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MOF Facility Object Lifecycle (MOFFOL)

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Preface

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OMG

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- Specialized CORBA specifications
- CORBA Component Model (CCM)

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- CORBAservices

- CORBAfacilities
- OMG Domain specifications
- OMG Embedded Intelligence specifications
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1 Scope

This specification separates out those aspects of MOF related to communicating with and managing the “facilities” responsible for providing the capabilities covered by the other MOF specifications. These facilities may be at many different levels, from a modeling tool to a full multi-user, multi-model repository. The scope includes:

- Locating and connecting to facilities;
- Object lifecycle operations (e.g., creation and deletion); and
- Operational aspects (e.g., transactions).

2 Conformance

With respect to compliance, the classes defined in this specification are to be treated as interfaces: compliant implementations must implement the properties and operations mapped to an appropriate language binding using one of the MOF2 language binding specifications (e.g., IDL Binding). This specification is not intended to imply any specific implementation of these interfaces.

Where full compliance is not to be provided, implementations must throw a NotSupported exception.

It is possible for a facility to indicate its level of compliance using the properties defined on Facility (inherited from Workspace).

The following Compliance Points are defined. Exactly one of the Base levels must be supported, and any number of the other levels.

- BaseFacility: this includes everything in this specification except those listed as specific compliance points below.
- BaseReadOnlyFacility: provided in order to allow MOF interfaces to be used as a wrapper to other systems. As for BaseFacility except does not require support of any update operations (including those specified in other MOF2 specifications).
- Stores: Support for the Store class. If this is not supported, implementations will need to implement their own storage scheme.
- Transactions: Support for LocalTransaction interface, and implicit transactional semantics on each request.
- Versioning: the interfaces obtained by a package merge of the MOF 2 Versioning specification model with that defined here. This will add capability to the Session and Workspace classes.

3 References

3.1 Normative References

- MOF 2 Core: http://www.omg.org/spec/MOF/2.0/

- MOF 2 Versioning and Development Lifecycle: http://www.omg.org/spec/MOFVD/2.0/
- XMI 2.1: http://www.omg.org/spec/XMI/2.1/

3.2 Informative References

- JMI - Java Metadata Interface (JSR 40)
- MOF 1.4: http://www.omg.org/spec/MOF/1.4/
- JCA - J2EE Connector Architecture Specification (JSR 112) version 1.5

4 Terms and Definitions

Term	Definition
Client	A MOF client is one that makes use of MOF services. The term is not meant to imply any sort of physical separation or use of middleware (though these are of course not excluded).
Facility	A MOF Facility consists of MOF software capable of servicing client requests together with specific MOF data that is accessed or manipulated. Typically the MOF data will comprise one or more extents.
Connection	As used in this specification ‘connection’ may refer to a ‘session connection’ that persists over many client requests (effectively establishing a ‘session’) or to a ‘transient connection’ that is established for one client request only (e.g., as for a web services request). Session connections represent typical use of MOF although transient connections will become more important, especially for bulk interchange.
Outermost Instance	An object that is not owned by another object.
Resource Adapter (generalized from JCA)	To achieve a standard system-level plug-ability between application servers and Enterprise Information Systems (EIS), the J2EE Connector architecture defines a standard set of system-level contracts between an application server and EIS. The resource adapter implements the EIS-side of these system-level contracts. A resource adapter is a system-level software driver used by an application server or an application client to connect to an EIS. By plugging into an application server, the resource adapter collaborates with the server to provide the underlying mechanisms, the transactions, security, and connection pooling mechanisms. A resource adapter is used within the address space of the application server.

5 Additional Information

5.1 Migration from MOF 1.4

The following outlines the equivalent to MOF 1.4 concepts. Note that MOF 1.4 had no notion of Facility, so many of the aspects in this specification are new to the MOF standard (though something equivalent was provided of necessity by most implementations).

Concept	MOF2 Equivalent
Extent	Repository
XPackage Interfaces	Creation and finding moved to Factory and Package interfaces respectively.
XClass interfaces	Creation and finding moved to Factory and Package interfaces respectively.
Package clustering (clustered import)	Not explicitly supported, however an Extent is package independent and a Factory may be associated with any package, which could be created by importing or merging other packages to give the same effect as clustering.
Package inheritance	None: in UML2/MOF2 Packages are not generalizable.
Package nesting	No direct equivalent: though packages can be nested in metamodels this is not used only for naming and not to determine nesting of Extents, which is not supported.
Package Import	Package or Element Import

