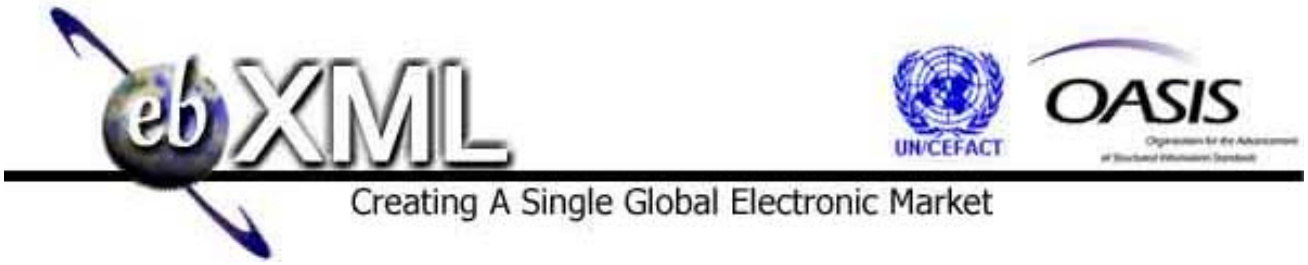

Registry Services Specification

v1.0

Registry Team

10 May 2001

(This document is the non-normative version formatted for printing, July 2001)

Table of Contents

1 Status of this Document

This document specifies an ebXML Technical Specification for the eBusiness community.

Distribution of this document is unlimited.

The document formatting is based on the Internet Society's Standard RFC format.

This version:

http://www.ebxml.org/specs/ebRS.pdf

Latest version:

http://www.ebxml.org/specs/ebRS.pdf

2 ebXML Participants

ebXML Registry Services, v1.0 was developed by the ebXML Registry Project Team. At the time this specification was approved, the membership of the ebXML Registry Project Team was as follows:

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3 Introduction

3.1 Summary of contents of document

This document defines the interface to the ebXML *Registry* Services as well as interaction protocols, message definitions and XML schema.

A separate document, *ebXML Registry Information Model* [ebRIM], provides information on the types of metadata that are stored in the Registry as well as the relationships among the various metadata classes.

3.2 General conventions

The following conventions are used throughout this document:

- UML diagrams are used as a way to concisely describe concepts. They are not intended to convey any specific *Implementation* or methodology requirements.
- The term *"repository item"* is used to refer to an object that has been submitted to a Registry for storage and safekeeping (e.g. an XML document or a DTD). Every repository item is described by a RegistryEntry instance.
- The term "*RegistryEntry*" is used to refer to an object that provides metadata about a *repository item*.
- *Capitalized Italic* words are defined in the ebXML Glossary.

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, MAY, and OPTIONAL, when they appear in this document, are to be interpreted as described in RFC 2119 [Bra97].

3.3 Audience

The target audience for this specification is the community of software developers who are:

- Implementers of ebXML Registry Services
- Implementers of ebXML Registry Clients

3.4 Related documents

The following specifications provide some background and related information to the reader:

- [ebRIM] ebXML Registry Information Model v1.0
- [ebMS] ebXML Message Service Specification v1.0
- [ebBPM] ebXML Business Process Specification Schema v1.01
- [ebCPP] ebXML Collaboration-Protocol Profile and Agreement Specification v1.0

4 Design Objectives

4.1 Goals

The goals of this version of the specification are to:

- Communicate functionality of Registry services to software developers
- Specify the interface for Registry clients and the Registry
- Provide a basis for future support of more complete ebXML Registry requirements
- Be compatible with other ebXML specifications

4.2 Caveats and assumptions

The Registry Services specification is first in a series of phased deliverables. Later versions of the document will include additional functionality planned for future development.

It is assumed that:

1. Interoperability requirements dictate that the ebXML Message Services Specification is used between an ebXML Registry and an ebXML Registry Client. The use of other communication means is not precluded; however, in those cases interoperability cannot be assumed. Other communication means are outside the scope of this specification.
2. All access to the Registry content is exposed via the interfaces defined for the Registry Services.
3. The Registry makes use of a Repository for storing and retrieving persistent information required by the Registry Services. This is an implementation detail that will not be discussed further in this specification.

5 System Overview

5.1 What the ebXML Registry does

The ebXML Registry provides a set of services that enable sharing of information between interested parties for the purpose of enabling *business process* integration between such parties based on the ebXML specifications. The shared information is maintained as objects in a repository and managed by the ebXML Registry Services defined in this document.

5.2 How the ebXML Registry works

This section describes at a high level some use cases illustrating how Registry clients may make use of Registry Services to conduct B2B exchanges. It is meant to be illustrative and not prescriptive.

The following scenario provides a high level textual example of those use cases in terms of interaction between Registry clients and the Registry. It is not a complete listing of the use cases that could be envisioned. It assumes for purposes of example, a buyer and a seller who wish to conduct B2B exchanges using the RosettaNet PIP3A4 Purchase Order business protocol. It is assumed that both buyer and seller use the same Registry service provided by a third party. Note that the architecture supports other possibilities (e.g. each party uses its own private Registry).

5.2.1 Schema documents are submitted

A third party such as an industry consortium or standards group submits the necessary schema documents required by the RosettaNet PIP3A4 Purchase Order business protocol with the Registry using the ObjectManager service of the Registry described in Section 7.3.

5.2.2 Business process documents are submitted

A third party, such as an industry consortium or standards group, submits the necessary business process documents required by the RosettaNet PIP3A4 Purchase Order business protocol with the Registry using the ObjectManager service of the Registry described in Section 7.3.

5.2.3 Seller's collaboration protocol profile Is submitted

The seller publishes its *Collaboration Protocol* Profile or CPP as defined by [ebCPP] to the Registry. The CPP describes the seller, the role it plays, the services it offers and the technical

details on how those services may be accessed. The seller classifies their Collaboration Protocol Profile using the Registry's flexible *Classification* capabilities.

5.2.4 Buyer discovers the seller

The buyer browses the Registry using *Classification* schemes defined within the Registry using a Registry Browser GUI tool to discover a suitable seller. For example the buyer may look for all parties that are in the Automotive Industry, play a seller role, support the RosettaNet PIP3A4 process and sell Car Stereos.

The buyer discovers the seller's CPP and decides to engage in a partnership with the seller.

5.2.5 CPA is established

The buyer unilaterally creates a *Collaboration Protocol Agreement* or CPA as defined by [ebCPP] with the seller using the seller's CPP and their own CPP as input. The buyer proposes a trading relationship to the seller using the unilateral CPA. The seller accepts the proposed CPA and the trading relationship is established.

Once the seller accepts the CPA, the parties may begin to conduct B2B transactions as defined by [ebMS].

5.3 Where the Registry Services may be implemented

The Registry Services may be implemented in several ways including, as a public web site, as a private web site, hosted by an ASP or hosted by a VPN provider.

5.4 Implementation conformance

An implementation is a *conforming* ebXML Registry if the implementation meets the conditions in Section 5.4.1. An implementation is a conforming ebXML Registry Client if the implementation meets the conditions in Section 5.4.2. An implementation is a conforming ebXML Registry and a conforming ebXML Registry Client if the implementation conforms to the conditions of Section 5.4.1 and Section 5.4.2. An implementation shall be a conforming ebXML Registry, a conforming ebXML Registry Client, or a conforming ebXML Registry and Registry Client.

5.4.1 Conformance as an ebXML Registry

An implementation conforms to this specification as an ebXML registry if it meets the following conditions:

1. Conforms to *the ebXML Registry Information Model [ebRIM]*.

2. Supports the syntax and semantics of the Registry Interfaces and Security Model.

3. Supports the defined ebXML Registry DTD (Appendix A)

4. Optionally supports the syntax and semantics of Section 8.3, SQL Query Support.

5.4.2 Conformance as an ebXML Registry client

An implementation conforms to this specification, as an ebXML Registry Client if it meets the following conditions:

1. Supports the ebXML CPA and bootstrapping process.

2. Supports the syntax and the semantics of the Registry Client Interfaces.

3. Supports the defined ebXML Error Message DTD.

4. Supports the defined ebXML Registry DTD.

6 Registry Architecture

The ebXML Registry architecture consists of an ebXML Registry and ebXML Registry Clients. The Registry Client interfaces may be local to the registry or local to the user. **Figure 1** depicts the two possible topologies supported by the registry architecture with respect to the Registry and Registry Clients.

The picture on the left side shows the scenario where the Registry provides a web based "thin client" application for accessing the Registry that is available to the user using a common web browser. In this scenario the Registry Client interfaces reside across the internet and are local to the Registry from the user's view.

The picture on the right side shows the scenario where the user is using a "fat client" Registry Browser application to access the registry. In this scenario the Registry Client interfaces reside within the Registry Browser tool and are local to the Registry from the user's view. The Registry Client interfaces communicate with the Registry over the internet in this scenario.

A third topology made possible by the registry architecture is where the Registry Client interfaces reside in a server side business component such as a Purchasing business component. In this topology there may be no direct user interface or user intervention involved. Instead the Purchasing business component may access the Registry in an automated manner to select possible sellers or service providers based current business needs.

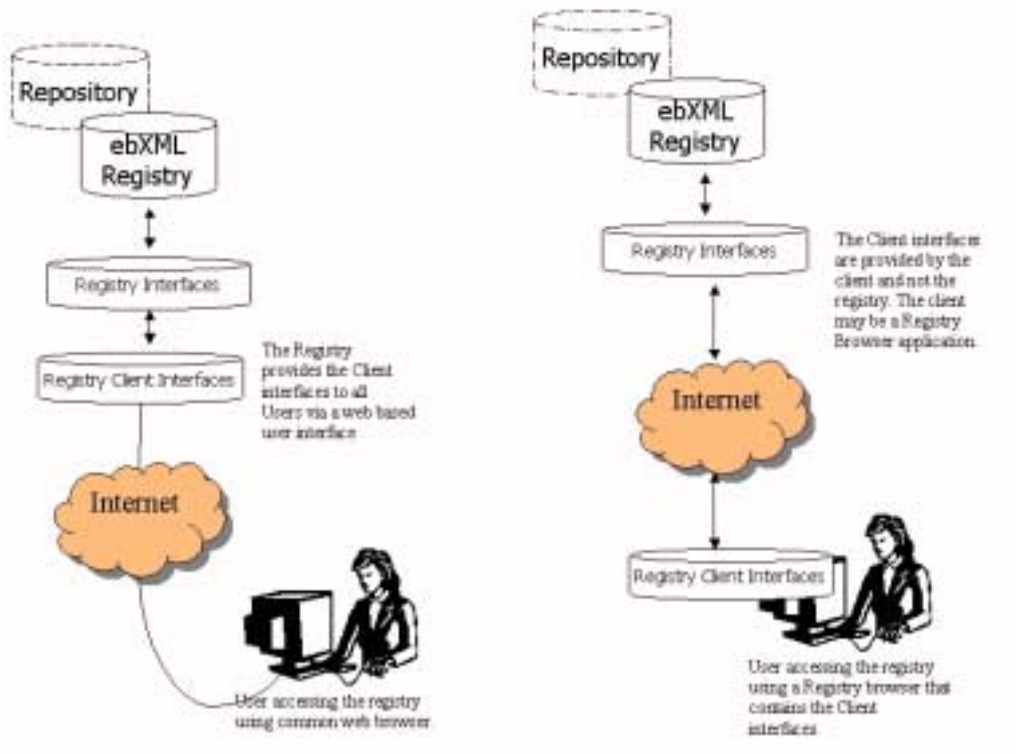


Figure 1: Registry Architecture Supports Flexible Topologies

Clients communicate with the Registry using the ebXML Messaging Service in the same manner as any two ebXML applications communicating with each other.

Future versions of this specification may provide additional services to explicitly extend the Registry architecture to support distributed registries. However this current version of the specification does not preclude ebXML Registries from cooperating with each other to share information, nor does it preclude owners of ebXML Registries from registering their ebXML registries with other registry systems, catalogs, or directories.

Examples include:

- an ebXML Registry of Registries that serves as a centralized registration point;
- cooperative ebXML Registries, where registries register with each other in a federation;
- registration of ebXML Registries with other Registry systems that act as white pages or yellow pages. The document [ebXML-UDDI] provides an example of ebXML Registries being discovered through a system of emerging white/yellow pages known as UDDI.

6.1 ebXML Registry profiles and agreements

The ebXML CPP specification [ebCPP] defines a Collaboration-Protocol Profile (CPP) and a Collaboration-Protocol Agreement (CPA) as mechanisms for two parties to share information regarding their respective business processes. That specification assumes that a CPA has been agreed to by both parties in order for them to engage in B2B interactions.

This specification does not mandate the use of a CPA between the Registry and the Registry Client. However if the Registry does not use a CPP, the Registry shall provide an alternate mechanism for the Registry Client to discover the services and other information provided by a CPP. This alternate mechanism could be simple URL.

The CPA between clients and the Registry should describe the interfaces that the Registry and the client expose to each other for Registry-specific interactions. These interfaces are described in Figure 2 and subsequent sections. The definition of the Registry CPP template and a Registry Client CPP template are beyond the scope of this document.

6.2 Client-to-Registry communication bootstrapping

Since there is no previously established CPA between the Registry and the RegistryClient, the client must know at least one Transport-specific communication address for the Registry. This communication address is typically a URL to the Registry, although it could be some other type of address such as an email address.

For example, if the communication used by the Registry is HTTP, then the communication address is a URL. In this example, the client uses the Registry's public URL to create an implicit CPA with the Registry. When the client sends a request to the Registry, it provides a URL to itself. The Registry uses the client's URL to form its version of an implicit CPA with the client. At this point a session is established within the Registry.

For the duration of the client's session with the Registry, messages may be exchanged bidirectionally as required by the interaction protocols defined in this specification.

