7 ProxyPort 79
9.3.1.8 TriggerOnNestedPort 79
9.3.2 Stereotypes 79
9.3.2.1 AcceptChangeStructuralFeatureEventAction 81
9.3.2.2 Block 82
9.3.2.3 ChangeStructuralFeatureEvent 82
9.3.2.4 DirectedFeature 82
9.3.2.5 FeatureDirection 83
9.3.2.6 FlowDirection 84
9.3.2.7 FlowProperty 84
9.3.2.8 FullPort 85
9.3.2.9 InterfaceBlock 86
9.3.2.10 InvocationOnNestedPortAction 86
9.3.2.11 ItemFlow 86
9.3.2.12 ProxyPort 87
9.3.2.13 TriggerOnNestedPort 88

9.4 Usage Examples 89
9.4.1 Ports with Required and Provided Features 89
9.4.2 Flow Ports and Item Flows 89
9.4.3 Ports with Flow Properties 90
9.4.4 Proxy and Full Ports 90
9.4.5 Association and Port Decomposition 91
9.4.6 Item Flow Decomposition 95
10 Constraint Blocks 97
10.1 Overview 97
10.2 Diagram Elements 98
10.2.1 Block Definition Diagram 98
10.2.2 Parametric Diagram 98
10.3 UML Extensions 99
10.3.1 Diagram Extensions 99
10.3.1.1 Block Definition Diagram 99
10.3.1.2 Parametric Diagram 101
10.3.2 Stereotypes 100
10.3.2.1 ConstraintBlock 101
10.4 Usage Examples 101
10.4.1 Definition of Constraint Blocks on a Block Definition Diagram 101
10.4.2 Usage of Constraint Blocks on a Parametric Diagram 101
BEHAVIORAL CONSTRUCTS 103
11 Activities 105
11.1 Overview 105
11.1.1 Control as Data 105
11.1.2 Continuous Systems 105
11.1.3 Probability 105
11.1.4 Activities as Blocks 106
11.1.5 Timelines 106
11.2 Diagram Elements 107
11.2.1 Activity Diagram 105
11.3 UML Extensions 114
11.3.1 Diagram Extensions 114
11.3.1.1 Activity 114
11.3.1.2 CallBehaviorAction 115
11.3.1.3 ControlFlow 116
11.3.1.4 ObjectNode, Variables, and Parameters 116
11.3.2 Stereotypes 117
11.3.2.1 Continuous 118

11.3.2.2 ControlOperator 119
11.3.2.3 Discrete 119
11.3.2.4 NoBuffer 119
11.3.2.5 Overwrite 120
11.3.2.6 Optional 120
11.3.2.7 Probability 120
11.3.2.8 Rate 121
11.3.3 Model Libraries 121
11.3.3.1 Package ControlValues 121
11.4 Usage Examples 122
12 Interactions 127
12.1 Overview 127
12.2 Diagram Elements 128
12.2.1 Sequence Diagram 128
12.3 UML Extensions 133
12.3.1 Diagram Extensions 133
12.3.1.1 Exclusion of Communication Diagram, Interaction Overview Diagram, and Timing Diagram 133
12.3.1.2 Interactions and Parameters 133
12.4 Usage Examples 134
12.4.1 Sequence Diagrams 134
13 State Machines 135
13.1 Overview 135
13.2 Diagram Elements 135
13.2.1 State Machine Diagram 135
13.3 UML Extensions 140
13.3.1 Diagram Extensions 140
13.3.1.1 State Machines and Parameters 140
13.4 Usage Examples 140
13.4.1 State Machine Diagram 140
14 Use Cases 141
14.1 Overview 141
14.2 Diagram Elements 142
14.2.1 Use Case Diagram 142
14.3 UML Extensions 143
14.4 Usage Examples 143
CROSSCUTTING CONSTRUCTS 145