5.2 Acknowledgements

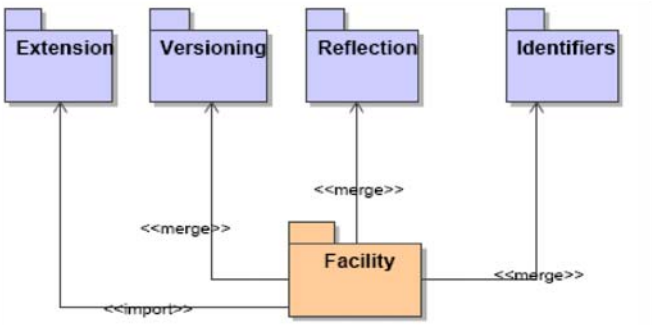
This specification was submitted and/or supported by the following companies/individuals:

- Adaptive
- Compuware Corporation
- Constantine Plotnikov
- INRIA
- Interactive Objects
- Sun Microsystems

6 MOF Facility Object Lifecycle

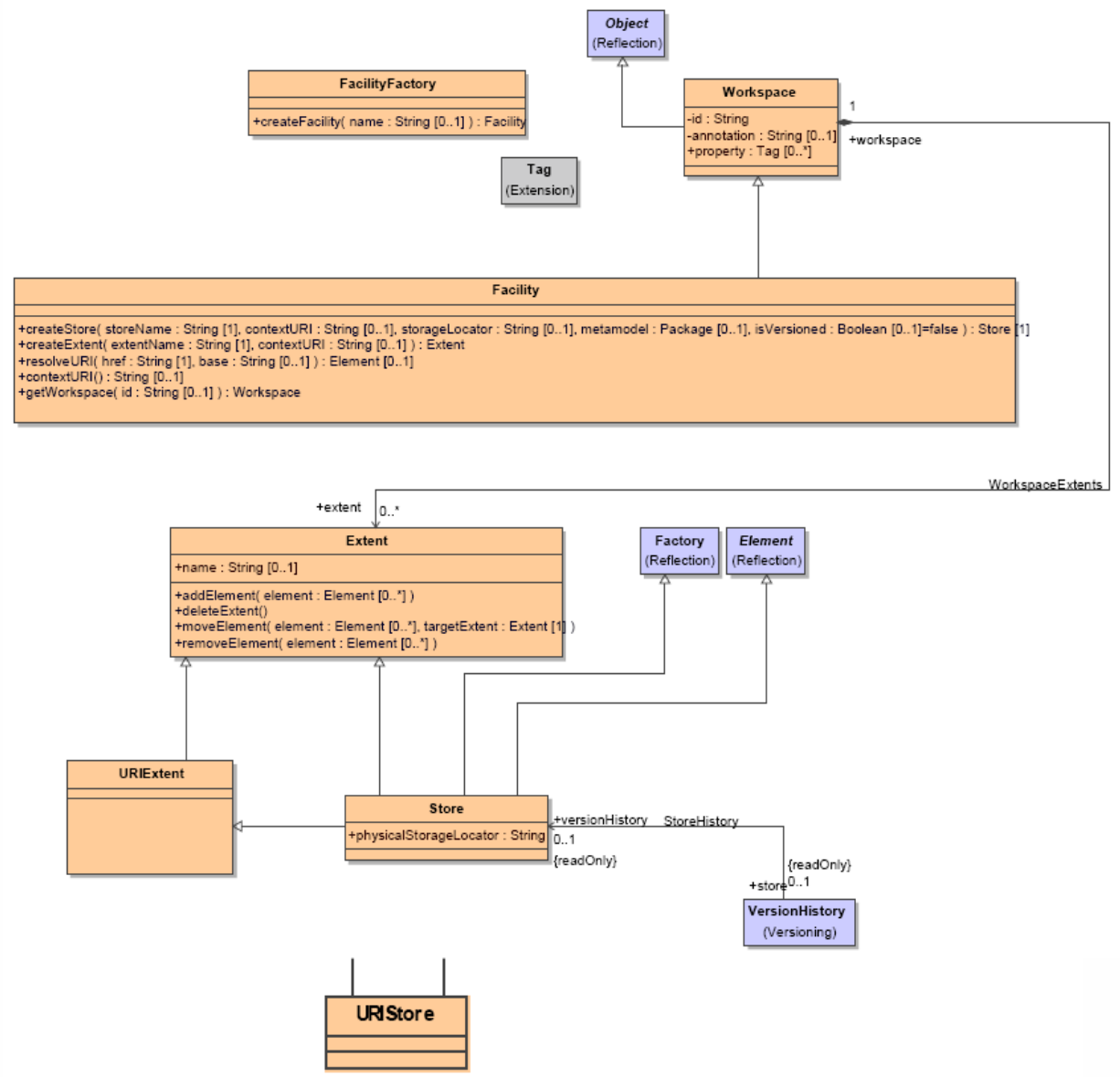
6.1 Structure

The following diagram illustrates the dependencies of facility package on other MOF packages. Note, however, that not all compliance levels require Versioning.



