

ISO/IEC 19502:2005-11 (E)

Information technology - Meta Object Facility (MOF)

Contents		Page
Foreword		viii
Introduction		ix
1	Scope	1
2	Normative references	1
2.1	Identical Recommendations	International Standards 1
2.2	International Standards	1
3	Abbreviations and Conventions	2
4	List of Documents	2
5	MOF Usage Scenarios	3
5.1	Overview	3
5.2	Software Development Scenarios	4
5.3	Type Management Scenarios	5
5.4	Information Management Scenarios	6
5.5	Data Warehouse Management Scenarios	7
6	MOF Conceptual Overview	9
6.1	Overview	9
6.2	Metadata Architectures	9
6.2.1	Four Layer Metadata Architectures	9
6.2.2	The MOF etadata Architecture	10
6.2.3	MOF Metamodeling Terminology	12
6.3	The MOF Model - Metamodeling Constructs	13
6.3.1	Classes	13
6.3.2	Associations	16
6.3.3	Aggregation	17
6.3.4	References	18
6.3.5	DataTypes	20
6.3.6	Packages	20
6.3.7	Constraints and Consistency	23
6.3.8	Miscellaneous Metamodeling Constructs	24
6.4	Metamodels and Mappings	25
6.4.1	Abstract and Concrete Mappings	25
6.4.2	he MOF Metamodel IDL Mapping	26
6.4.3	he MOF Metamodel XML Mapping	26
6.4.4	Mappings of the MOF Model	27
7	MOF Model and Interfaces	29
7.1	Overview	29
7.2	How the MOF Model is Described	29
7.2.1	Classes	30
7.2.2	Associations	34
7.2.3	DataTypes	35
7.2.4	Exceptions	35
7.2.5	Constants	36
7.2.6	Constraints	36
7.2.7	UML Diagrams	36

7.3	The Structure of the MOF Model	36
7.3.1	The MOF Model Package	36
7.3.2	The MOF Model Service IDL	38
7.3.3	The MOF Model Structure	38
7.3.4	The MOF Model Containment Hierarchy	40
7.4	OF Model Classes	41
7.4.1	ModelElement	(abstract) 41
7.4.2	Namespace	(abstract) 45
7.4.3	GeneralizableElement	(abstract) 48
7.4.4	TypedElement	(abstract) 52
7.4.5	Classifier	(abstract) 53
7.4.6	Class	54
7.4.7	DataType	(abstract) 55
7.4.8	PrimitiveType	56
7.4.9	CollectionType	57
7.4.10	EnumerationType	58
7.4.11	AliasType	59
7.4.12	StructureType	59
7.4.13	StructureField	60
7.4.14	Feature	(abstract) 60
7.4.15	StructuralFeature	(abstract) 62
7.4.16	Attribute	(idl_substitute_name "MofAttribute") 63
7.4.17	Reference	64
7.4.18	BehavioralFeature	(abstract) 66
7.4.19	Operation	67
7.4.20	Exception	(idl_substitute_name "MofException") 68
7.4.21	Association	69
7.4.22	AssociationEnd	71
7.4.23	Package	74
7.4.24	Import	76
7.4.25	Parameter	78
7.4.26	Constraint	79
7.4.27	Constant	82
7.4.28	Tag	83
7.5	MOF Model Associations	85
7.5.1	Contains	85
7.5.2	Generalizes	86
7.5.3	RefersTo	87
7.5.4	Exposes	(derived) 88
7.5.5	IsOfType	90
7.5.6	CanRaise	90
7.5.7	Aliases	91
7.5.8	Constrains	92
7.5.9	DependsOn	(derived) 93
7.5.10	AttachesTo	95
7.6	MOF Model Data Types	96
7.6.1	PrimitiveTypes used in the MOF Model	96
7.6.2	MultiplicityType	96
7.6.3	VisibilityKind	97
7.6.4	DirectionKind	98
7.6.5	ScopeKind	98
7.6.6	AggregationKind	98
7.6.7	EvaluationKind	98
7.7	MOF Model Exceptions	99
7.7.1	NameNotFound	99
7.7.2	NameNotResolved	99
7.8	MOF Model Constants	99
7.8.1	Unbounded	100
7.8.2	The Standard DependencyKinds	100
7.9	MOF Model Constraints	101
7.9.1	MOF Model Constraints and other M2 Level Semantics	101
7.9.2	Notational Conventions	101