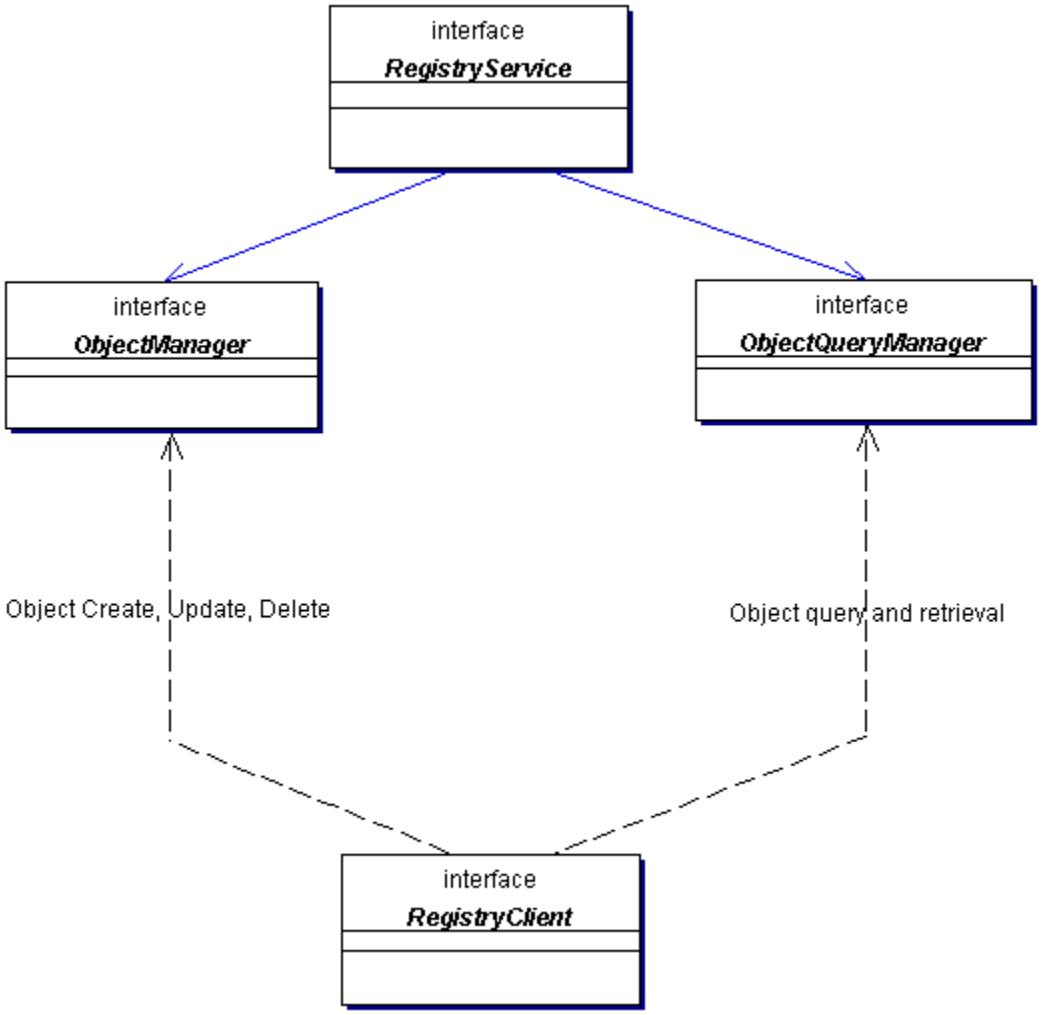


Figure 2: ebXML Registry Interfaces

6.3 Interfaces

This specification defines the interfaces exposed by both the Registy (Section 6.4) and the Registry Client (Section 6.5). Figure 2 shows the relationship between the interfaces and the mapping of specific Registy interfaces with specific Registry Client interfaces.

6.4 Interfaces exposed by the Registry

When using the ebXML Messaging Services Specification, ebXML Registry Services elements correspond to Messaging Services elements as follows:

- The value of the Service element in the MessageHeader is an ebXML Registry Service interface name (e.g., “ObjectManager”). The type attribute of the Service element should have a value of “ebXMLRegistry”.

- The value of the Action element in the MessageHeader is an ebXML Registry Service method name (e.g., “submitObjects”).

Note The above allows the Registry Client only one interface/method pair per message. This implies that a Registry Client can only invoke one method on a specified interface for a given request to a registry.

6.4.1 Synchronous and asynchronous responses

All methods on interfaces exposed by the registry return a response message.

- Asynchronous response
  - MessageHeader only;
  - No registry response element (e.g., AdHocQueryResponse and GetContentResponse).
- Synchronous response
  - MessageHeader;
  - Registry response element including
    - a status attribute (success or failure)
    - an optional ebXML Error.

The ebXML Registry implements the following interfaces as its services (Registry Services).

6.4.2 Interface RegistryService

This is the principal interface implemented by the Registry. It provides the methods that are used by the client to discover service-specific interfaces implemented by the Registry.

Method Summary of RegistryService	
ObjectManager	**getObjectManager( )** Returns the ObjectManager interface implemented by the Registry service.
ObjectQueryManager	**getObjectQueryManager( )** Returns the ObjectQueryManager interface implemented by the Registry service.

6.4.3 Interface ObjectManager

This is the interface exposed by the Registry Service that implements the Object life cycle management functionality of the Registry. Its methods are invoked by the Registry Client. For example, the client may use this interface to submit objects, to classify and associate objects and to deprecate and remove objects. For this specification the semantic meaning of submit, classify, associate, deprecate and remove is found in [ebRIM].

Method Summary of ObjectManager	
`RegistryResponse`	**approveObjects**(ApproveObjectsRequest `req`) Approves one or more previously submitted objects.
`RegistryResponse`	**deprecateObjects**(DeprecateObjectsRequest `req`) Deprecates one or more previously submitted objects.
`RegistryResponse`	**removeObjects**(RemoveObjectsRequest `req`) Removes one or more previously submitted objects from the Registry.
`RegistryResponse`	**submitObjects**(SubmitObjectsRequest `req`) Submits one or more objects and possibly related metadata such as Associations and Classifications.
`RegistryResponse`	**addSlots**(AddSlotsRequest `req`) Add slots to one or more registry entries.
`RegistryResponse`	**removeSlots**(RemoveSlotsRequest `req`) Remove specified slots from one or more registry entries.

6.4.4 Interface ObjectQueryManager

This is the interface exposed by the Registry that implements the Object Query management service of the Registry. Its methods are invoked by the Registry Client. For example, the client may use this interface to perform browse and drill down queries or ad hoc queries on registry content.

Method Summary of ObjectQueryManager	
RegistryResponse	**getClassificationTree**(GetClassificationTreeRequest `req`) Returns the ClassificationNode Tree under the ClassificationNode specified in GetClassificationTreeRequest.
RegistryResponse	**getClassifiedObjects**(GetClassifiedObjectsRequest `req`) Returns a collection of references to RegistryEntries classified under specified ClassificationItem.

RegistryResponse	**getContent**( ) Returns the content of the specified Repository Item. The response includes all the content specified in the request as additional payloads within the response message.
RegistryResponse	**getRootClassificationNodes**(GetRootClassificationNodesRequest `req`) Returns all root ClassificationNodes that match the namePattern attribute in GetRootClassificationNodesRequest request.
RegistryResponse	**submitAdhocQuery**(AdhocQueryRequest `req`) Submit an ad hoc query request.

6.5 Interfaces exposed by Registry clients

An ebXML Registry client implements the following interface.

6.5.1 Interface RegistryClient

This is the principal interface implemented by a Registry client. The client provides this interface when creating a connection to the Registry. It provides the methods that are used by the Registry to deliver asynchronous responses to the client. Note that a client need not provide a RegistryClient interface if the [CPA] between the client and the registry does not support asynchronous responses.

The registry sends all asynchronous responses to operations to the onResponse method.

Method Summary of RegistryClient	
`void`	**onResponse**(RegistryResponse `resp`) Notifies client of the response sent by registry to previously submitted request.

6.6 Registry response class hierarchy

Since many of the responses from the registry have common attributes they are arranged in the following class hierarchy. This hierarchy is reflected in the registry DTD.

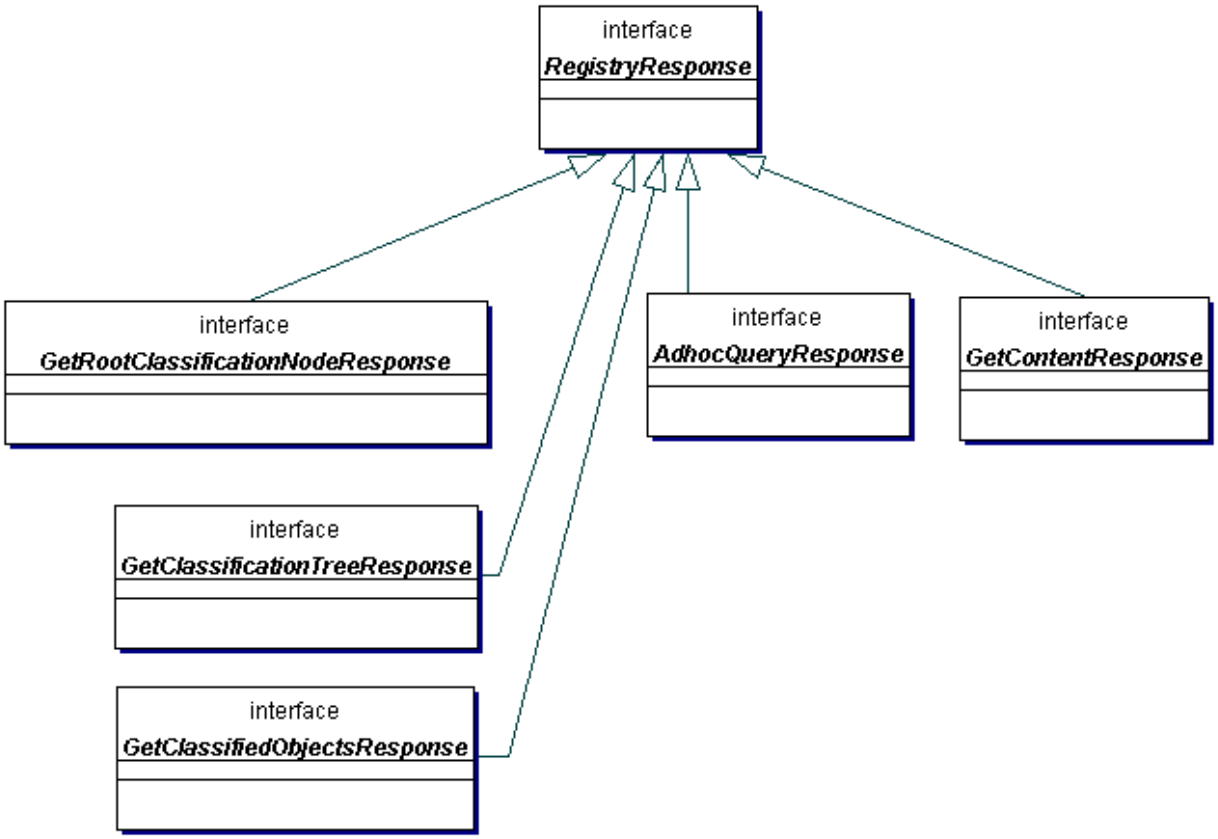


Figure 3: Registry Reponse Class Hierarchy

7 Object Management Service

This section defines the ObjectManagement service of the Registry. The Object Management Service is a sub-service of the Registry service. It provides the functionality required by RegistryClients to manage the life cycle of repository items (e.g. XML documents required for ebXML business processes). The Object Management Service can be used with all types of repository items as well as the metadata objects specified in [ebRIM] such as Classification and Association.

The minimum *security policy* for an ebXML registry is to accept content from any client if the content is digitally signed by a certificate issued by a Certificate Authority recognized by the ebXML registry. Submitting Organizations do not have to register prior to submitting content.

7.1 Life cycle of a repository item

The main purpose of the ObjectManagement service is to manage the life cycle of repository items.

Figure 4 shows the typical life cycle of a repository item. Note that the current version of this specification does not support Object versioning. Object versioning will be added in a future version of this specification.

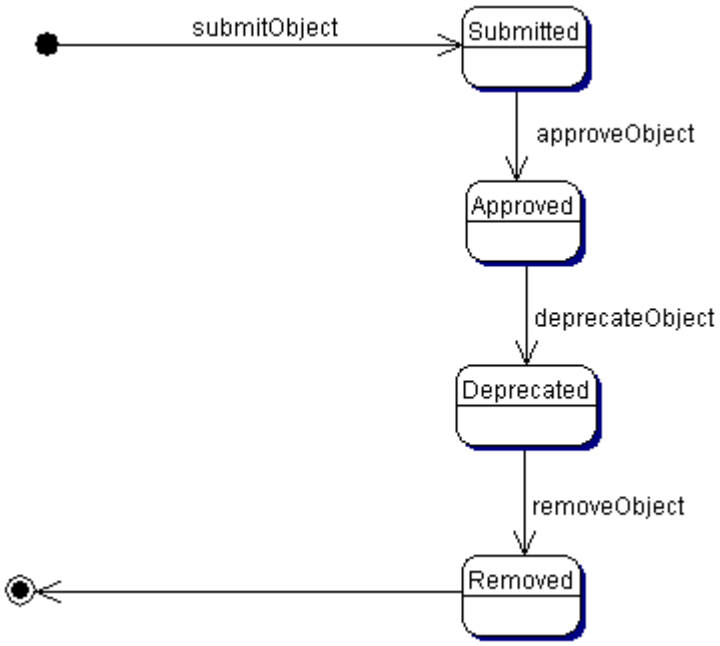


Figure 4: Life Cycle of a Repository Item

7.2 RegistryObject attributes

A repository item is associated with a set of standard metadata defined as attributes of the RegistryObject class and its sub-classes as described in [ebRIM]. These attributes reside outside of the actual repository item and catalog descriptive information about the repository item. XML elements called ExtrinsicObject and IntrinsicObject (See 10 for details) encapsulate all object metadata attributes defined in [ebRIM] as XML attributes.

7.3 The Submit Objects protocol

This section describes the protocol of the Registry Service that allows a RegistryClient to submit one or more repository items to the repository using the *ObjectManager* on behalf of a Submitting Organization. It is expressed in UML notation as described in Appendix B.