6.2 Facilities

This chapter describes elements that extend MOF to provide entry points to the instances of metamodels and a notion of a store; as a special kind of extent capable of physically storing the metadata. The platform independent model of the MOF Facility is as follows.



6.2.1 Facility

The Facility class provides the entry connection point to the metadata for clients. Through inheritance from Workspace it contains Extents, some of which may be RepositoriesStores and it acts as a factory for these. A Facility is a singleton that is addressable but is not created or deleted.

6.2.1.1 Generalizations

Workspace

6.2.1.2 Properties

Noneextent : Extent [0..*] Set of Extents the Facility consists of.

6.2.1.3 Operations

createExtent(name: String,	The URI to be used to address the Extent. If specified, an instance of URIExtent will be created.
contextURI: String[0..1]	The URI to be used to address the Extent. If specified, an instance of URIExtent will be created.
) : Extent	Creates a new Extent (or URIExtent) and adds it to the extent property for the facility.

createStore(name: String,	The name to be given to the new Store. It must not previously have been used by any Extent in extent for this facility.
contextURI: String[0..1]	The URI to be used to address this Store. If specified, an instance of URIStore will be created.
storageLocator: String[0..1]	Will be used to set the physicalStorageLocator property (q.v) of the new Store.
metamodel:MOF::Package[0..1]	Used to set the inherited Factory::package property on the created store.
isVersioned:Boolean[0..1]=false	Used to indicate whether the store to be created is to be enabled for versioning.
) : Store	As for createExtent but creates an instance of Store. If isVersioned is true, then a VersionHistory and initial Version is also created and associated with the Store (see MOF Versioning for details of these classes).

resolveURI(href: String[1]	The URI to be dereferenced.
base: String[0..1]	The base URI for the facility, to be stripped from the supplied href in order to get a unique id within this facility.
) : Element[0..1]	Dereferences the supplied URI down to an element (if possible) which is returned.

contextURI() : String[0..1]	Returns the URI for the facility, used to connect.
getWorkspace(id: String[0..1]	An optional identifier to be matched.
) : Workspace[0..*]	Returns Workspaces contained by the Facility. If id parameter is supplied, then only the workspace (if any) with that id is returned; otherwise all Workspaces are returned.

createWorkspace(id: String[0..1]	The identifier for the new Workspace. It must be unique for the Facility.
) : Workspace	Creates a new Workspace that will be added to the set returned by getWorkspace for this facility.

6.2.1.4 Constraints

No additional constraints.

6.2.1.5 Semantics

A Facility represents an entry point to the metadata, the means for clients to ‘connect’ to models and elements, which are accessed via Extents. It consists of zero to many extents, that are the actual metadata “holders.”

6.2.1.6 Rationale

There needs to be a top-most object serving as a locator of individual extents/repositories as “metadata holders” for a metadata of a specific kind.

6.2.1.7 Changes from MOF 1.4

There was no notion of anything above RefPackage - a package extent. In MOF 1.4 terms, Facility can be thought of as a container of zero to many package Extents. MOF 1.4 did not include a platform independent model of facilities and reflection. It was left up to the specific mappings to specify those if desired.

6.2.2 Extent

Adds incremental operations, through package merge, to the Extent class, originally defined in MOF 2 Core.

6.2.2.1 Generalizations

None

6.2.2.2 Properties

None

6.2.2.3 Operations

addElement(addedElement: Element)

Adds an existing Element to the extent. This is a null operation if the Element is already in the Extent.

removeObjectElement (removedObjectElement: ObjectElement)

Removes the Element from the extent. It is an error if the Element is not a member. This may or may not result in it being deleted (see Section 6.3.2, “Deletion Semantics”).

moveElement (movedElement: Element, targetExtent: Extent)

An atomic combination of addElement and removeElement. targetExtent must be different from the extent on which the operation is invoked.

deleteExtent()

Deletes the Extent, but not necessarily the Elements it contains (see Section 6.3.2, “Deletion Semantics).

6.2.2.4 Constraints

No additional constraints

6.2.2.5 Semantics

See MOF 2.0 Core, and Section 6.2.3.

6.2.2.6 Changes from MOF 1.4

At MOF 1.4, extent membership was quite static: an Element was created within one extent and could not be moved. This is more akin to the notion of Store at MOF 2: Extent is more of a loose grouping of Elements providing a scope/content for various operations. An Element may be in more than one Extent and may be moved between them.

6.2.3 Store

Store can be understood as a special kind of extent with an ability to actually store the models. The lifecycle of an Element can be managed by at most one Store.

In the case where the storage is not being managed by MOF, then Stores are not required to be used. It is still possible to create Elements provided that appropriate implementations of Factory are available.

6.2.3.1 Generalizations

Factory, Element, URIExtent.