15 Allocations 147
15.1 Overview 147
15.2 Diagram Elements 147
15.2.1 Representing Allocation on Diagrams 148
15.3 UML Extensions 149
15.3.1 Diagram Extensions 149
15.3.1.1 Tables 149
15.3.1.2 Allocate Relationship Rendering 149
15.3.1.3 Allocation Compartment Format 149
15.3.1.4 Allocation Callout Format 149
15.3.1.5 AllocatedActivityPartition Label 149
15.3.2 Stereotypes 150
15.3.2.1 Allocate(from Allocations) 150
15.3.2.2 AllocateActivityPartition(from Allocations) 151
15.4 Usage Examples 152
15.4.1 Behavior Allocation of Actions to Parts and Activities to Blocks 152
15.4.2 Allocate Flow 153
15.4.2.1 Allocating Structure 154
15.4.2.2 Automotive Example 154
15.4.3 Tabular Representation 155
16 Requirements 157
16.1 Overview 157
16.2 Diagram Elements 159
16.2.1 Requirement Diagram 159
16.3 UML Extensions 162
16.3.1 Diagram Extensions 162
16.3.1.1 Requirement Diagram 162
16.3.1.2 Requirement Notation 162
16.3.1.3 Requirement Property Callout Format 162
16.3.1.4 Requirements on Other Diagrams 162
16.3.1.5 Requirements Table 163
16.3.2 Stereotypes 164
16.3.2.1 Copy 164
16.3.2.2 DeriveReqt 165
16.3.2.3 Refine 165
16.3.2.4 Requirement 165
16.3.2.5 TestCase 167
16.3.2.6 Satisfy 167
16.3.2.7 Trace 167
16.3.2.8 Verify 168
16.4 Usage Examples 168
16.4.1 Requirement Decomposition and Traceability 168
16.4.2 Requirements and Design Elements 169

16.4.3 Requirements Reuse 171
16.4.4 Verification Procedure (Test Case) 172
17 Profiles & Model Libraries 175
17.1 Overview 175
17.2 Diagram Elements 176
17.2.1 Profile Definition in Package Diagram 176
17.2.1.1 Extension 178
17.2.2 Stereotypes Used On Diagrams 178
17.2.2.1 StereotypeInNode 179
17.2.2.2 StereotypeInComment 180
17.2.2.3 StereotypeInCompartment 180
17.3 UML Extensions 180
17.4 Usage Examples 180
17.4.1 Defining a Profile 180
17.4.2 Adding Stereotypes to a Profile 181
17.4.3 Defining a Model Library that Uses a Profile 182
17.4.4 Guidance on Whether to Use a Stereotype or Class 183
17.4.5 Using a Profile 183
17.4.6 Using a Stereotype 184
17.4.7 Using a Model Library Element 184
ANNEXES 187
Annex A: Diagrams 189
Annex B: SysML Diagram Interchange 195
Annex C: Deprecated Elements 205
Annex D: Sample Problem 213
Annex E: Non-normative Extensions 251
Annex F: Requirements Traceability 319
Annex G: Model Interchange 321
Annex H: Legal Information 325

List of Figures

Figure 4.1 - Overview of SysML/UML Interrelationship 7
Figure 4.2 - SysML Extension of UML 11
Figure 4.3 - SysML Package Structure 12
Figure 4.4 - Non-normative Package Structure 13
Figure 7.1 - Stereotypes defined in package ModelElements 26
Figure 7.2 - Rationale and Problem examples 31
Figure 8.1 - Nested property reference 45
Figure 8.2 - Abstract syntax extensions for SysML blocks 47
Figure 8.3 - Abstract syntax extensions for SysML properties 47
Figure 8.4 - Abstract syntax extensions for SysML value types 47
Figure 8.5 - Abstract syntax extensions for SysML property paths 48
Figure 8.6 - Abstract syntax extensions for SysML connector ends 48
Figure 8.7 - Abstract syntax extensions for SysML property-specific types 48
Figure 8.8 - Abstract syntax extensions for SysML bound references 49
Figure 8.9 - Abstract syntax extensions for SysML adjunct properties and classifier behavior properties 49
Figure 8.10 - Model library for primitive value types 59
Figure 8.11 - Model library for Unit and QuantityKind 60
Figure 8.12 - Block diagram for the Wheel Package 63
Figure 8.13 - Internal Block Diagram for WheelHubAssembly 64
Figure 8.14 - Defining Value Types with units of measure from the International System of Units (SI) 64
Figure 8.15 - Vehicle decomposition 65
Figure 8.16 - Vehicle internal structure 66
Figure 8.17 - Vehicle specialization 66
Figure 8.18 - Example of Unit, QuantityKind and ValueType definitions 67
Figure 8.19 - Instance-level view of the Unit, QuantityKind and ValueType definitions 68
Figure 8.20 - Example of equivalent Unit representations 68
Figure 8.21 - Instance-level representation of equivalent Unit definitions 69
Figure 9.1 - Port Stereotypes 79
Figure 9.2 - Stereotypes for Actions on Nested Ports 80
Figure 9.3 - Stereotypes for Property Value Change Events 80
Figure 9.4 - Provided and Required Features 80
Figure 9.5 - ItemFlow Stereotype 81
Figure 9.6 - Usage example of ports with provided and required features 89
Figure 9.7 Usage example of proxy and full ports 91
Figure 9.8 - Water Delivery association block 92
Figure 9.9 - Internal structure of Water Delivery association block 92
Figure 9.10 - Two views of Water Delivery connector within House block 93
Figure 9.11 - Specializations of Water Client in house example 93
Figure 9.12 - Plumbing association block 94
Figure 9.13 - Internal structure of Plumbing association block 94
Figure 9.14 - Water Delivery association block with internal Plumbing connector 94