Figure 5: Submit Objects Sequence Diagram

For details on the schema for the *Business documents* shown in this process refer to 10.

The SubmitObjectRequest message includes a RegistrEntryList element.

The RegistryEntryList element specifies one or more ExtrinsicObjects or other RegistryEntries such as Classifications, Associations, ExternalLinks, or Packages.

An ExtrinsicObject element provides required metadata about the content being submitted to the Registry as defined by [ebRIM]. Note that these standard ExtrinsicObject attributes are separate from the repository item itself, thus allowing the ebXML Registry to catalog objects of any object type.

In the event of success, the registry sends a RegistryResponse with a status of “success” back to the client. In the event of failure, the registry sends a RegistryResponse with a status of “failure” back to the client.

7.3.1 Universally unique ID generation

As specified by [ebRIM], all objects in the registry have a unique id. The id must be a *Universally Unique Identifier (UUID)* and must conform to the to the format of a URN that specifies a DCE 128 bit UUID as specified in [UUID].

(e.g. urn:uuid:a2345678-1234-1234-123456789012)

This id is usually generated by the registry. The `id` attribute for submitted objects may optionally be supplied by the client. If the client supplies the `id` and it conforms to the format of a URN that specifies a DCE 128 bit UUID then the registry assumes that the client wishes to

specify the `id` for the object. In this case, the registry must honor a client-supplied `id` and use it as the `id` attribute of the object in the registry. If the `id` is found by the registry to not be globally unique, the registry must raise the error condition: InvalidIdError.

If the client does not supply an `id` for a submitted object then the registry must generate a universally unique `id.` Whether the `id` is generated by the client or whether it is generated by the registry, it must be generated using the DCE 128 bit UUID generation algorithm as specified in [UUID].

7.3.2 ID attribute and object references

The id attribute of an object may be used by other objects to reference the first object. Such references are common both within the SubmitObjectsRequest as well as within the registry. Within a SubmitObjectsRequest, the id attribute may be used to refer to an object within the SubmitObjectsRequest as well as to refer to an object within the registry. An object in the SubmitObjectsRequest that needs to be referred to within the request document may be assigned an id by the submitter so that it can be referenced within the request. The submitter may give the object a proper uuid URN, in which case the id is permanently assigned to the object within the registry. Alternatively, the submitter may assign an arbitrary id (not a proper uuid URN) as long as the id is unique within the request document. In this case the id serves as a linkage mechanism within the request document but must be ignored by the registry and replaced with a registry generated id upon submission.

When an object in a SubmitObjectsRequest needs to reference an object that is already in the registry, the request must contain an ObjectRef element whose id attribute is the id of the object in the registry. This id is by definition a proper uuid URN. An ObjectRef may be viewed as a proxy within the request for an object that is in the registry.

7.3.3 Sample SubmitObjectsRequest

The following example shows several different use cases in a single SubmitObjectsRequest. It does not show the complete ebXML Message with the message header and additional payloads in the message for the repository items.

A SubmitObjectsRequest includes a RegistryEntryList which contains any number of objects that are being submitted. It may also contain any number of ObjectRefs to link objects being submitted to objects already within the registry.

```
<?xml version = "1.0" encoding = "UTF-8"?>
<!DOCTYPE SubmitObjectsRequest SYSTEM "file:////home/najmi/Registry.dtd">
<SubmitObjectsRequest>
  <RegistryEntryList>
    <!–
    The following 3 objects package specified ExtrinsicObject in specified
    Package, where both the Package and the ExtrinsicObject are
```

```
being  submitted
-->
<Package id = "acmePackage1" name = "Package #1" description = "ACME's package #1"/>
<ExtrinsicObject id = "acmeCPP1" contentURI = "CPP1"
  objectType = "CPP" name = "Widget Profile"
  description = "ACME's profile for selling widgets"/>
<Association id = "acmePackage1-acmeCPP1-Assoc" associationType = "Packages"
  sourceObject = "acmePackage1" targetObject = "acmeCPP1"/>

<!—
The following 3 objects package specified ExtrinsicObject in specified Package,
Where the Package is being submitted and the ExtrinsicObject is
already in registry
-->
<Package id = "acmePackage2" name = "Package #2" description = "ACME's package #2"/>
<ObjectRef id = "urn:uuid:a2345678-1234-1234-123456789012"/>
<Association id = "acmePackage2-alreadySubmittedCPP-Assoc"
  associationType = "Packages" sourceObject = "acmePackage2"
  targetObject = "urn:uuid:a2345678-1234-1234-123456789012"/>
<!—
The following 3 objects package specified ExtrinsicObject in specified Package,
where the Package and the ExtrinsicObject are already in registry
-->
<ObjectRef id = "urn:uuid:b2345678-1234-1234-123456789012"/>
<ObjectRef id = "urn:uuid:c2345678-1234-1234-123456789012"/>
<!-- id is unspecified implying that registry must create a uuid for this object -->
<Association associationType = "Packages"
  sourceObject = "urn:uuid:b2345678-1234-1234-123456789012"
  targetObject = "urn:uuid:c2345678-1234-1234-123456789012"/>
<!—
The following 3 objects externally link specified ExtrinsicObject using
specified ExternalLink, where both the ExternalLink and the ExtrinsicObject
are being submitted
-->
<ExternalLink id = "acmeLink1" name = "Link #1" description = "ACME's Link #1"/>
<ExtrinsicObject id = "acmeCPP2" contentURI = "CPP2" objectType = "CPP"
  name = "Sprockets Profile" description = "ACME's profile for selling sprockets"/>
<Association id = "acmeLink1-acmeCPP2-Assoc" associationType = "ExternallyLinks"
  sourceObject = "acmeLink1" targetObject = "acmeCPP2"/>
<!--
The following 2 objects externally link specified ExtrinsicObject using specified
ExternalLink, where the ExternalLink is being submitted and the ExtrinsicObject
```

```
is already in registry. Note that the targetObject points to an ObjectRef in a
previous line
-->
<ExternalLink id = "acmeLink2" name = "Link #2" description = "ACME's Link #2"/>
<Association id = "acmeLink2-alreadySubmittedCPP-Assoc"
  associationType = "ExternallyLinks" sourceObject = "acmeLink2"
  targetObject = "urn:uuid:a2345678-1234-1234-123456789012"/>
<!--
The following 2 objects externally identify specified ExtrinsicObject using specified
ExternalIdentifier, where the ExternalIdentifier is being submitted and the
ExtrinsicObject is already in registry. Note that the targetObject points to an
ObjectRef in a previous line
-->
<ExternalIdentifier id = "acmeDUNSId" name = "DUNS" description = "DUNS ID for ACME"
  value = "13456789012"/>
<Association id = "acmeDUNSId-alreadySubmittedCPP-Assoc"
  associationType = "ExternallyIdentifies" sourceObject = "acmeDUNSId"
  targetObject = "urn:uuid:a2345678-1234-1234-123456789012"/>
<!--
The following show submission of a brand new classification scheme in its entirety
-->
<ClassificationNode id = "geographyNode" name = "Geography"
  description = "The Geography scheme example from Registry Services Spec" />
<ClassificationNode id = "asiaNode" name = "Asia"
  description = "The Asia node under the Geography node" parent="geographyNode" />
<ClassificationNode id = "japanNode" name = "Japan"
  description ="The Japan node under the Asia node" parent="asiaNode" />
<ClassificationNode id = "koreaNode" name = "Korea"
  description ="The Korea node under the Asia node" parent="asiaNode" />
<ClassificationNode id = "europeNode" name = "Europe"
  description = "The Europe node under the Geography node" parent="geographyNode" />
<ClassificationNode id = "germanyNode" name = "Germany"
  description ="The Germany node under the Asia node" parent="europeNode" />
<ClassificationNode id = "northAmericaNode" name = "North America"
  description = "The North America node under the Geography node"
  parent="geographyNode" />
<ClassificationNode id = "usNode" name = "US"
  description ="The US node under the Asia node" parent="northAmericaNode" />

<!--
The following show submission of a Automotive sub-tree of ClassificationNodes that
gets added to an existing classification scheme named 'Industry'
```

```
    that is already in the registry
    -->
    <ObjectRef id="urn:uuid:d2345678-1234-1234-123456789012" />
    <ClassificationNode  id = "automotiveNode" name = "Automotive"
      description = "The Automotive sub-tree under Industry scheme"
      parent = "urn:uuid:d2345678-1234-1234-123456789012"/>
    <ClassificationNode id = "partSuppliersNode" name = "Parts Supplier"
      description = "The Parts Supplier node under the Automotive node"
      parent="automotiveNode" />
    <ClassificationNode id = "engineSuppliersNode" name = "Engine Supplier"
      description = "The Engine Supplier node under the Automotive node"
      parent="automotiveNode" />
    <!--
    The following show submission of 2 Classifications of an object  that is already in
    the registry using 2 ClassificationNodes. One ClassificationNode
    is being submitted in this request (Japan) while the other is already in the registry.
    -->
    <Classification id = "japanClassification"
      description = "Classifies object by /Geography/Asia/Japan node"
      classifiedObject="urn:uuid:a2345678-1234-1234-123456789012"
      classificationNode="japanNode" />
    <Classification id = "classificationUsingExistingNode"
      description = "Classifies object using a node in the registry"
      classifiedObject="urn:uuid:a2345678-1234-1234-123456789012"
      classificationNode="urn:uuid:e2345678-1234-1234-123456789012" />
    <ObjectRef id="urn:uuid:e2345678-1234-1234-123456789012" />
  </RegistryEntryList>
</SubmitObjectsRequest>
```

7.4 The Add Slots protocol

This section describes the protocol of the Registry Service that allows a client to add slots to a previously submitted registry entry using the ObjectManager. Slots provide a dynamic mechanism for extending registry entries as defined by [ebRIM].

Figure 7: Add Slots Sequence Diagram

In the event of success, the registry sends a RegistryResponse with a status of "success" back to the client. In the event of failure, the registry sends a RegistryResponse with a status of "failure" back to the client.

7.5 The Remove Slots protocol

This section describes the protocol of the Registry Service that allows a client to remove slots to a previously submitted registry entry using the ObjectManager.

Figure 8: Remove Slots Sequence Diagram

In the event of success, the registry sends a RegistryResponse with a status of "success" back to the client. In the event of failure, the registry sends a RegistryResponse with a status of "failure" back to the client.

7.6 The Approve Objects protocol

This section describes the protocol of the Registry Service that allows a client to approve one or more previously submitted repository items using the ObjectManager. Once a repository item is approved it will become available for use by business parties (e.g. during the assembly of new CPAs and Collaboration Protocol Profiles).

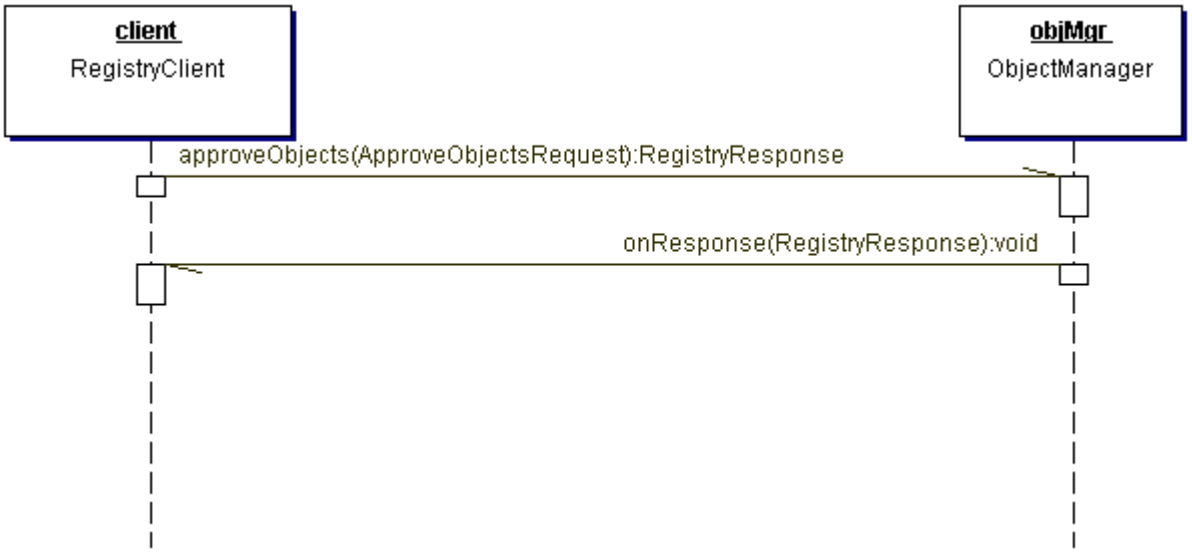


Figure 9: Approve Objects Sequence Diagram

In the event of success, the registry sends a RegistryResponse with a status of “success” back to the client. In the event of failure, the registry sends a RegistryResponse with a status of “failure” back to the client.

For details on the schema for the business documents shown in this process refer to 10.

7.7 The Deprecate Objects protocol

This section describes the protocol of the Registry Service that allows a client to deprecate one or more previously submitted repository items using the ObjectManager. Once an object is deprecated, no new references (e.g. *new* Associations, Classifications and ExternalLinks) to that object can be submitted. However, existing references to a deprecated object continue to function normally.