6.2.3.2 Properties

PhysicalStorageLocator : String

[1] Specifies a storage location to be used for the physical storage. The usage of the value is implementation dependent and could, for example, represent the name of a file or a database.

6.2.3.3 Operations

No additional operations

6.2.3.4 Constraints

A Store is able to manage only Elements described by metaElements contained in the metamodel referenced by the inherited *package* property of the store.

6.2.3.5 Semantics

A Store manages the lifecycle of the elements associated with it - it provides a physical home for them. Store inherits from Factory, which means that it can create the elements. All the elements created by the store automatically become associated with it as an Extent.

6.2.3.6 Changes from MOF 1.4

The Store concept was not present in MOF 1.4, although it is similar to an outermost package extent/proxy from MOF 1.4. The difference is that rather than consisting of individual class and association proxies, Store is able to handle creation of instances of any class (or Association in CMOF) itself.

6.2.4 Workspace

This is a simplification of the concept in MOF Versioning, where it provides access to specific Versions of extents. When used with Versioning the classes will be merged. In the context of this Facility specification, Workspace (which is inherited by Facility itself) provides a scoping mechanism in terms of the Extents that are available.

6.2.4.1 Generalizations

Object

6.2.4.2 Properties

id : String	The name or identifier for the Workspace.
annotation : String[0..1]	Optional descriptive text.
properties: Tag [0..*]	Provides a placeholder for implementation-specific details.
extent: Extent [0..*]	The set of Extents that the workspace provides access to.

6.2.4.3 Operations

No additional operations

6.2.4.4 Constraints

None

6.2.4.5 Semantics

A Workspace is the container for Extents.

6.2.4.6 Changes from MOF 1.4

The Workspace concept was not present in MOF 1.4.

6.2.5 FacilityFactory

This is used to create Facilities.

6.2.5.1 Generalizations

None

6.2.5.2 Properties

None

6.2.5.3 Operations

createFacility(id:String): Facility	The id to be given to the new Facility This creates a new Facility.

6.2.5.4 Constraints

None

6.2.5.5 Semantics

This is a pure Factory interface that can have multiple implementations.

6.2.5.6 Changes from MOF 1.4

The Facility concept was not present in MOF 1.4.

6.3 Object Lifecycle

6.3.1 Lifecycle Operations

This section summarizes how the different lifecycle operations are provided by the MOF interfaces.

Creation:	An element is created by a Factory. Typically this will be a Store but not necessarily.
Deletion:	Each object element has a delete interface; however see Section 6.3.2.
Copy:	An element may be added to another Extent: this may mean it is accessible via more than one URI. However there is only one underlying object so changes made via one extent will be reflected in the other.
Move:	An element may be added to another extent and then removed from the original as an atomic operation.
Compare:	MOF Core provides a general comparison by identity. No further comparison capability based on element content is provided - since the scope (e.g., whether deep or shallow) will tend to be application-specific.

6.3.2 Deletion Semantics

If an Element is removed from an Extent that is a Store, then it is deleted. Removing an object from any other Extent has no deletion implications (though custom subclasses of Extent may implement different policies).

The explicit delete operation will remove the element from its Store (if it is in one) and any other Extents.

6.4 Connection and Location

6.4.1 Location

The only location capability provided is via URI. URIs may be used to locate:

- Facilities
- Extents

- Elements from a metamodel
- Instances

The Facility interface provides a single point for resolving URIs, using the resolveURI operation. This may in turn be delegated to URIExtents or Stores, but this is hidden from the caller.

6.4.1.1 Basic URI Encoding Scheme

In order to provide a base level of interoperability, this specification includes a basic scheme for mapping URIs to a metamodel structure. There is nothing to stop implementations using any internal/proprietary scheme for this mapping.

The scheme covers:

- How to generate a URI for an element
- How to locate an element from a URI

It only applies to Elements that have non-empty values for their isID property and which have composite parents likewise. It makes the following assumptions about models:

- The values of isID properties are unique within the same composite parent.
- The values of isID properties are syntactically valid components of a URI.

Note that it is possible for isID properties to be derived properties: the derivation may be arbitrary manner. However it is the responsibility of the Facility to provide efficient location of elements via URI (which for derived properties would tend to imply using some sort of cached lookup table or directory).

The basic Scheme encodes absolute URIs as follows (see also RFC 2396):

http:*//Facility-ContextURI/Facility-Name/Extent-Name[***?***Top-Element-Id{/Element-Id}**|***;uuid**=*uuid]*

Note that ? is used in the middle of the hierarchy to separate the extent from the contents.

The *Facility-ContextURI* is the value returned by the operation Facility::ContextURI() and should be mappable to an IP address using normal TCP-IP mechanisms such as DNS, or local mechanisms such as XML Catalog. It may include a port number. The IP address is used for connection (see Section 6.4.2).

Facility -Name is the property Facility::name defined against the Facility class.