7.9.3	OCLE Usage in the MOF Model specification	103
7.9.4	The MOF Model Constraints	105
7.9.5	Semantic specifications for some Operations, derived Attributes and Derived Associations	125
7.9.6	OCLE Helper functions	131
7.10	The PrimitiveTypes Package	134
7.10.1	Boolean	135
7.10.2	Integer	135
7.10.3	Long	135
7.10.4	Float	135
7.10.5	Double	135
7.10.6	String	135
7.10.7	IDL for the PrimitiveTypes Package	136
7.11	Standard Technology Neutral Tags	136
8	The MOF Abstract Mapping	139
8.1	Overview	139
8.2	MOF Values	139
8.3	Semantics of Data Types	139
8.4	Semantics of Equality for MOF Values	140
8.5	Semantics of Class Instances	141
8.6	Semantics of Attributes	141
8.6.1	Attribute name and type	142
8.6.2	Multiplicity	142
8.6.3	Scope	143
8.6.4	Is_derived	144
8.6.5	Aggregation	144
8.6.6	Visibility and is_changeable	144
8.7	Package Composition	144
8.7.1	Package Nesting	144
8.7.2	Package Generalization	145
8.7.3	Package Importation	145
8.7.4	Package Clustering	145
8.8	Extents	145
8.8.1	The Purpose of Extents	146
8.8.2	Class Extents	147
8.8.3	Association Extents	147
8.8.4	Package Extents	147
8.9	Semantics of Associations	149
8.9.1	MOF Associations in UML notation	149
8.9.2	Core Association Semantics	150
8.9.3	AssociationEnd Changeability	152
8.9.4	Association Aggregation	152
8.9.5	Derived Associations	152
8.10	Aggregation Semantics	152
8.10.1	Aggregation "none"	152
8.10.2	Aggregation "composite"	153
8.10.3	Aggregation "shared"	153
8.11	Closure Rules	153
8.11.1	The Reference Closure Rule	153
8.11.2	The Composition Closure Rule	155
8.12	Recommended Copy Semantics	156
8.13	Computational Semantics	157
8.13.1	A Style Guide for Metadata Computational Semantics	157
8.13.2	Access operations should not change metadata	158
8.13.3	Update operations should only change the nominated metadata	158
8.13.4	Derived Elements should behave like non-derived Elements	158
8.13.5	Constraint evaluation should not have side-effects	158
8.13.6	Access operations should avoid raising Constraint exceptions	159
9	MOF to IDL Mapping	161
9.1	Overview	161

9.2	Meta Objects and Interfaces	161
9.2.1	Meta Object Type Overview	161
9.2.2	The Meta Object Interface Hierarchy	163
9.3	Computational Semantics for the IDL Mapping	165
9.3.1	The CORBAIDL Types Package	165
9.3.2	Mapping of MOF Data Types to CORBA IDL Types	169
9.3.3	Value Types and Equality in the IDL Mapping	170
9.3.4	Lifecycle Semantics for the IDL Mapping	170
9.3.5	Association Access and Update Semantics for the IDL Mapping	173
9.3.6	Link Addition Operations	173
9.3.7	Attribute Access and Update Semantics for the IDL Mapping	176
9.3.8	Reference Semantics for the IDL Mapping	181
9.3.9	Cluster Semantics for the IDL Mapping	182
9.3.10	Atomicity Semantics for the IDL Mapping	182
9.3.11	The Supertype Closure Rule	182
9.3.12	Copy Semantics for the IDL Mapping	183
9.4	Exception Framework	183
9.4.1	Error_kind string values	185
9.4.2	Structural Errors	185
9.4.3	Constraint Errors	188
9.4.4	Semantic Errors	188
9.4.5	Usage Errors	189
9.4.6	Reflective Errors	190
9.5	Preconditions for IDL Generation	192
9.6	Standard Tags for the IDL Mapping	194
9.6.1	Tags for Specifying IDL #pragma directives	194
9.6.2	Tags for Providing Substitute Identifiers	195
9.6.3	Tags for Specifying IDL Inheritance	196
9.7	Generated IDL Issues	198
9.7.1	Generated IDL Identifiers	198
9.7.2	Generation Rules for Synthesized Collection Types	200
9.7.3	IDL Identifier Qualification	202
9.7.4	File Organization and #include statements	202
9.8	IDL Mapping Templates	202
9.8.1	Template Notation	203
9.8.2	Package Module Template	203
9.8.3	Package Factory Template	205
9.8.4	Package Template	206
9.8.5	Class Forward Declaration Template	209
9.8.6	Class Template	209
9.8.7	Class Proxy Template	210
9.8.8	Instance Template	212
9.8.9	Class Create Template	213
9.8.10	Association Template	214
9.8.11	Attribute Template	222
9.8.12	Reference Template	231
9.8.13	Operation Template	240
9.8.14	Exception Template	242
9.8.15	DataType Template	243
9.8.16	Constraint Template	245
9.8.17	Annotation Template	245
10	The Reflective Module	247
10.1	Introduction	247
10.2	The Reflective Interfaces	248
10.2.1	Reflective Argument Encoding Patterns	248
10.2.2	Reflective::RefBaseObject	(abstract) 250
10.2.3	Reflective::RefObject	(abstract) 254
10.2.4	Reflective::RefAssociation	(abstract) 265
10.2.5	Reflective::RefPackage	(abstract) 269
10.3	The CORBA IDL for the Reflective Interfaces	270
10.3.1	Introduction	270

10.3.2 Data Types271
Annex A (normative) Conformance Issues273
Annex B (normative) Legal Information275
INDEX279