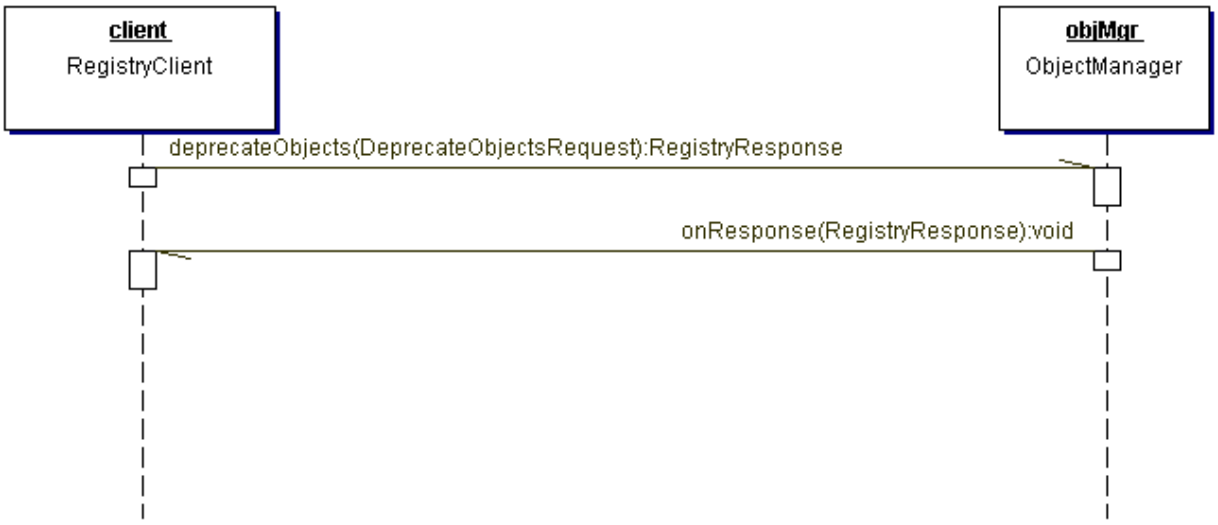


Figure 10: Deprecate Objects Sequence Diagram

In the event of success, the registry sends a RegistryResponse with a status of "success" back to the client. In the event of failure, the registry sends a RegistryResponse with a status of "failure" back to the client.

For details on the schema for the business documents shown in this process refer to 10.

7.8 The Remove Objects protocol

This section describes the protocol of the Registry Service that allows a client to remove one or more RegistryEntry instances and/or repository items using the ObjectManager.

The RemoveObjectsRequest message is sent by a client to remove RegistryEntry instances and/or repository items. The RemoveObjectsRequest element includes an XML attribute called *deletionScope* which is an enumeration that can have the values as defined by the following sections.

7.8.1 Deletion scope DeleteRepositoryItemOnly

This deletionScope specifies that the request should delete the repository items for the specified registry entries but not delete the specified registry entries. This is useful in keeping references to the registry entries valid.

7.8.2 Deletion scope DeleteAll

This deletionScope specifies that the request should delete both the RegistryEntry and the repository item for the specified registry entries. Only if all references (e.g. Associations,

Classifications, ExternalLinks) to a RegistryEntry have been removed, can that RegistryEntry then be removed using a RemoveObjectsRequest with deletionScope DeleteAll. Attempts to remove a RegistryEntry while it still has references raises an error condition: InvalidRequestError.

The remove object protocol is expressed in UML notation as described in Appendix B.

Figure 11: Remove Objects Sequence Diagram

In the event of success, the registry sends a RegistryResponse with a status of “success” back to the client. In the event of failure, the registry sends a RegistryResponse with a status of “failure” back to the client.

For details on the schema for the business documents shown in this process refer to Appendix A.

8 Object Query Management Service

This section describes the capabilities of the Registry Service that allow a client (ObjectQueryManagerClient) to search for or query RegistryEntries in the ebXML Registry using the ObjectQueryManager interface of the Registry.

The Registry supports multiple query capabilities. These include the following:

1. Browse and Drill Down Query

2. Filtered Query

3. SQL Query

The browse and drill down query in Section 8.1 and the filtered query mechanism in Section 8.2 SHALL be supported by every Registry implementation. The SQL query mechanism is an optional feature and MAY be provided by a registry implementation. However, if a vendor provides an SQL query capability to an ebXML Registry it SHALL conform to this document. As such this capability is a normative yet optional capability.

In a future version of this specification, the W3C XQuery syntax may be considered as another query syntax.

Any errors in the query request messages are indicated in the corresponding query response message.

8.1 Browse and drill-down query support

The browse and drill drown query style is supported by a set of interaction protocols between the ObjectQueryManagerClient and the ObjectQueryManager. Sections 8.1.1, 8.1.2 and 8.1.3 describe these protocols.

8.1.1 Get root classification nodes request

An ObjectQueryManagerClient sends this request to get a list of root ClassificationNodes defined in the repository. Root classification nodes are defined as nodes that have no parent. Note that it is possible to specify a namePattern attribute that can filter on the name attribute of the root ClassificationNodes. The namePattern must be specified using a wildcard pattern defined by SQL-92 LIKE clause as defined by [SQL].

Figure 12: Get Root Classification Nodes Sequence Diagram

In the event of success, the registry sends a GetRootClassificationNodeResponse with a status of "success" back to the client. In the event of failure, the registry sends a GetRootClassificationNodeResponse with a status of "failure" back to the client.

For details on the schema for the business documents shown in this process refer to 10.

8.1.2 Get classification tree request

An ObjectQueryManagerClient sends this request to get the ClassificationNode sub-tree defined in the repository under the ClassificationNodes specified in the request. Note that a GetClassificationTreeRequest can specify an integer attribute called *depth* to get the sub-tree up to the specified depth. If *depth* is the default value of 1, then only the immediate children of the specified ClassificationNodeList are returned. If *depth* is 0 or a negative number then the entire sub-tree is retrieved.

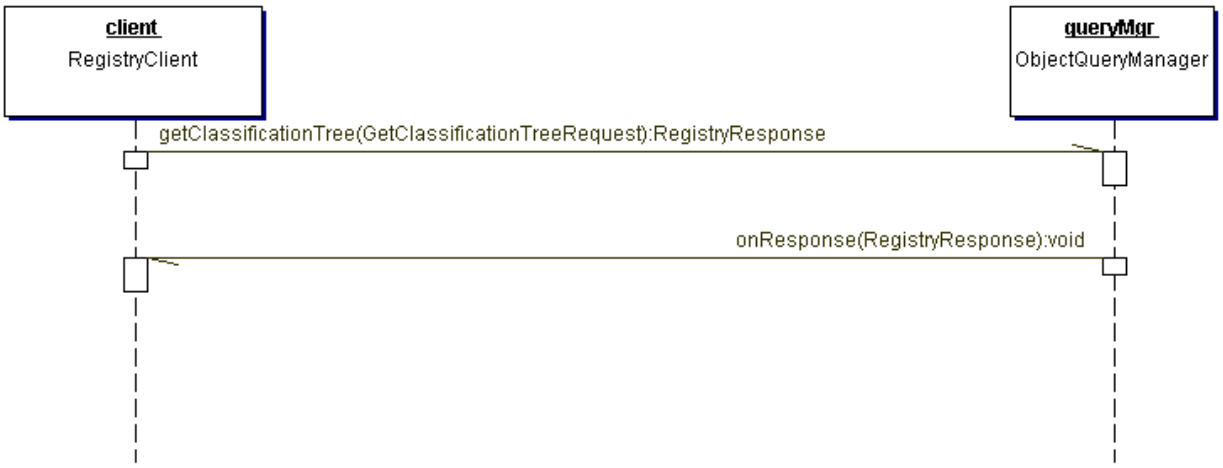


Figure 14: Get Classification Tree Sequence Diagram

In the event of success, the registry sends a GetClassificationTreeResponse with a status of "success" back to the client. In the event of failure, the registry sends a GetClassificationTreeResponse with a status of "failure" back to the client.

For details on the schema for the business documents shown in this process refer to 10.

8.1.3 Get classified objects request

An ObjectQueryManagerClient sends this request to get a list of RegistryEntries that are classified by all of the specified ClassificationNodes (or any of their descendants), as specified by the ObjectRefList in the request.

It is possible to get RegistryEntries based on matches with multiple classifications. Note that specifying a ClassificationNode is implicitly specifying a logical OR with all descendants of the specified ClassificationNode.

When a GetClassifiedObjectsRequest is sent to the ObjectQueryManager it should return Objects that are:

1. Either directly classified by the specified ClassificationNode

2. Or are directly classified by a descendant of the specified ClassificationNode

8.1.3.1 Get Classified Objects Request Example

Figure 16: A Sample Geography Classification

Let us say a classification tree has the structure shown in **Figure 16**:

- If the Geography node is specified in the GetClassifiedObjectsRequest then the GetClassifiedObjectsResponse should include all RegistryEntries that are directly classified by Geography *or* North America *or* US *or* Asia *or* Japan *or* Korea *or* Europe *or* Germany.

- If the Asia node is specified in the GetClassifiedObjectsRequest then the GetClassifiedObjectsResponse should include all RegistryEntries that are directly classified by Asia *or* Japan *or* Korea.

- If the Japan *and* Korea nodes are specified in the GetClassifiedObjectsRequest then the GetClassifiedObjectsResponse should include all RegistryEntries that are directly classified by both Japan *and* Korea.

- If the North America *and* Asia node is specified in the GetClassifiedObjectsRequest then the GetClassifiedObjectsResponse should include all RegistryEntries that are directly classified by (North America *or* US) *and* (Asia *or* Japan *or* Korea).

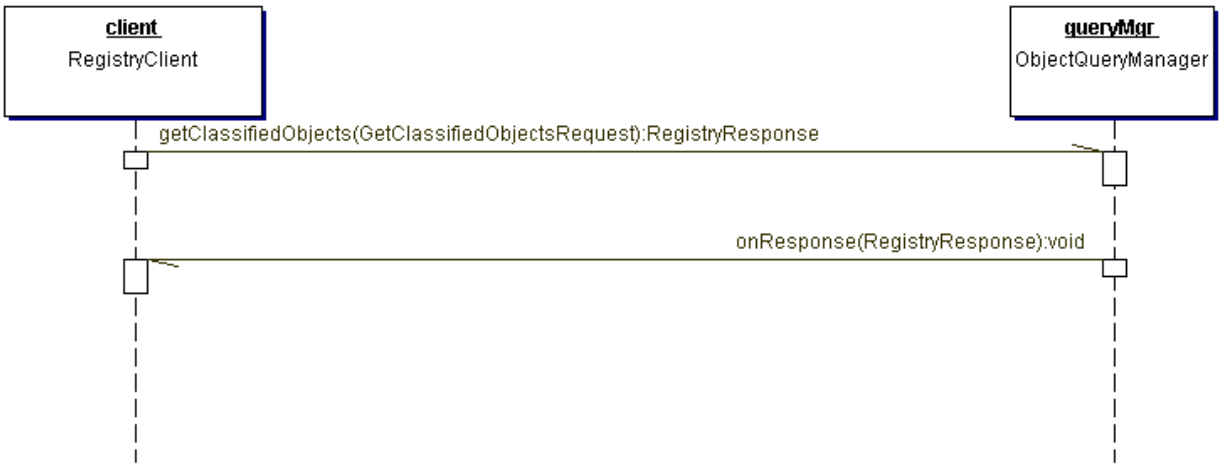


Figure 17: Get Classified Objects Sequence Diagram

In the event of success, the registry sends a GetClassifiedObjectsResponse with a status of "success" back to the client. In the event of failure, the registry sends a GetClassifiedObjectsResponse with a status of "failure" back to the client.

8.2 Filter query support

FilterQuery is an XML syntax that provides simple query capabilities for any ebXML conforming Registry implementation. Each query alternative is directed against a single class defined by the ebXML Registry Information Model (ebRIM). The result of such a query is a set of identifiers for instances of that class. A FilterQuery may be a stand-alone query or it may be the initial action of a ReturnRegistryEntry query or a ReturnRepositoryItem query.

A client submits a FilterQuery, a ReturnRegistryEntry query, or a ReturnRepositoryItem query to the ObjectQueryManager as part of an AdhocQueryRequest. The ObjectQueryManager sends an AdhocQueryResponse back to the client, enclosing the appropriate FilterQueryResponse, ReturnRegistryEntryResponse, or ReturnRepositoryItemResponse specified herein. The sequence diagrams for AdhocQueryRequest and AdhocQueryResponse are specified in Section 8.4.

Each FilterQuery alternative is associated with an ebRIM Binding that identifies a hierarchy of classes derived from a single class and its associations with other classes as defined by ebRIM. Each choice of a class pre-determines a virtual XML document that can be queried as a tree. For example, let C be a class, let Y and Z be classes that have direct associations to C, and let V be a class that is associated with Z. The ebRIM Binding for C might be as in **Figure 19**.

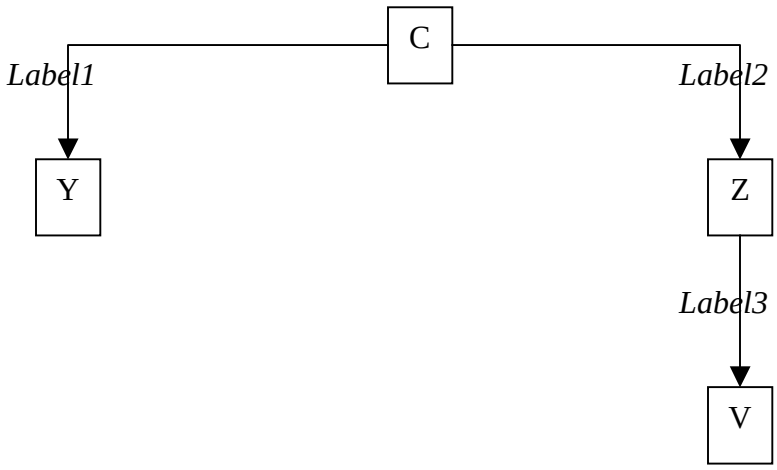


Figure 19: Example ebRIM Binding

Label1 identifies an association from C to Y, Label2 identifies an association from C to Z, and Label3 identifies an association from Z to V. Labels can be omitted if there is no ambiguity as to which ebRIM association is intended. The name of the query is determined by the root class, i.e.

this is an ebRIM Binding for a CQuery. The Y node in the tree is limited to the set of Y instances that are linked to C by the association identified by Label1. Similarly, the Z and V nodes are limited to instances that are linked to their parent node by the identified association.

Each FilterQuery alternative depends upon one or more *class filters*, where a class filter is a restricted *predicate clause* over the attributes of a single class. The supported class filters are specified in Section 8.2.9 and the supported predicate clauses are defined in Section 8.2.10. A FilterQuery will be composed of elements that traverse the tree to determine which branches satisfy the designated class filters, and the query result will be the set of root node instances that support such a branch.