Extent-Name is the property Extent::name defined against the Extent class.

Using this scheme the value returned by URIExtent::contextURI() is thus **http:**//*Facility-ContextURI*/*Facility-Name/ Extent-Name.*

Top-Element-Id is the identifier (value of the property with Property:isID=true) for a TopElement. A TopElement is a Reflective::Element in the Extent with no composite owner (all properties with opposites having isComposite=true are empty for this Element). There can be many such TopElements for an Extent.

Each *Element-Name* is the value of the property with Property:isID=true for an element whose compositeOwner is the element identified by the URI to the left.

Here are some examples:

a the metaclass UseCase in the UML2 metamodel
http://mof.omg.org/MetamodelFacility/UML2Store?uml2/UseCase

b the activity CalculateHoursWorked
http://mof.adaptive.com:8083/ModelsFacility/PayrollModels?ProcessModel/MonthlyProcess/CalculateHoursWorked

c the element with uuid X12345 in extent PayrollModels
http://mof.adaptive.com:8083/ModelsFacility/PayrollModels;uuid= X12345

Relative URIs

In the Basic Scheme URIs are always relative to an Extent and not to composite parents. So, for example, xmi:idref=""Customer.order" would be invalid for referencing Customer::order: a TopElement would be needed (i.e., the Package): for example Customer.Customer.order.

For the purpose of cross-referencing within an XMI file, the XMI file itself is treated as an Extent. The MOF hierarchy, not the XML hierarchy, should be used. Normally they are the same, but for example the *XMI* XML element is ignored for addressing purposes and not counted as a TopElement. Tags (MOF) and Stereotype instances (UML), which are not nested in the XML structure (due to the lack of a composite ownedAttribute), are nested in the MOF hierarchy.

Relative addressing using . and .. may be used within URI up to the ? (if present).

6.4.2 Session

Connections can be established implicitly per client request or as a session - represented via a Session object (which is transient). In both cases a ConnectionSpec is used to hold the connection information: this is an extensible structure.

The metamodel for Sessions is as follows. This is based on the interfaces provided by the J2EE Connection Architecture (JCA) in order to provide interoperability with clients and application servers using that standard (assuming a Java binding).

Once the Session is established, it should be passed to subsequent requests: the mechanism for this is platform dependent.

The following capabilities are only available on explicit Session:

Transaction interface (otherwise transactions are implicit per request)

6.4.2.1 SessionFactory

This is used to create Sessions.

6.4.2.1.1 Generalizations

None

6.4.2.1.2 Properties

None

6.4.2.1.3 Operations

createSession(properties:ConnectionSpec	The parameters for the session. By default this is just the connection URI, but the ConnectionSpec is designed to be extensible.
): Session	This creates a new Session connected to the specified Facility.

6.4.2.1.4 Constraints

None

6.4.2.1.5 Semantics

This is a pure Factory interface that can have multiple implementations.

6.4.2.1.6 Changes from MOF 1.4

The Session concept was not present in MOF 1.4.

6.4.2.2 Session

This represents a client session with a facility; it is not a persistent class. When used with Versioning this is designed to merge with the Session class in that specification.

6.4.2.2.1 Generalizations

None

6.4.2.2.2 Properties

workspace: Workspace[0..1]	This is the workspace that scopes the extents available in this session. It may be updated within the session.

6.4.2.2.3 Operations

Close()	This closes the connection and deletes the Session.
getLocalTransation(): LocalTransaction	This creates a new transaction proxy, but does not begin it yet. See Section 6.10.

6.4.2.2.4 Constraints

None

6.4.2.2.5 Semantics

This represents a single connection. Depending on the facility implementation, a client may maintain multiple concurrent Sessions (if not supported, attempts to create a further Session will throw an exception).

6.4.2.2.6 Changes from MOF 1.4

The Session concept was not present in MOF 1.4.

6.4.2.3 ConnectionSpec

This is a data type designed to be extended for more sophistication in connection.

6.4.2.3.1 Properties

connectURI: String	The URI to use for connecting to a facility. A Connection is to a Facility so the value should match Facility::ContextURI()/Facility::name (i.e., the values of these two properties separated by a '/').