Figure 9.15 - Usage example of item flows in internal block diagrams 95
Figure 9.16 - Usage example of item flow decomposition 96
Figure 9.17 - Usage example of item flow decomposition 96
Figure 10.1 - Stereotypes defined in SysML ConstraintBlocks package....100
Figure 11.1 - Block definition diagram with activities as blocks....115
Figure 11.2 - CallBehaviorAction notation.with behavior stereotype 115
Figure 11.3 - CallBehaviorAction notation.with action name 115
Figure 11.4 - Control flow notation....116
Figure 11.5 - Block definition diagram with activities as blocks associated with types of object nodes, variables, and parameters....116
Figure 11.6 - ObjectNode notation in activity diagrams....117
Figure 11.7 - ObjectNode notation in activity diagrams....117
Figure 11.8 - Abstract Syntax for SysML Activity Extensions 118
Figure 11.9 - Control values....121
Figure 11.10 - Continuous system example 1 123
Figure 11.11 - Continuous system example 2 124
Figure 11.12 - Continuous system example 3 124
Figure 11.13 - Example block definition diagram for activity decomposition 125
Figure 11.14 - Example block definition diagram for object node types....125
Figure 12.1 - Block definition diagram with interactions as blocks associated with used interactions and types of parameters....133
Figure 13.1 - Block definition diagram with state machines as blocks associated with submachines and types of parameters....140
Figure 15.1 - Abstract syntax extensions for SysML Allocation....150
Figure 15.2 - Abstract syntax expression for AllocatedActivityPartition....150
Figure 15.3 - Generic Allocation, including /from and /to association ends 152
Figure 15.4 - Behavior allocation....152
Figure 15.5 - Example of flow allocation from ObjectFlow to Connector....153
Figure 15.6 - Example of flow allocation from ObjectFlow to ItemFlow 153
Figure 15.7 - Example of flow allocation from ObjectNode to FlowProperty 154
Figure 15.8 - Example of Structural Allocation....154
Figure 15.9 - Allocation Matrix showing Allocation for Hybrid SUV Accelerate Example....155
Figure 16.1 - Non-normative Examples of Tabular Representations of Requirements 163
Figure 16.2 - Abstract Syntax for Requirements Stereotypes....164
Figure 16.3 - Requirements Derivation....169
Figure 16.4 - Links between requirements and design....170
Figure 16.5 - Requirement satisfaction in an internal block diagram 171
Figure 16.6 - Use of the copy dependency to facilitate reuse 171
Figure 16.7 - Linkage of a Test Case to a requirement: This figure shows the Requirement Diagram 172
Figure 16.8 - Linkage of a Test Case to a requirement: This figure shows the Test Case as a State Diagram....173
Figure 17.1 - Defining a stereotype....178
Figure 17.2 - Using a stereotype 179