In the above example, the CQuery element will have three subelements, one a CFilter on the C class to eliminate C instances that do not satisfy the predicate of the CFilter, another a YFilter on the Y class to eliminate branches from C to Y where the target of the association does not satisfy the YFilter, and a third to eliminate branches along a path from C through Z to V. The third element is called a *branch* element because it allows class filters on each class along the path from X to V. In general, a branch element will have subelements that are themselves class filters, other branch elements, or a full-blown query on the terminal class in the path.

If an association from a class C to a class Y is one-to-zero or one-to-one, then at most one branch or filter element on Y is allowed. However, if the association is one-to-many, then multiple filter or branch elements are allowed. This allows one to specify that an instance of C must have associations with multiple instances of Y before the instance of C is said to satisfy the branch element.

The FilterQuery syntax is tied to the structures defined in ebRIM. Since ebRIM is intended to be stable, the FilterQuery syntax is stable. However, if new structures are added to the ebRIM, then the FilterQuery syntax and semantics can be extended at the same time.

Support for FilterQuery is required of every conforming ebXML Registry implementation, but other query options are possible. The Registry will hold a self-describing CPP that identifies all supported AdhocQuery options. This profile is described in Section 6.1.

The ebRIM Binding paragraphs in Sections 8.2.2 through 8.2.6 below identify the virtual hierarchy for each FilterQuery alternative. The Semantic Rules for each query alternative specify the effect of that binding on query semantics.

The ReturnRegistryEntry and ReturnRepositoryItem services defined below provide a way to structure an XML document as an expansion of the result of a RegistryEntryQuery. The ReturnRegistryEntry element specified in Section 8.2.7 allows one to specify what metadata one wants returned with each registry entry identified in the result of a RegistryEntryQuery. The ReturnRepositoryItem specified in Section 8.2.8 allows one to specify what repository items one wants returned based on their relationships to the registry entries identified by the result of a RegistryEntryQuery.

8.2.1 FilterQuery

8.2.1.1 Purpose

To identify a set of registry instances from a specific registry class. Each alternative assumes a specific binding to ebRIM. The query result for each query alternative is a set of references to instances of the root class specified by the binding. The status is a success indication or a collection of warnings and/or exceptions.

8.2.1.2 Definition

```
<!ELEMENT FilterQuery
 (    RegistryEntryQuery
   |  AuditableEventQuery
   |  ClassificationNodeQuery
   |  RegistryPackageQuery
   |  OrganizationQuery        )>
<!ELEMENT FilterQueryResult
  (   RegistryEntryQueryResult
   |  AuditableEventQueryResult
   |  ClassificationNodeQueryResult
   |  RegistryPackageQueryResult
   |  OrganizationQueryResult   )>
<!ELEMENT RegistryEntryQueryResult ( RegistryEntryView* )>
<!ELEMENT RegistryEntryView EMPTY >
<!ATTLIST RegistryEntryView
   objectURN     CDATA     #REQUIRED
   contentURI    CDATA     #IMPLIED
   objectID      CDATA     #IMPLIED  >
<!ELEMENT AuditableEventQueryResult ( AuditableEventView* )>
<!ELEMENT AuditableEventView EMPTY >
<!ATTLIST AuditableEventView
   objectID      CDATA     #REQUIRED
   timestamp     CDATA     #REQUIRED  >
<!ELEMENT ClassificationNodeQueryResult
               (ClassificationNodeView*)>
<!ELEMENT ClassificationNodeView EMPTY >
<!ATTLIST ClassificationNodeView
   objectURN     CDATA     #REQUIRED
   contentURI    CDATA     #IMPLIED
   objectID      CDATA     #IMPLIED  >
<!ELEMENT RegistryPackageQueryResult ( RegistryPackageView* )>
<!ELEMENT RegistryPackageView EMPTY >
<!ATTLIST RegistryPackageView
   objectURN     CDATA     #REQUIRED
   contentURI    CDATA     #IMPLIED
   objectID      CDATA     #IMPLIED  >
<!ELEMENT OrganizationQueryResult ( OrganizationView* )>
<!ELEMENT OrganizationView EMPTY >
<!ATTLIST OrganizationView
   orgURN        CDATA     #REQUIRED
   objectID      CDATA     #IMPLIED  >
```

8.2.1.3 Semantic rules

The semantic rules for each FilterQuery alternative are specified in subsequent subsections.

1. Each FilterQueryResult is a set of XML reference elements to identify each instance of the result set. Each XML attribute carries a value derived from the value of an attribute specified in the Registry Information Model as follows:

   a.) objectID is the value of the ID attribute of the RegistryObject class,

   b.) objectURN and orgURN are URN values derived from the object ID,

   c.) contentURI is a URL value derived from the contentURI attribute of the RegistryEntry class,

   d.) timestamp is a literal value to represent the value of the timestamp attribute of the AuditableEvent class.

2. If an error condition is raised during any part of the execution of a FilterQuery, then the status attribute of the XML RegistryResult is set to “failure” and no query result element is returned; instead, a RegistryErrorList element must be returned with its highestSeverity element set to “error”. At least one of the RegistryError elements in the RegistryErrorList will have its severity attribute set to “error”.

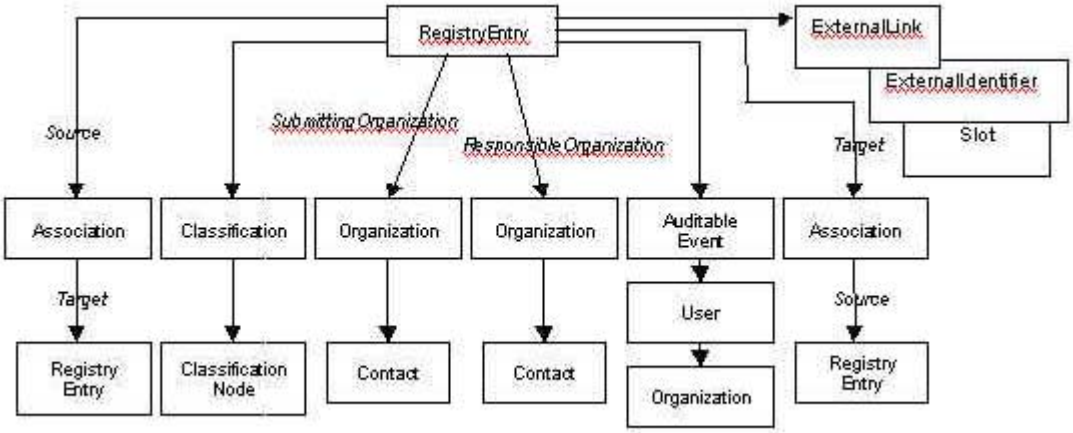
3. If no error conditions are raised during execution of a FilterQuery, then the status attribute of the XML RegistryResult is set to “success” and an appropriate query result element must be included. If a RegistryErrorList is also returned, then the highestSeverity attribute of the RegistryErrorList is set to “warning” and the serverity attribute of each RegistryError is set to “warning”.

8.2.2 RegistryEntryQuery

8.2.2.1 Purpose

To identify a set of registry entry instances as the result of a query over selected registry metadata.

8.2.2.2 ebRIM binding



8.2.2.3 Definition

```
<!ELEMENT RegistryEntryQuery
   (  RegistryEntryFilter?,
      SourceAssociationBranch*,
      TargetAssociationBranch*,
      HasClassificationBranch*,
      SubmittingOrganizationBranch?,
      ResponsibleOrganizationBranch?,
      ExternalIdentifierFilter*,
      ExternalLinkFilter*,
      SlotFilter*,
      HasAuditableEventBranch*          )>
<!ELEMENT SourceAssociationBranch
  (   AssociationFilter?,
      RegistryEntryFilter?              )>
<!ELEMENT TargetAssociationBranch
  (   AssociationFilter?,
      RegistryEntryFilter?              )>
<!ELEMENT HasClassificationBranch
  (   ClassificationFilter?,
      ClassificationNodeFilter?         )>
<!ELEMENT SubmittingOrganizationBranch
  (   OrganizationFilter?,
      ContactFilter?                    )>
<!ELEMENT ResponsibleOrganizationBranch
  (   OrganizationFilter?,
      ContactFilter?                    )>
<!ELEMENT HasAuditableEventBranch
  (   AuditableEventFilter?,
      UserFilter?,
      OrganizationFilter?               )>
```

8.2.2.4 Semantic rules

1. Let RE denote the set of all persistent RegistryEntry instances in the Registry. The following steps will eliminate instances in RE that do not satisfy the conditions of the specified filters.

   a.) If a RegistryEntryFilter is not specified, or if RE is empty, then continue below; otherwise, let x be a registry entry in RE. If x does not satisfy the RegistryEntryFilter as defined in Section 8.2.9, then remove x from RE.

   b.) If a SourceAssociationBranch element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x is not the source object of some Association instance, then remove x from RE; otherwise, treat each SourceAssociationBranch element separately as follows:

   If no AssociationFilter is specified within SourceAssociationBranch, then let AF be the set of all Association instances that have x as a source object; otherwise, let AF be the set of Association instances that satisfy the AssociationFilter and have x as the source object. If AF is empty, then remove x from RE. If no RegistryEntryFilter is specified within SourceAssociationBranch, then let RET be the set of all RegistryEntry instances that are the target object of some element of AF; otherwise, let RET be the set of RegistryEntry instances that satisfy the RegistryEntryFilter and are the target object of some element of AF. If RET is empty, then remove x from RE.

   c.) If a TargetAssociationBranch element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x is not the target object of some Association instance, then remove x from RE; otherwise, treat each TargetAssociationBranch element separately as follows:

   If no AssociationFilter is specified within TargetAssociationBranch, then let AF be the set of all Association instances that have x as a target object; otherwise, let AF be the set of Association instances that satisfy the AssociationFilter and have x as the target object. If AF is empty, then remove x from RE. If no RegistryEntryFilter is specified within TargetAssociationBranch, then let RES be the set of all RegistryEntry instances that are the source object of some element of AF; otherwise, let RES be the set of RegistryEntry instances that satisfy the RegistryEntryFilter and are the source object of some element of AF. If RES is empty, then remove x from RE.

   d.) If a HasClassificationBranch element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x is not the source object of some Classification instance, then remove x from RE; otherwise, treat each HasClassificationBranch element separately as follows:

   If no ClassificationFilter is specified within the HasClassificationBranch, then let CL be the set of all Classification instances that have x as a source object; otherwise, let CL be the set of Classification instances that satisfy the ClassificationFilter and have x as the source object. If CL is empty, then remove x from RE. If no ClassificationNodeFilter is

specified within HasClassificationBranch, then let CN be the set of all ClassificationNode instances that are the target object of some element of CL; otherwise, let CN be the set of RegistryEntry instances that satisfy the ClassificationNodeFilter and are the target object of some element of CL. If CN is empty, then remove x from RE.

e.) If a SubmittingOrganizationBranch element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x does not have a submitting organization, then remove x from RE. If no OrganizationFilter is specified within SubmittingOrganizationBranch, then let SO be the set of all Organization instances that are the submitting organization for x; otherwise, let SO be the set of Organization instances that satisfy the OrganizationFilter and are the submitting organization for x. If SO is empty, then remove x from RE. If no ContactFilter is specified within SubmittingOrganizationBranch, then let CT be the set of all Contact instances that are the contacts for some element of SO; otherwise, let CT be the set of Contact instances that satisfy the ContactFilter and are the contacts for some element of SO. If CT is empty, then remove x from RE.

f.) If a ResponsibleOrganizationBranch element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x does not have a responsible organization, then remove x from RE. If no OrganizationFilter is specified within ResponsibleOrganizationBranch, then let RO be the set of all Organization instances that are the responsible organization for x; otherwise, let RO be the set of Organization instances that satisfy the OrganizationFilter and are the responsible organization for x. If RO is empty, then remove x from RE. If no ContactFilter is specified within SubmittingOrganizationBranch, then let CT be the set of all Contact instances that are the contacts for some element of RO; otherwise, let CT be the set of Contact instances that satisfy the ContactFilter and are the contacts for some element of RO. If CT is empty, then remove x from RE.

g.) If an ExternalLinkFilter element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x is not linked to some ExternalLink instance, then remove x from RE; otherwise, treat each ExternalLinkFilter element separately as follows:

Let EL be the set of ExternalLink instances that satisfy the ExternalLinkFilter and are linked to x. If EL is empty, then remove x from RE.

h.) If an ExternalIdentifierFilter element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x is not linked to some ExternalIdentifier instance, then remove x from RE; otherwise, treat each ExternalIdentifierFilter element separately as follows:

Let EI be the set of ExternalIdentifier instances that satisfy the ExternalIdentifierFilter and are linked to x. If EI is empty, then remove x from RE.

i.) If a SlotFilter element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x is not linked to some Slot instance, then remove x from RE; otherwise, treat each SlotFilter element separately as follows:

Let SL be the set of Slot instances that satisfy the SlotFilter and are linked to x. If SL is empty, then remove x from RE.

j.) If a HasAuditableEventBranch element is not specified, or if RE is empty, then continue below; otherwise, let x be a remaining registry entry in RE. If x is not linked to some AuditableEvent instance, then remove x from RE; otherwise, treat each HasAuditableEventBranch element separately as follows:

If an AuditableEventFilter is not specified within HasAuditableEventBranch, then let AE be the set of all AuditableEvent instances for x; otherwise, let AE be the set of AuditableEvent instances that satisfy the AuditableEventFilter and are auditable events for x. If AE is empty, then remove x from RE. If a UserFilter is not specified within HasAuditableEventBranch, then let AI be the set of all User instances linked to an element of AE; otherwise, let AI be the set of User instances that satisfy the UserFilter and are linked to an element of AE.

If AI is empty, then remove x from RE. If an OrganizationFilter is not specified within HasAuditableEventBranch, then let OG be the set of all Organization instances that are linked to an element of AI; otherwise, let OG be the set of Organization instances that satisfy the OrganizationFilter and are linked to an element of AI. If OG is empty, then remove x from RE.