6.5 Federation

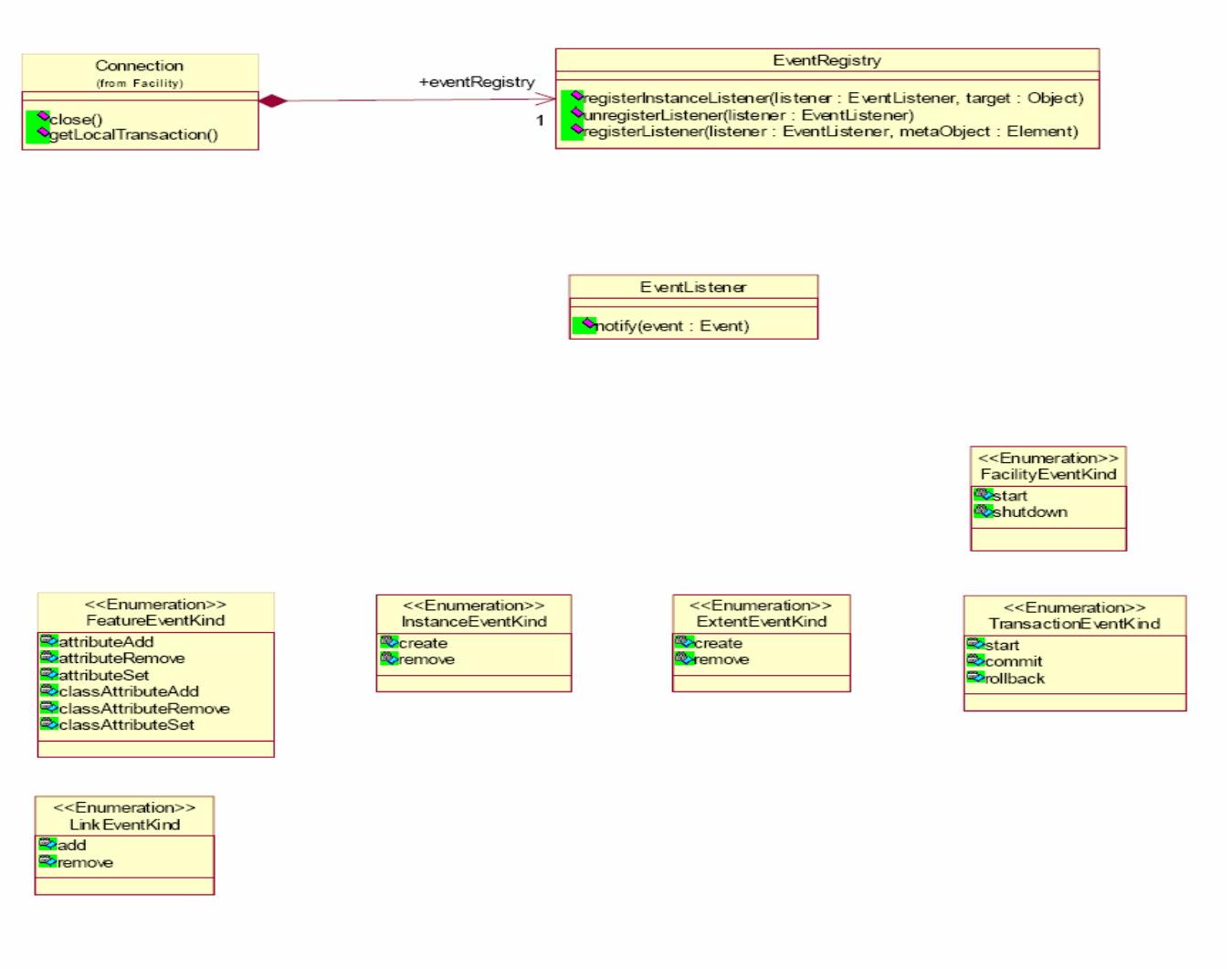
At the level of client APIs such as Reflection it is possible to seamlessly traverse associations that span multiple physical stores or even facilities. This is handled by Facilities behind the scenes.

6.5.1 Local Copies of Elements

The ability for elements to appear in many extents allows for local copies. This needs to be combined with a (URI) resolution mechanism such as XML Catalogs for mapping URIs to a local XMI namespace and hence Extent.

6.6 Authentication

ConnectionSpec is designed to be extended to contain credentials that can be authenticated by ConnectionFactory implementations. This specification does not mandate a specific scheme.



6.7 Exception Handling

6.7.1 Exception Definition

In UML Infrastructure (and hence MOF2 Core), exceptions are represented as Types associated with an Operation via the multivalued *raisedException* association. The types have names and possibly structure (e.g., holding details of an error) and may use inheritance. However the Types for the exceptions in MOF Core itself have not been modeled (they are referred to only by name in the text for different Operations). Furthermore UML2 has no **notation** defined for actually modeling Types associated with Operations as raisedExceptions. Therefore it is proposed to:

- Determine in conjunction with UML2 RTF the notational means to associate exceptions with Operations.
- Explicitly model all the Exceptions for all the MOF2 specs, including Facility, to form an integrated consistent set with appropriate reuse, drawing on the exception parameters from MOF 1.4 and the MOF2 IDL binding, and propose to MOF2 RTFs/FTFs.

6.7.2 Exception Effect

When using transactions (implicitly or explicitly), the effect of an exception occurring is to abort the current transaction and roll back any changes. Without transaction support, the system should be considered in an undefined state.