Figure 17.3 - Using stereotypes and showing values 180
Figure 17.4 - Other notational forms for showing values 180
Figure 17.5 - Definition of a profile 181
Figure 17.6 - Profile Contents 181
Figure 17.7 - Two model libraries 182
Figure 17.8 - A model with applied profile and imported model library 183
Figure 17.9 - Using two stereotypes on a model element 184
Figure 17.10 - Using model library elements 184
Figure A.1 - SysML Diagram Taxonomy 190
Figure A.2 - Diagram Frame 191
Figure A.3 - Diagram Usages 193
Figure A.4 - Optional Form of Line Crossing 194
Figure C.1 - Deprecated Stereotypes 208
Figure D.1 - Establishing the User Model by Importing and Applying SysML Profile & Model Library (Package Diagram) 214
Figure D.2 - Defining valueTypes and units to be Used in the Sample Problem 215
Figure D.3 - Establishing Structure of the User Model using Packages and Views (Package Diagram) 216
Figure D.4 - Establishing the Context of the Hybrid SUV System using a User-Defined Context Diagram. (Internal Block Diagram) Completeness of Diagram Noted in Diagram Description 217
Figure D.5 - Establishing Top Level Use Cases for the Hybrid SUV (Use Case Diagram) 218
Figure D.6 - Establishing Operational Use Cases for “Drive the Vehicle” (Use Case Diagram) 219
Figure D.7 - Elaborating Black Box Behavior for the “Drive the Vehicle” Use Case (Sequence Diagram) 220
Figure D.8 - Finite State Machine Associated with “Drive the Vehicle” (State Machine Diagram) 221
Figure D.9 - Black Box Interaction for “StartVehicle,” referencing White Box Interaction (Sequence Diagram) 221
Figure D.10 - White Box Interaction for “StartVehicle” (Sequence Diagram) 222
Figure D.11 - Establishing HSUV Requirements Hierarchy (containment) - (Requirements Diagram) 223
Figure D.12 - Establishing Derived Requirements and Rationale from Lowest Tier of Requirements Hierarchy (Requirements Diagram) 224
Figure D.13 - Acceleration Requirement Relationships (Requirements Diagram) 225
Figure D.14 - Requirements Relationships Expressed in Tabular Format (Table) 226
Figure D.15 - Defining the Automotive Domain (compare with Figure D.4) - (Block Definition Diagram) 227
Figure D.16 - Defining Structure of the Hybrid SUV System (Block Definition Diagram) 227
Figure D.17 - Internal Structure of Hybrid SUV (Internal Block Diagram) 228
Figure D.18 - Defining Structure of Power Subsystem (Block Definition Diagram) 229
Figure D.19 - Internal Structure of the Power Subsystem (Internal Block Diagram) 230
Figure D.20 - Blocks Typing Ports in the Power Subsystem (Block Definition Diagram) 230
Figure D.21 - Initially Defining Port Types with Flow Properties for the CAN Bus (Block Definition Diagram) 231
Figure D.22 - Consolidating Connectors into the CAN Bus. (Internal Block Diagram) 232
Figure D.23 - Elaborating Definition of Fuel Flow. (Block Definition Diagram) 232
Figure D.24 - Defining Fuel Flow Constraints (Parametric Diagram) 233
Figure D.25 - Detailed Internal Structure of Fuel Delivery Subsystem (Internal Block Diagram) 234
Figure D.26 - Defining Analyses for Hybrid SUV Engineering Development (Block Definition Diagram) 235
Figure D.27 - Establishing a Performance View of the User Model (Package Diagram) 236
Figure D.28 - Defining Requirements and VnV viewpoints (Package Diagram) 237