2. If RE is empty, then raise the warning: *registry entry query result is empty*.

3. Return RE as the result of the RegistryEntryQuery.

8.2.2.5 Examples

A client wants to establish a trading relationship with XYZ Corporation and wants to know if they have registered any of their business documents in the Registry. The following query returns a set of registry entry identifiers for currently registered items submitted by any organization whose name includes the string "XYZ". It does not return any registry entry identifiers for superceded, replaced, deprecated, or withdrawn items.

```
<RegistryEntryQuery>
   <RegistryEntryFilter>
         status EQUAL "Approved"        -- code by Clause, Section 8.2.10
   </RegistryEntryFilter>
   <SubmittingOrganizationBranch>
      <OrganizationFilter>
            name CONTAINS "XYZ"         -- code by Clause, Section 8.2.10
      </OrganizationFilter>
   </SubmittingOrganizationBranch>
</RegistryEntryquery>
```

A client is using the United Nations Standard Product and Services Classification (UNSPSC) scheme and wants to identify all companies that deal with products classified as "Integrated circuit components", i.e. UNSPSC code "321118". The client knows that companies have registered their party profile documents in the Registry, and that each profile has been classified by the products the company deals with. The following query returns a set of registry entry identifiers for profiles of companies that deal with integrated circuit components.

```
<RegistryEntryQuery>
   <RegistryEntryFilter>
      objectType EQUAL "CPP" AND        -- code by Clause, Section 8.2.10
      status EQUAL "Approved"
   </RegistryEntryFilter>
   <HasClassificationBranch>
      <ClassificationNodeFilter>
         id STARTSWITH "urn:un:spsc:321118"   -- code by Clause, Section 8.2.10
      </ClassificationNodeFilter>
   <HasClassificationBranch>
</RegistryEntryQuery>
```

A client application needs all items that are classified by two different classification schemes, one based on "Industry" and another based on "Geography". Both schemes have been defined by ebXML and are registered. The root nodes of each scheme are identified by "urn:ebxml:cs:industry" and "urn:ebxml:cs:geography", respectively. The following query identifies registry entries for all registered items that are classified by "Industry/Automotive" and by "Geography/Asia/Japan".

```
<RegistryEntryQuery>
   <HasClassificationBranch>
      <ClassificationNodeFilter>
         id STARTSWITH "urn:ebxml:cs:industry" AND
         path EQUAL "Industry/Automotive"      -- code by Clause, Section 8.2.10
      </ClassificationNodeFilter>
      <ClassificationNodeFilter>
         id STARTSWITH "urn:ebxml:cs:geography" AND
         path EQUAL "Geography/Asia/Japan"    -- code by Clause, Section 8.2.10
      </ClassificationNodeFilter>
   </HasClassificationBranch>
</RegistryEntryQuery>
```

A client application wishes to identify all registry Package instances that have a given registry entry as a member of the package. The following query identifies all registry packages that contain the registry entry identified by URN "urn:path:myitem" as a member:

```
<RegistryEntryQuery>
   <RegistryEntryFilter>
      objectType EQUAL "RegistryPackage"      -- code by Clause, Section 8.2.10
   </RegistryEntryFilter>
   <SourceAssociationBranch>
      <AssociationFilter>                   -- code by Clause, Section 8.2.10
         associationType EQUAL "HasMember" AND
         targetObject EQUAL "urn:path:myitem"
      </AssociationFilter>
```

```
      </SourceAssociationBranch>
   </RegistryEntryQuery>
```

A client application wishes to identify all ClassificationNode instances that have some given keyword as part of their name or description. The following query identifies all registry classification nodes that contain the keyword "transistor" as part of their name or as part of their description.

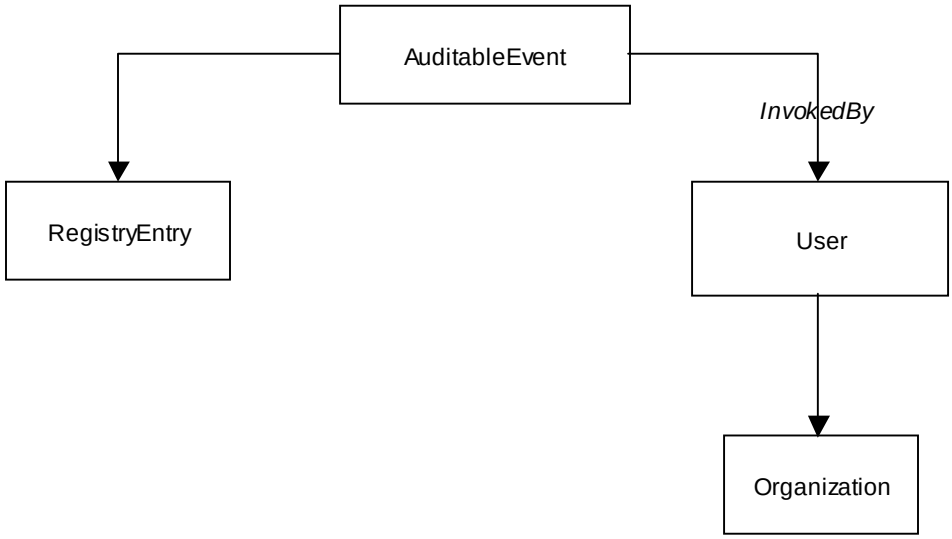
```
<RegistryEntryQuery>
   <RegistryEntryFilter>
      ObjectType="ClassificationNode" AND
      (name CONTAINS "transistor" OR      -- code by Clause, Section 8.2.10
      description CONTAINS "transistor")
   </RegistryEntryFilter>
</RegistryEntryQuery>
```

8.2.3 AuditableEventQuery

8.2.3.1 Purpose

To identify a set of auditable event instances as the result of a query over selected registry metadata.

ebRIM Binding



8.2.3.2 Definition

```
<!ELEMENT AuditableEventQuery
  (   AuditableEventFilter?,
      RegistryEntryQuery*,
      InvokedByBranch?     )>
<!ELEMENT InvokedByBranch
```

```
(   UserFilter?,
    OrganizationQuery?   )>
```

8.2.3.3 Semantic rules

Let AE denote the set of all persistent AuditableEvent instances in the Registry. The following steps will eliminate instances in AE that do not satisfy the conditions of the specified filters.

a.) If an AuditableEventFilter is not specified, or if AE is empty, then continue below; otherwise, let x be an auditable event in AE. If x does not satisfy the AuditableEventFilter as defined in Section 8.2.9, then remove x from AE.

b.) If a RegistryEntryQuery element is not specified, or if AE is empty, then continue below; otherwise, let x be a remaining auditable event in AE. Treat each RegistryEntryQuery element separately as follows:

c.) Let RE be the result set of the RegistryEntryQuery as defined in Section 8.2.2. If x is not an auditable event for some registry entry in RE, then remove x from AE.

d.) If an InvokedByBranch element is not specified, or if AE is empty, then continue below; otherwise, let x be a remaining auditable event in AE.

Let u be the user instance that invokes x. If a UserFilter element is specified within the InvokedByBranch, and if u does not satisfy that filter, then remove x from AE; otherwise, continue below.

> If an OrganizationQuery element is not specified within the InvokedByBranch, then continue below; otherwise, let OG be the set of Organization instances that are identified by the organization attribute of u and are in the result set of the OrganizationQuery. If OG is empty, then remove x from AE.

1. If AE is empty, then raise the warning: auditable event query result is empty.

2. Return AE as the result of the AuditableEventQuery.

8.2.3.4 Examples

A Registry client has registered an item and it has been assigned a URN identifier "urn:path:myitem". The client is now interested in all events since the beginning of the year that have impacted that item. The following query will return a set of AuditableEvent identifiers for all such events.

```
<AuditableEventquery>
   <AuditableEventFilter>
      timestamp GE "2001-01-01" AND         -- code by Clause, Section 8.2.10
      registryEntry EQUAL "urn:path:myitem"
   </AuditableEventFilter>
```

```
</AuditableEventQuery>
```

A client company has many registered objects in the Registry. The Registry allows events submitted by other organizations to have an impact on your registered items, e.g. new classifications and new associations. The following query will return a set of identifiers for all auditable events, invoked by some other party, that had an impact on an item submitted by “myorg” and for which “myorg” is the responsible organization.

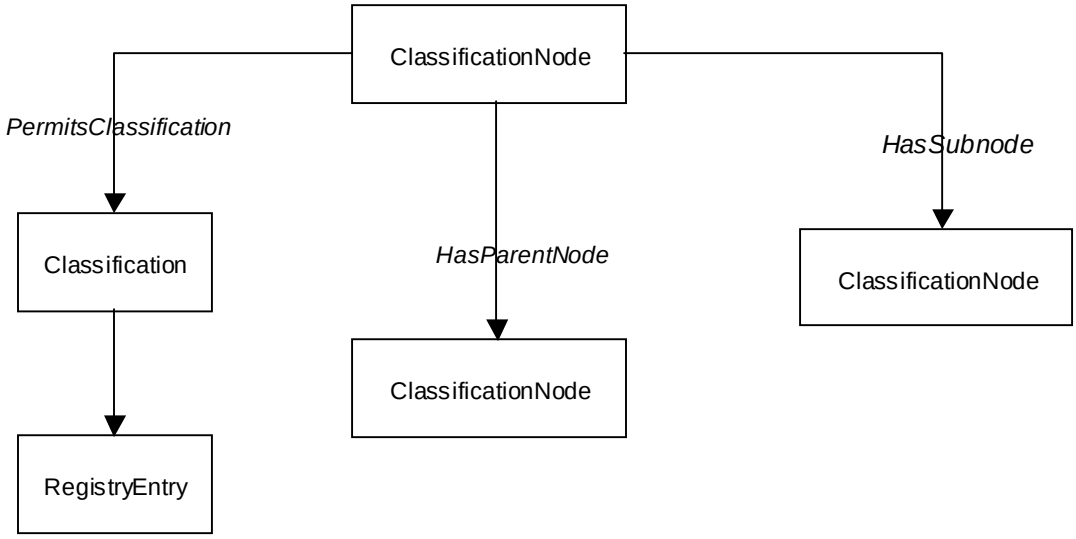
```
<AuditableEventQuery>
   <RegistryEntryQuery>
      <SubmittingOrganizationBranch>
         <OrganizationFilter>
            id EQUAL "urn:somepath:myorg"      -- code by Clause, Section 8.2.10
         </OrganizationFilter>
      </SubmittingOrganizationBranch>
      <ResponsibleOrganizationBranch>
         <OrganizationFilter>
            id EQUAL "urn:somepath:myorg"      -- code by Clause, Section 8.2.10
         </OrganizationFilter>
      </ResponsibleOrganizationBranch>
   </RegistryEntryQuery>
   <InvokedByBranch>
      <OrganizationQuery>
         <OrganizationFilter>
            id -EQUAL "urn:somepath:myorg"     -- code by Clause, Section 8.2.10
         </OrganizationFilter>
      </OrganizationQuery>
   </InvokedByBranch>
</AuditableEventQuery>
```

8.2.4 ClassificationNodeQuery

8.2.4.1 Purpose

To identify a set of classification node instances as the result of a query over selected registry metadata.

8.2.4.2 ebRIM binding



8.2.4.3 Definition

```
<!ELEMENT ClassificationNodeQuery
   (  ClassificationNodeFilter?,
      PermitsClassificationBranch*,
      HasParentNode?,
      HasSubnode*                )>
<!ELEMENT PermitsClassificationBranch
   (  ClassificationFilter?,
      RegistryEntryQuery?        )>
<!ELEMENT HasParentNode
   (  ClassificationNodeFilter?,
      HasParentNode?             )>
<!ELEMENT HasSubnode
   (  ClassificationNodeFilter?,
      HasSubnode*                )>
```

8.2.4.4 Semantic rules

1. Let CN denote the set of all persistent ClassificationNode instances in the Registry. The following steps will eliminate instances in CN that do not satisfy the conditions of the specified filters.

   a.) If a ClassificationNodeFilter is not specified, or if CN is empty, then continue below; otherwise, let x be a classification node in CN. If x does not satisfy the ClassificationNodeFilter as defined in Section 8.2.9, then remove x from AE.

   b.) If a PermitsClassificationBranch element is not specified, or if CN is empty, then continue below; otherwise, let x be a remaining classification node in CN. If x is not the target object of some Classification instance, then remove x from CN; otherwise, treat each PermitsClassificationBranch element separately as follows:

If no ClassificationFilter is specified within the PermitsClassificationBranch element, then let CL be the set of all Classification instances that have x as the target object; otherwise, let CL be the set of Classification instances that satisfy the ClassificationFilter and have x as the target object. If CL is empty, then remove x from CN. If no RegistryEntryQuery is specified within the PermitsClassificationBranch element, then let RES be the set of all RegistryEntry instances that are the source object of some classification instance in CL; otherwise, let RE be the result set of the RegistryEntryQuery as defined in Section 8.2.2 and let RES be the set of all instances in RE that are the source object of some classification in CL. If RES is empty, then remove x from CN.

c.) If a HasParentNode element is not specified, or if CN is empty, then continue below; otherwise, let x be a remaining classification node in CN and execute the following paragraph with n=x.

Let n be a classification node instance. If n does not have a parent node (i.e. if n is a root node), then remove x from CN. Let p be the parent node of n. If a ClassificationNodeFilter element is directly contained in HasParentNode and if p does not satisfy the ClassificationNodeFilter, then remove x from CN.

If another HasParentNode element is directly contained within this HasParentNode element, then repeat the previous paragraph with n=p.

d.) If a HasSubnode element is not specified, or if CN is empty, then continue below; otherwise, let x be a remaining classification node in CN. If x is not the parent node of some ClassificationNode instance, then remove x from CN; otherwise, treat each HasSubnode element separately and execute the following paragraph with n = x.

Let n be a classification node instance. If a ClassificationNodeFilter is not specified within the HasSubnode element then let CNC be the set of all classification nodes that have n as their parent node; otherwise, let CNC be the set of all classification nodes that satisfy the ClassificationNodeFilter and have n as their parent node. If CNC is empty then remove x from CN; otherwise, let y be an element of CNC and continue with the next paragraph.

If the HasSubnode element is terminal, i.e. if it does not directly contain another HasSubnode element, then continue below; otherwise, repeat the previous paragraph with the new HasSubnode element and with n = y.