In order to permit the re-running of such failed operations, where possible operations should be idempotent (that is they can be repeated). So, for example, adding an element to a Set when it is already present should not cause an exception but have a null effect. This is not always achievable (e.g., when adding an element to a bag or list) but provides a good principle for exception design.

6.7.3 Exception Returns

Language-specific mechanisms (for example Java exceptions) are used to return exception information (an instance of the Type associated with the Operation) to the client program.

6.8 Constraint Handling

MOF 1.4 distinguished between *immediate* (executed immediately after any change) and *deferred* constraints (executed on demand only). There were also implicit constraints (e.g., those implied by the multiplicity of Properties).

MOF 2.0 should reflect the fact that constraint checkers (e.g., OCL engines) are now usually separate components.

Clearly one reason why a change might be refused is through constraint violation, and it should be possible to configure constraint checking through software acting in the role of an agent (e.g., an OCL engine).

6.8.1 Information

Constraint failure raises a specific exception (see Section 6.8), which has properties to indicate the constraint failed and the failing element(s). Optionally many constraint exceptions may be grouped in an overall Constraint Exception: however it is permissible to return only the ‘first.’

6.9 Transactions

LocalTransaction objects can be created via the Session interface - see Section 6.4.2. This is again based on JCA, which has been designed to be able to interface with many different back-end systems.

6.9.1 LocalTransaction

This is a proxy for a local transactions ‘thread.’ The same LocalTransaction can be used to begin and end (commit or rollback) many actual transactions. Nesting is not supported.

6.9.1.1 Generalizations

None

6.9.1.2 Properties

None

6.9.1.3 Operations

begin()	This starts a new transaction. An exception is thrown if there is a transaction in progress.
commit()	This commits the current transaction and ends it. Any changes since the transaction begin() are persistently recorded. An exception is thrown if there is no transaction in progress.
rollback()	This aborts the current transaction and ends it. Any changes since the transaction begin() are lost. An exception is thrown if there is no transaction in progress.

6.9.1.4 Constraints

None

6.9.1.5 Semantics

ACID semantics must be implemented.

6.10 Import/Export

6.10.1 XMI Cross-Referencing

In order to allow seamless XMI processing, access via hrefs in XMI files must yield the same XMI stream regardless of whether the content is stored in a local file or comes from a remote MOF facility. XML Catalog may be used to redirect the request to local storage (for example, by mapping part of the URI to a local XMI file).

Note that this gives the choice of using URIs to indicate specific elements or using a URI to access an Extent and then using XPath to navigate the XML stream for the whole extent.

6.10.2 Import/export via HTTP

Due to the use of URIs to access XMI streams, one export option is to use http (or https) *get* on a URI. This may be limited and is not for use in secure environments, unless a Single Sign On mechanism is in place since it does not provide for explicit Connection.

Likewise an http *put* can be used for imports.

This style of interface is commonly referred to as REST (Representational State transfer) and is widely used in web applications.

6.10.3 Import/Export Operations

An import/export is inherently transactional (it completely succeeds or fails). However it may be part of a larger transaction set up on the Session.

These operations are provided on Session since it has the capability to select a Workspace for the operation to act on. In general the behavior is as described in the XMI specification.

importURI (uri: String[0..1],	The target Extent for the import. It must be visible via the Session. If empty, the Workspace of the Session will be used.
Stream: String,	The information to be imported as an XMI stream.

baseURI: String[0..1],	The base URI for the facility, to be stripped from contained hrefs in order to get a unique id within this facility.
options: ImportOptions): Element[0..*]	The import options (see description of the data type).

exportURI (uri: String,	The target Extent for the import. It must be visible via the Session. If empty, the Workspace of the Session will be used.
baseURI: String[0..1],	The base URI for the facility, to be added to the contained hrefs in order to get a unique id within this facility.
options: ExportOptions): String	The export options (see description of the data type) The value returned is the exported XMI stream.

exportElements(elementSet:Example[0..*],	The set of Elements to export.
baseURI: String[0..1],	The base URI for the facility, to be added to the contained hrefs in order to get a unique id within this facility.
options: ExportOptions): String	The export options (see description of the data type) The value returned is the exported XMI stream.

6.10.3.1 ImportOptions

This is a DataType to control import behavior through a number of Boolean flags.

6.10.3.1.1 Properties

clearFirst: Boolean[0..1] = false	Before starting, the import will clear the target extent (i.e., delete all elements).
tidyOrphans: Boolean[0..1] = false	After completing the import this will delete all ‘orphans’ i.e., elements with no composite owner except for those elements with no composite owner in the imported file.
retainToolExtensions: Boolean[0..1] = false	Persistently retains the information from all XMI Extension elements after the import. See Section 7.1.1.4.
matchUuids: Boolean[0..1] = false	Reconciles imported against existing elements using uuids. This is typically used for a ‘round trip’ where elements are exported, edited by an external tool, then re-imported. It is important that they are reconciled with the originals. See Section 7.1.1.2.