Figure D.29 - Requirements and VnV views exposing elements from the model (Package Diagram).....238
Figure D.30 - The Requirements and VnV views with supporting views (Package Diagram) 239
Figure D.31 - Defining Measures of Effectiveness and Key Relationships (Parametric Diagram).....240
Figure D.32 - Establishing Mathematical Relationships for Fuel Economy Calculations (Parametric Diagram)..241
Figure D.33 - Straight Line Vehicle Dynamics Mathematical Model (Parametric Diagram).....242
Figure D.34 - Defining Straight-Line Vehicle Dynamics Mathematical Constraints (Block Definition Diagram).....243
Figure D.35 - Results of Maximum Acceleration Analysis (Timing Diagram).....244
Figure D.36 - Behavior Model for “Accelerate” Function (Activity Diagram).....245
Figure D.37 - Decomposition of “Accelerate” Function (Block Definition diagram).....246
Figure D.38 - Detailed Behavior Model for “Provide Power” (Activity Diagram) Note hierarchical consistency with Figure D.36. 247
Figure D.39 - Flow Allocation to Power Subsystem (Internal Block Diagram).....248
Figure D.40 - Tabular Representation of Allocation from “Accelerate” Behavior Model to Power Subsystem (Table).....248
Figure D.41 - Special Case of Internal Block Diagram Showing Reference to Specific Properties (serial numbers).....249
Figure E.1 - Example activity with «effbd» stereotype applied.....253
Figure E.2 - Example activity with «streaming» and «nonStreaming» stereotypes applied to subactivities 253
Figure E.3 - Example extensions to Requirement.....256
Figure E.4 - Example Parametric Diagram using Stereotypes for Measures of Effectiveness 257
Figure E.5 - QUDV Concepts diagram 259
Figure E.6 - QUDV Units diagram 260
Figure E.7 - QUDV Quantity Kinds diagram 260
Figure E.8 - Base Unit and Quantity Kinds of the SI and ISQ respectively 278
Figure E.9 - Example of a derived unit and derived quantity kind 278
Figure E.10 - Spring Length Example 279
Figure E.11 - Model libraries of SysML Quantity Kinds and Units for the covered content of ISO 80000 parts 3,4,5,6,7,9,10 and 13 280
Figure E.12 - Organization of the definitions of units and quantities from the normative parts of ISO 80000 covered in SysML 1.4, which includes all the normative content of parts 3,4,5,6; the subset of parts 7,9,10 corresponding to the content from SysML 1.3 and the subset of part 13 pertaining to commonly used units of information. Parts 8,11 and 12 are not covered because none of their units and quantities were referenced in previous versions of SysML nor in the summary tables in ISO 80000-1 281
Figure E.13 - Content relationships for the systems of units and quantities in from the different parts of ISO 80000 in relation to ISO 80000 as a whole and to the International System of Units (SI) and quantities (ISQ) 282
Figure E.14 - Table 1 (from ISO 80000-1) SI base units for the ISQ base quantities 283
Figure E.15 - Table 2 (from ISO 80000-1) ISQ derived quantities and SI derived units with special names (1) .284
Figure E.16 - Table 2 (from ISO 80000-1) ISQ derived quantities and SI derived units with special names (2) .285
Figure E.17 - Table 2 (from ISO 80000-1) ISQ derived quantities and SI derived units with special names (3) .286
Figure E.18 - Table 3 (from the SI brochure) SI derived units with special names and symbols.....287
Figure E.19 - Constant numbers used throughout the SysML ISO 80000 library. 289

Figure E.20 - Example of value type definitions for a quantity and applicable units and prefixed units.....290
Figure E.21 - Basic distribution stereotypes.....316
Figure E.22 - Distribution Example.....317
Figure G.1 - SysML/AP233 Data Overlaps.....322