2. If CN is empty, then raise the warning: *classification node query result is empty*.

3. Return CN as the result of the ClassificationNodeQuery.

8.2.4.5 Examples

A client application wishes to identify all classification nodes defined in the Registry that are root nodes and have a name that contains the phrase “product code” or the phrase “product type”.

Note By convention, if a classification node has no parent (i.e. is a root node), then the parent attribute of that instance is set to null and is represented as a literal by a zero length string.

```
<ClassificationNodeQuery>
   <ClassificationNodeFilter>
      (name CONTAINS “product code” OR     -- code by Clause, Section 8.2.10
       name CONTAINS “product type”) AND
       parent EQUAL “”
   </ClassificationNodeFilter>
</ClassificationNodeQuery>
```

A client application wishes to identify all of the classification nodes at the third level of a classification scheme hierarchy. The client knows that the URN identifier for the root node is “urn:ebxml:cs:myroot”. The following query identifies all nodes at the second level under “myroot” (i.e. third level overall).

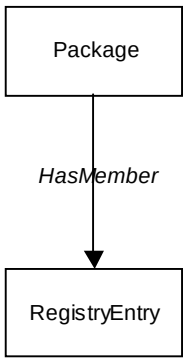
```
<ClassificationNodeQuery>
   <HasParentNode>
      <HasParentNode>
         <ClassificationNodeFilter>
            id EQ “urn:ebxml:cs:myroot”   -- code by Clause, Section 8.2.10
         </ClassificationNodeFilter>
      </HasParentNode>
   </HasParentNode>
</ClassificationNodeQuery>
```

8.2.5 RegistryPackageQuery

8.2.5.1 Purpose

To identify a set of registry package instances as the result of a query over selected registry metadata.

8.2.5.2 ebRIM binding



8.2.5.3 Definition

```
<!ELEMENT RegistryPackageQuery
  (   PackageFilter?,
      HasMemberBranch*     )>
<!ELEMENT HasMemberBranch
  (   RegistryEntryQuery?   )>
```

8.2.5.4 Semantic rules

1. Let RP denote the set of all persistent Package instances in the Registry. The following steps will eliminate instances in RP that do not satisfy the conditions of the specified filters.

   a.) If a PackageFilter is not specified, or if RP is empty, then continue below; otherwise, let x be a package instance in RP. If x does not satisfy the PackageFilter as defined in Section 8.2.9, then remove x from RP.

   b.) If a HasMemberBranch element is not directly contained in the RegistryPackageQuery, or if RP is empty, then continue below; otherwise, let x be a remaining package instance in RP. If x is an empty package, then remove x from RP; otherwise, treat each HasMemberBranch element separately as follows:

   If a RegistryEntryQuery element is not directly contained in the HasMemberBranch element, then let PM be the set of all RegistryEntry instances that are members of the package x; otherwise, let RE be the set of RegistryEntry instances returned by the RegistryEntryQuery as defined in Section 8.2.2 and let PM be the subset of RE that are members of the package x. If PM is empty, then remove x from RP.

2. If RP is empty, then raise the warning: *registry package query result is empty*.

3. Return RP as the result of the RegistryPackageQuery.

8.2.5.5 Examples

A client application wishes to identify all package instances in the Registry that contain an Invoice extrinsic object as a member of the package.

```
<RegistryPackageQuery>
   <HasMemberBranch>
      <RegistryEntryQuery>
         <RegistryEntryFilter>
            objectType EQ “Invoice”      -- code by Clause, Section 8.2.10
         </RegistryEntryFilter>
      </RegistryEntryQuery>
   </HasMemberBranch>
</RegistryPackageQuery>
```

A client application wishes to identify all package instances in the Registry that are not empty.

```
<RegistryEntryQuery>
   <HasMemberBranch/>
</RegistryEntryQuery>
```

A client application wishes to identify all package instances in the Registry that are empty. Since the RegistryPackageQuery is not set up to do negations, clients will have to do two separate RegistryPackageQuery requests, one to find all packages and another to find all non-empty packages, and then do the set difference themselves. Alternatively, they could do a more complex RegistryEntryQuery and check that the packaging association between the package and its members is non-existent.

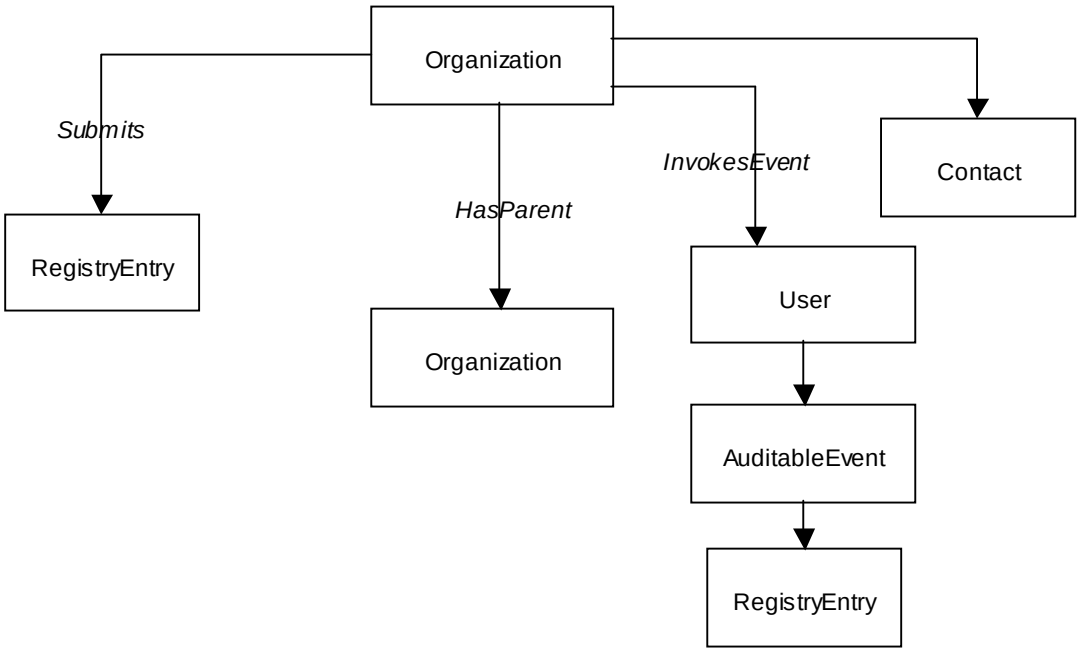
Note A registry package is an intrinsic RegistryEntry instance that is completely determined by its associations with its members. Thus a RegistryPackageQuery can always be re-specified as an equivalent RegistryEntryQuery using appropriate “Source” and “Target” associations. However, the equivalent RegistryEntryQuery is often more complicated to write.

8.2.6 OrganizationQuery

8.2.6.1 Purpose

To identify a set of organization instances as the result of a query over selected registry metadata.

8.2.6.2 ebRIM binding



8.2.6.3 Definition

```
<!ELEMENT OrganizationQuery
  (   OrganizationFilter?,
      SubmitsRegistryEntry*,
      HasParentOrganization?,
      InvokesEventBranch*,
      ContactFilter           )>
<!ELEMENT SubmitsRegistryEntry ( RegistryEntryQuery? )>
<!ELEMENT HasParentOrganization
  (   OrganizationFilter?,
      HasParentOrganization?   )>
<!ELEMENT InvokesEventBranch
  (   UserFilter?,
      AuditableEventFilter?,
      RegistryEntryQuery?      )>
```

8.2.6.4 Semantic rules

1. Let ORG denote the set of all persistent Organization instances in the Registry. The following steps will eliminate instances in ORG that do not satisfy the conditions of the specified filters.

a.) If an OrganizationFilter element is not directly contained in the OrganizationQuery element, or if ORG is empty, then continue below; otherwise, let x be an organization instance in ORG. If x does not satisfy the OrganizationFilter as defined in Section 8.2.9, then remove x from RP.

b.) If a SubmitsRegistryEntry element is not specified within the OrganizationQuery, or if ORG is empty, then continue below; otherwise, consider each SubmitsRegistryEntry element separately as follows:

If no RegistryEntryQuery is specified within the SubmitsRegistryEntry element, then let RES be the set of all RegistryEntry instances that have been submitted to the Registry by organization x; otherwise, let RE be the result of the RegistryEntryQuery as defined in Section 8.2.2 and let RES be the set of all instances in RE that have been submitted to the Registry by organization x. If RES is empty, then remove x from ORG.

c.) If a HasParentOrganization element is not specified within the OrganizationQuery, or if ORG is empty, then continue below; otherwise, execute the following paragraph with o = x:

Let o be an organization instance. If an OrganizationFilter is not specified within the HasParentOrganization and if o has no parent (i.e. if o is a root organization in the Organization hierarchy), then remove x from ORG; otherwise, let p be the parent organization of o. If p does not satisfy the OrganizationFilter, then remove x from ORG.

If another HasParentOrganization element is directly contained within this HasParentOrganization element, then repeat the previous paragraph with o = p.

d.) If an InvokesEventBranch element is not specified within the OrganizationQuery, or if ORG is empty, then continue below; otherwise, consider each InvokesEventBranch element separately as follows:

If an UserFilter is not specified, and if x is not the submitting organization of some AuditableEvent instance, then remove x from ORG. If an AuditableEventFilter is not specified, then let AE be the set of all AuditableEvent instances that have x as the submitting organization; otherwise, let AE be the set of AuditableEvent instances that satisfy the AuditableEventFilter and have x as the submitting organization. If AE is empty, then remove x from ORG. If a RegistryEntryQuery is not specified in the InvokesEventBranch element, then let RES be the set of all RegistryEntry instances associated with an event in AE; otherwise, let RE be the result set of the RegistryEntryQuery, as specified in Section 8.2.2, and let RES be the subset of RE of entries submitted by x. If RES is empty, then remove x from ORG.

e.) If a ContactFilter is not specified within the OrganizationQuery, or if ORG is empty, then continue below; otherwise, consider each ContactFilter separately as follows:

Let CT be the set of Contact instances that satisfy the ContactFilter and are the contacts for organization x. If CT is empty, then remove x from ORG.

2. If ORG is empty, then raise the warning: *organization query result is empty*.

3. Return ORG as the result of the OrganizationQuery.

8.2.6.5 Examples

A client application wishes to identify a set of organizations, based in France, that have submitted a PartyProfile extrinsic object this year.

```
<OrganizationQuery>
   <OrganizationFilter>
      country EQUAL “France”         -- code by Clause, Section 8.2.10
   </OrganizationFilter>
   <SubmitsRegistryEntry>
      <RegistryEntryQuery>
         <RegistryEntryFilter>
            objectType EQUAL “CPP”   -- code by Clause, Section 8.2.10
         </RegistryEntryFilter>
         <HasAuditableEventBranch>
            <AuditableEventFilter>
               timestamp GE “2001-01-01”   -- code by Clause, Section 8.2.10
            </AuditableEventFilter>
         </HasAuditableEventBranch>
      </RegistryEntryQuery>
   </SubmitsRegistryEntry>
</OrganizationQuery>
```

A client application wishes to identify all organizations that have XYZ, Corporation as a parent. The client knows that the URN for XYZ, Corp. is urn:ebxml:org:xyz, but there is no guarantee that subsidiaries of XYZ have a URN that uses the same format, so a full query is required.

```
<OrganizationQuery>
   <HasParentOrganization>
      <OrganizationFilter>
         id EQUAL “urn:ebxml:org:xyz”     -- code by Clause, Section 8.2.10
      </OrganizationFilter>
   </HasParentOrganization>
</OrganizationQuery>
```

8.2.7 ReturnRegistryEntry

8.2.7.1 Purpose

To construct an XML document that contains selected registry metadata associated with the registry entries identified by a RegistryEntryQuery

Note Initially, the RegistryEntryQuery could be the URN identifier for a single registry entry.

8.2.7.2 Definition

```
<!ELEMENT ReturnRegistryEntry
  (   RegistryEntryQuery,
      WithClassifications?,
      WithSourceAssociations?,
      WithTargetAssociations?,
      WithAuditableEvents?,
      WithExternalLinks?              )>
<!ELEMENT WithClassifications  ( ClassificationFilter? )>
<!ELEMENT WithSourceAssociations  ( AssociationFilter? )>
<!ELEMENT WithTargetAssociations  ( AssociationFilter? )>
<!ELEMENT WithAuditableEvents  ( AuditableEventFilter? )>
<!ELEMENT WithExternalLinks  ( ExternalLinkFilter? )>
<!ELEMENT ReturnRegistryEntryResult
   (  RegistryEntryMetadata*)>
<!ELEMENT RegistryEntryMetadata
    ( RegistryEntry,
      Classification*,
      SourceAssociations?,
      TargetAssociations?,
      AuditableEvent*,
      ExternalLink*                        )>
<!ELEMENT SourceAssociations ( Association* )>
<!ELEMENT TargetAssociations ( Association* )>
```

8.2.7.3 Semantic rules

1. The RegistryEntry, Classification, Association, AuditableEvent, and ExternalLink elements contained in the ReturnRegistryEntryResult are defined by the ebXML Registry DTD specified in Appendix A.

2. Execute the RegistryEntryQuery according to the Semantic Rules specified in Section 8.2.2, and let R be the result set of identifiers for registry entry instances. Let S be the set of warnings and errors returned. If any element in S is an error condition, then stop execution and return the same set of warnings and errors along with the ReturnRegistryEntryResult.

3. If the set R is empty, then do not return a RegistryEntryMetadata subelement in the ReturnRegistryEntryResult. Instead, raise the warning: *no resulting registry entry*. Add this warning to the error list returned by the RegistryEntryQuery and return this enhanced error list with the ReturnRegistryEntryResult.

4. For each registry entry E referenced by an element of R, use the attributes of E to create a new RegistryEntry element as defined in Appendix A. Then create a new RegistryEntryMetadata element as defined above to be the parent element of that RegistryEntry element.

5. If no With option is specified, then the resulting RegistryEntryMetadata element has no Classification, SourceAssociations, TargetAssociations, AuditableEvent, or ExternalData subelements. The set of RegistryEntryMetadata elements, with the Error list from the RegistryEntryQuery, is returned as the ReturnRegistryEntryResult.