6.10.3.2 ExportOptions

This is a DataType to control export behavior through a number of properties.

6.10.3.2.1 Properties

XmiVersion: String[0..1] = 2.1	The version of XMI to use. There is no obligation to support any version except the default, 2.1.
clearAfter: Boolean[0..1] = false	After successful completion, the export will clear the source extent (i.e., delete all elements). This is the equivalent of a ‘move.’
includeUuids: Boolean[0..1] = false	Includes uuids in the export. This is the ‘partner’ to includeUuids option on import: see that for details.
retainToolExtensions: Boolean[0..1] = false	The exported file includes all information from previously imported and retained XMI Extension elements. See Section 7.1.1.4.
toolExtensionToRestore: String[0..1]	Includes Extension information for the specified Tool identifier in the exported file. Furthermore it uses that Tool’s identifiers as the xmi:uuids in the exported file.
nsURI: String [0..1]	The namespace to use in the exported file (to override what is in the source metamodel). May be used for example to export an L1 stream from an L3 model repository.

7 Changes or Extensions Required to Adopted OMG Specifications

7.1 MOF 2.0 Core (formal/2006-01-01)

A further rule is necessary for the effective isID property: add the following to the Constraints section of 10.3 Property

- Only one member Attribute of a Class may have isID = true. Any others (e.g., those inherited) must be redefined: either made unavailable or redefined to change isID=false

7.1.1 MOF 2.0 XMI formal/2005-09-01

7.1.1.1 Example of Basic URI Scheme

The Basic URI Scheme (see Section 2.4.1.1) should be referenced and used as an example in the XMI specification.

There should be a new example 5 in Section 4.10.2.2

5 Using the MOF 2 Facility Basic Encoding Scheme

The MOF2 Facility specification provides a means of encoding URIs to refer to elements in facilities: these may be realized through XMI files, database-backed repositories or other mechanisms. Hence it is usually not appropriate to make use of xmi:id values which are in general transient and limited in scope: rather names and unique ids are made use of. Full details are contained in that specification.

As an example here is a link to an activity called CalculateHoursWorked which is within ProcessModel within PayrollModels; PayrollModels is located via facility http://mof.adaptive.com:8083/ModelsFacility.

<activity
href="http://mof.adaptive.com:8083/ModelsFacility/PayrollModels?ProcessModel/MonthlyProcess/CalculateHoursWorked"/>

7.1.1.2 Reconciliation on Import

Add the following as a new section 4.15 in the XMI specification:

4.15 Import Reconciliation

The following are cases where an element in an imported XMI file will resolve to an existing element in the importer: only one of the following need apply:

- both elements have uuids that are identical
- the XMI element has extenderID and extender that are identical to those associated with the element in the importer (see 2.11.7)
- both elements have identical values of a Property with isID=true
- both elements are in the same extent and would have identical values for the basic URI scheme

Should elements match as above, the element in the importer is updated as follows:

- If property P is explicitly included in the XMI file, then the value of that property is updated to the value(s) from the XMI file. If multivalued, then any existing values not in the new set are removed.
- If P is included but empty in the XMI file, the property is unset; if mandatory, it is instead set to its default value.
- If P is not explicitly included in the XMI file, then any existing value in the importer is unchanged.

Should a matching element be referenced from the Differences element, the actions are carried out in order prior to the main import.

7.1.1.3 Clarify use of isId

Change the last bullet in section 4.11.2 as follows (this also fixes the typo where 2 occurrences of 'isProperty' should be 'idProperty'):

- If the id Property tag is set, the idName tag is ignored. The tagged property must have type which is a Datatype and it must also have isId = true in the metamodel. This means that only one idProperty tag may be specified for a class.

7.1.1.4 XMI Extensions

Add the following to the end of Section 4.13 *Document Exchange With Multiple Tools* (prior to sub-heading for 4.13.1)

In order to allow the use of such schemes as outlined here, XMI Extensions must be persistently maintained by the importing tool.

7.1.2 MOF 2 Versioning formal/2007-05-01

7.1.2.1 Align Workspace to Extent association

In order to allow a package merge of between Versioning:Workspace and facility::Workspace it is necessary to rename Workspace::versionedExtent to Workspace::extent in the Versioning spec.

This change should be made in the following places (in each case the word "versionedExtent" (when spelled with lower case 'v' only) is replaced with "extent"):

- Figure 5.3
- Section 5.6.2.1, first reference

7.1.3 MOF 2.0 IDL

This should be aligned to include the functionality and operations in this specificstionspecification. However this will be done by the normal revision process rather than by the adoption of this submission.

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