List of Tables

Table 4.1 - UML 2 metaclasses excluded from the UML4SysML subset 8
Table 4.2 - UML 2 metaclasses and datatypes included in the UML4SysML subset 9
Table 4.3 - SysML stereotypes, blocks, valuetypes, and datatypes 10
Table 7.1 - Graphical nodes defined by ModelElements package 22
Table 7.2 - Graphical paths defined by ModelElements package 24
Table 8.1 - Graphical nodes defined in Block Definition diagrams 34
Table 8.2 - Graphical paths defined by in Block Definition diagrams 37
Table 8.3 - Graphical nodes defined in Internal Block diagrams 40
Table 8.4 - Graphical paths defined in Internal Block diagrams 41
Table 9.1 - Graphical nodes defined in Block Definition diagrams 73
Table 9.2 - Graphical nodes defined in Internal Block diagrams 76
Table 10.1 - Graphical nodes defined in Block Definition diagrams 98
Table 10.2 - Graphical nodes defined in Parametric diagrams 99
Table 11.1 - Graphical nodes included in activity diagrams 107
Table 11.2 - Graphical paths included in activity diagrams 112
Table 11.3 - Other graphical elements included in activity diagrams 113
Table 12.1 - Graphical nodes included in sequence diagrams 128
Table 12.2 - Graphical paths included in sequence diagram 132
Table 12.3 - Other graphical elements included in sequence diagram 132
Table 13.1 - Graphical nodes included in state machine diagrams 135
Table 13.2 - Graphical paths included in state machine diagrams 139
Table 13.3 - Other graphical elements included in state machine diagram 139
Table 14.1 - Graphical nodes included in Use Case diagrams 142
Table 14.2 - Graphical paths included in Use Case diagrams 143
Table 15.1 - Extension to graphical nodes included in diagrams 148
Table 16.1 - Graphical nodes included in Requirement diagrams 159
Table 16.2 - Graphical paths included in Requirement diagrams 160
Table 17.1 - Graphical nodes used in profile definition 176
Table 17.2 - Graphical paths used in profile definition 177
Table 17.3 - Notations for Stereotype Use 178
Table 17.4 - Notations for Stereotype Use (continued) 179
Table B.1 - SysML Diagram Elements 201
Table C.1 - Graphical nodes defined in block definition diagrams 206
Table C.2 - Graphical nodes defined in internal block diagrams 207
Table E.1 - Addition stereotypes for EFFBDs 251
Table E.2 - Streaming options for activities 252
Table E.3 - Additional Requirement Stereotypes 254
Table E.4 - Requirement property enumeration types 255
Table E.5 - Stereotypes for Measures of Effectiveness 257

Table E.6 - The decimal and binary prefixes in scope of the International System of Units (SI) which uses the ISO 80000 system of units and its included systems of units such as ISO 80000-13 287
Table E.7 - Normative units in ISO 80000-3 (1 of 2) 291
Table E.8 - Normative units in ISO 80000-3 (2 of 2) 292
Table E.9 - Normative quantity kinds in ISO 80000-3 (1 of 2) 292
Table E.10 - Normative quantity kinds in ISO 80000-3 (2 of 2) 293
Table E.11 - Normative units in ISO 80000-4 (1 of 2) 294
Table E.12 - Normative units in ISO 80000-4 (2 of 2) 295
Table E.13 - Normative quantity kinds in ISO 80000-4 (1 of 4) 296
Table E.14 - Normative quantity kinds in ISO 80000-4 (2 of 4) 297
Table E.15 - Normative quantity kinds in ISO 80000-4 (3 of 4) 298
Table E.16 - Normative quantity kinds in ISO 80000-4 (4 of 4) 299
Table E.17 - Normative units in ISO 80000-5 (1 of 2) 300
Table E.18 - Normative units in ISO 80000-5 (2 of 2) 301
Table E.19 - Normative quantity kinds in ISO 80000-5 (1 of 5) 302
Table E.20 - Normative quantity kinds in ISO 80000-5 (2 of 5) 303
Table E.21 - Normative quantity kinds in ISO 80000-5 (3 of 5) 303
Table E.22 - Normative quantity kinds in ISO 80000-5 (4 of 5) 304
Table E.23 - Normative quantity kinds in ISO 80000-5 (5 of 5) 305
Table E.24 - Normative units in ISO 80000-6 (1 of 5) 306
Table E.25 - Normative units in ISO 80000-6 (2 of 5) 307
Table E.26 - Normative units in ISO 80000-6 (3 of 5) 307
Table E.27 - Normative units in ISO 80000-6 (4 of 5) 308
Table E.28 - Normative units in ISO 80000-6 (5 of 5) 309
Table E.29 - Normative quantity kinds in ISO 80000-6 (1 of 4) 310
Table E.30 - Normative quantity kinds in ISO 80000-6 (2 of 4) 311
Table E.31 - Normative quantity kinds in ISO 80000-6 (3 of 4) 312
Table E.32 - Normative quantity kinds in ISO 80000-6 (4 of 4) 313
Table E.33 - Units in ISO 80000-7 314
Table E.34 - Quantity Kinds in ISO 80000-7 314
Table E.35 - Units in ISO 80000-9 314
Table E.36 - Quantity Kinds in ISO 80000-9 315
Table E.37 - Units in ISO 80000-10 315
Table E.38 - Quantity Kinds in ISO 80000-10 315
Table E.39 - Units in ISO 80000-13 315
Table E.40 - Quantity Kinds in ISO 80000-13 316
Table E.41 - Distribution Stereotypes 317