6. If WithClassifications is specified, then for each E in R do the following: If a ClassificationFilter is not present, then let C be any classification instance linked to E; otherwise, let C be a classification instance linked to E that satisfies the ClassificationFilter (Section 8.2.9). For each such C, create a new Classification element as defined in Appendix A. Add these Classification elements to their parent RegistryEntryMetadata element.

7. If WithSourceAssociations is specified, then for each E in R do the following: If an AssociationFilter is not present, then let A be any association instance whose source object is E; otherwise, let A be an association instance that satisfies the AssociationFilter (Section 8.2.9) and whose source object is E. For each such A, create a new Association element as defined in Appendix A. Add these Association elements as subelements of the WithSourceAssociations and add that element to its parent RegistryEntryMetadata element.

8. If WithTargetAssociations is specified, then for each E in R do the following: If an AssociationFilter is not present, then let A be any association instance whose target object is E; otherwise, let A be an association instance that satisfies the AssociationFilter (Section 8.2.9) and whose target object is E. For each such A, create a new Association element as defined in Appendix A. Add these Association elements as subelements of the WithTargetAssociations and add that element to its parent RegistryEntryMetadata element.

9. If WithAuditableEvents is specified, then for each E in R do the following: If an AuditableEventFilter is not present, then let A be any auditable event instance linked to E; otherwise, let A be any auditable event instance linked to E that satisfies the AuditableEventFilter (Section 8.2.9). For each such A, create a new AuditableEvent element as defined in Appendix A. Add these AuditableEvent elements to their parent RegistryEntryMetadata element.

10. If WithExternalLinks is specified, then for each E in R do the following: If an ExternalLinkFilter is not present, then let L be any external link instance linked to E; otherwise, let L be any external link instance linked to E that satisfies the ExternalLinkFilter (Section 8.2.9). For each such D, create a new ExternalLink element as defined in Appendix A. Add these ExternalLink elements to their parent RegistryEntryMetadata element.

11. If any warning or error condition results, then add the code and the message to the RegistryResponse element that includes the RegistryEntryQueryResult.

12. Return the set of RegistryEntryMetadata elements as the content of the ReturnRegistryEntryResult.

8.2.7.4 Examples

A customer of XYZ Corporation has been using a PurchaseOrder DTD registered by XYZ some time ago. Its URN identifier is "urn:com:xyz:po:325". The customer wishes to check on the current status of that DTD, especially if it has been superceded or replaced, and get all of its current classifications. The following query request will return an XML document with the

registry entry for the existing DTD as the root, with all of its classifications, and with associations to registry entries for any items that have superceded or replaced it.

```
<ReturnRegistryEntry>
   <RegistryEntryQuery>
      <RegistryEntryFilter>
         id EQUAL "urn:com:xyz:po:325"       -- code by Clause, Section 8.2.10
      </RegistryEntryFilter>
   </RegistryEntryQuery>
   <WithClassifications/>
   <WithSourceAssociations>
      <AssociationFilter>                    -- code by Clause, Section 8.2.10
         associationType EQUAL "SupercededBy" OR
         associationType EQUAL "ReplacedBy"
      </AssociationFilter>
   </WithSourceAssociations>
</ReturnRegistryEntry>
```

A client of the Registry registered an XML DTD several years ago and is now thinking of replacing it with a revised version. The identifier for the existing DTD is "urn:xyz:dtd:po97". The proposed revision is not completely upward compatible with the existing DTD. The client desires a list of all registered items that use the existing DTD so they can assess the impact of an incompatible change. The following query returns an XML document that is a list of all RegistryEntry elements that represent registered items that use, contain, or extend the given DTD. The document also links each RegistryEntry element in the list to an element for the identified association.

```
<ReturnRegistryEntry>
   <RegistryEntryQuery>
      <SourceAssociationBranch>
         <AssociationFilter>              -- code by Clause, Section 8.2.10
            associationType EQUAL "Contains" OR
            associationType EQUAL "Uses" OR
            associationType EQUAL "Extends"
         </AssociationFilter>
         <RegistryEntryFilter>            -- code by Clause, Section 8.2.10
            id EQUAL "urn:xyz:dtd:po97"
         </RegistryEntryFilter>
      </SourceAssociationBranch>
   </RegistryEntryQuery>
   <WithSourceAssociations>
      <AssociationFilter>                   -- code by Clause, Section 8.2.10
         associationType EQUAL "Contains" OR
         associationType EQUAL "Uses" OR
         associationType EQUAL "Extends"
      </AssociationFilter>
   </WithSourceAssociations>
</ReturnRegistryEntry>
```

A user has been browsing the registry and has found a registry entry that describes a package of core-components that should solve the user's problem. The package URN identifier is "urn:com:cc:pkg:ccstuff". Now the user wants to know what's in the package. The following

query returns an XML document with a registry entry for each member of the package along with that member's Uses and HasMemberBranch associations.

```
<ReturnRegistryEntry>
   <RegistryEntryQuery>
      <TargetAssociationBranch>
         <AssociationFilter>           -- code by Clause, Section 8.2.10
             associationType EQUAL "HasMember"
         </AssociationFilter>
         <RegistryEntryFilter>         -- code by Clause, Section 8.2.10
            id EQUAL " urn:com:cc:pkg:ccstuff "
         </RegistryEntryFilter>
      </TargetAssociationBranch>
   </RegistryEntryQuery>
   <WithSourceAssociations>
      <AssociationFilter>               -- code by Clause, Section 8.2.10
         associationType EQUAL "HasMember" OR
         associationType EQUAL "Uses"
      </AssociationFilter>
   </WithSourceAssociations>
</ReturnRegistryEntry>
```

8.2.8 ReturnRepositoryItem

8.2.8.1 Purpose

To construct an XML document that contains one or more repository items, and some associated metadata, by submitting a RegistryEntryQuery to the registry/repository that holds the desired objects.

Note Initially, the RegistryEntryQuery could be the URN identifier for a single registry entry.

8.2.8.2 Definition

```
<!ELEMENT ReturnRepositoryItem
(  RegistryEntryQuery,
   RecursiveAssociationOption?,
   WithDescription?              )>
<!ELEMENT RecursiveAssociationOption ( AssociationType+ )>
<!ATTLIST RecursiveAssociationOption
      depthLimit   CDATA   #IMPLIED   >
<!ELEMENT AssociationType EMPTY >
<!ATTLIST AssociationType
      role   CDATA   #REQUIRED  >
<!ELEMENT WithDescription EMPTY >
<!ELEMENT ReturnRepositoryItemResult
   ( RepositoryItem*)>
<!ELEMENT RepositoryItem
   (    ClassificationScheme
      | RegistryPackage
      | ExtrinsicObject
      | WithdrawnObject
      | ExternalLinkItem      )>
```

```
<!ATTLIST RepositoryItem
   identifier      CDATA   #REQUIRED
   name            CDATA   #REQUIRED
   contentURI      CDATA   #REQUIRED
   objectType      CDATA   #REQUIRED
   status          CDATA   #REQUIRED
   stability       CDATA   #REQUIRED
   description     CDATA   #IMPLIED   >
<!ELEMENT ExtrinsicObject  (#PCDATA) >
<!ATTLIST ExtrinsicObject
   byteEncoding    CDATA    "Base64"  >
<!ELEMENT WithdrawnObject EMPTY >
<!ELEMENT ExternalLinkItem EMPTY >
```

8.2.8.3 Semantic rules

1. If the RecursiveOption element is not present , then set Limit=0. If the RecursiveOption element is present, interpret its depthLimit attribute as an integer literal. If the depthLimit attribute is not present, then set Limit = -1. A Limit of 0 means that no recursion occurs. A Limit of -1 means that recursion occurs indefinitely. If a depthLimit value is present, but it cannot be interpreted as a positive integer, then stop execution and raise the exception: *invalid depth limit*; otherwise, set Limit=N, where N is that positive integer. A Limit of N means that exactly N recursive steps will be executed unless the process terminates prior to that limit.

2. Set Depth=0. Let Result denote the set of RepositoryItem elements to be returned as part of the ReturnRepositoryItemResult. Initially Result is empty. Semantic rules 4 through 10 determine the content of Result.

3. If the WithDescription element is present, then set WSD="yes"; otherwise, set WSD="no".

4. Execute the RegistryEntryQuery according to the Semantic Rules specified in Section 8.2.2, and let R be the result set of identifiers for registry entry instances. Let S be the set of warnings and errors returned. If any element in S is an error condition, then stop execution and return the same set of warnings and errors along with the ReturnRepositoryItemResult.

5. Execute Semantic Rules 6 and 7 with X as a set of registry references derived from R. After execution of these rules, if Depth is now equal to Limit, then return the content of Result as the set of RepositoryItem elements in the ReturnRepositoryItemResult element; otherwise, continue with Semantic Rule 8.

6. Let X be a set of RegistryEntry instances. For each registry entry E in X, do the following:

   a.) If E.contentURI references a repository item in this registry/repository, then create a new RepositoryItem element, with values for its attributes derived as specified in Semantic Rule 7.

i) If E.objectType="ClassificationScheme", then put the referenced ClassificationScheme DTD as the subelement of this RepositoryItem. [NOTE: Requires DTD specification!]

ii) If E.objectType="RegistryPackage", then put the referenced RegistryPackage DTD as the subelement of this RepositoryItem. [NOTE: Requires DTD specification!]

iii) Otherwise, i.e., if the object referenced by E has an unknown internal structure, then put the content of the repository item as the #PCDATA of a new ExtrinsicObject subelement of this RepositoryItem.

b.) If E.objectURL references a registered object in some other registry/repository, then create a new RepositoryItem element, with values for its attributes derived as specified in Semantic Rule 7, and create a new ExternalLink element as the subelement of this RepositoryItem.

c.) If E.objectURL is void, i.e. the object it would have referenced has been withdrawn, then create a new RepositoryItem element, with values for its attributes derived as specified in Semantic Rule 7, and create a new WithdrawnObject element as the subelement of this RepositoryItem.

7. Let E be a registry entry and let RO be the RepositoryItem element created in Semantic Rule 6. Set the attributes of RO to the values derived from the corresponding attributes of E. If WSD="yes", include the value of the description attribute; otherwise, do not include it. Insert this new RepositoryItem element into the Result set.

8. Let R be defined as in Semantic Rule 3. Execute Semantic Rule 9 with Y as the set of RegistryEntry instances referenced by R. Then continue with Semantic rule 10.

9. Let Y be a set of references to RegistryEntry instances. Let NextLevel be an empty set of RegistryEntry instances. For each registry entry E in Y, and for each AssociationType A of the RecursiveAssociationOption, do the following:

   a.) Let Z be the set of target items E' linked to E under association instances having E as the source object, E' as the target object, and A as the AssociationType.

   b.) Add the elements of Z to NextLevel.

10. Let X be the set of new registry entries that are in NextLevel but are not yet represented in the Result set.

    Case:

    a.) If X is empty, then return the content of Result as the set of RepositoryItem elements in the ReturnRepositoryItemResult element.

b.) If X is not empty, then execute Semantic Rules 6 and 7 with X as the input set. When finished, add the elements of X to Y and set Depth=Depth+1. If Depth is now equal to Limit, then return the content of Result as the set of RepositoryItem elements in the ReturnRepositoryItemResult element; otherwise, repeat Semantic Rules 9 and 10 with the new set Y of registry entries.

11. If any exception, warning, or other status condition results during the execution of the above, then return appropriate RegistryError elements in the RegistryResult associated with the ReturnRepositoryItemResult element created in Semantic Rule 5 or Semantic Rule 10.

8.2.8.4 Examples

A registry client has found a registry entry for a core-component item. The item's URN identity is "urn:ebxml:cc:goodthing". But "goodthing" is a composite item that uses many other registered items. The client desires the collection of all items needed for a complete implementation of "goodthing". The following query returns an XML document that is a collection of all needed items.

```
<ReturnRepositoryItem>
   <RegistryEntryQuery>
      <RegistryEntryFilter>              -- code by Clause, Section 8.2.10
         id EQUAL "urn:ebxml:cc:goodthing"
      </RegistryEntryFilter>
   </RegistryEntryQuery>
   <RecursiveAssociationOption>
      <AssociationType  role="Uses"  />
      <AssociationType  role="ValidatesTo"  />
   </RecursiveAssociationOption>
</ReturnRepositoryItem>
```

A registry client has found a reference to a core-component routine ("urn:ebxml:cc:rtn:nice87") that implements a given business process. The client knows that all routines have a required association to its defining UML specification. The following query returns both the routine and its UML specification as a collection of two items in a single XML document.

```
<ReturnRepositoryItem>
   <RegistryEntryQuery>
      <RegistryEntryFilter>              -- code by Clause, Section 8.2.10
         id EQUAL "urn:ebxml:cc:rtn:nice87"
      </RegistryEntryFilter>
   </RegistryEntryQuery>
   <RecursiveAssociationOption   depthLimit="1" >
      <AssociationType  role="ValidatesTo"  />
   </RecursiveAssociationOption>
</ReturnRepositoryItem>
```

A user has been told that the 1997 version of the North American Industry Classification System (NAICS) is stored in a registry with URN identifier "urn:nist:cs:naics-1997". The following query would retrieve the complete classification scheme, with all 1810 nodes, as an XML document that validates to a classification scheme DTD.

```
<ReturnRepositoryItem>
```

```
      <RegistryEntryQuery>
         <RegistryEntryFilter>              -- code by Clause, Section 8.2.10
            id EQUAL "urn:nist:cs:naics-1997"
         </RegistryEntryFilter>
      </RegistryEntryQuery>
   </ReturnRepositoryItem>
```

Note The ReturnRepositoryItemResult would include a single RepositoryItem that consists of a ClassificationScheme document whose content is determined by the URL ftp://xsun.sdct.itl.nist.gov/regrep/scheme/naics.txt.

8.2.9 Registry filters

8.2.9.1 Purpose

To identify a subset of the set of all persistent instances of a given registry class.

8.2.9.2 Definition

```
<!ELEMENT ObjectFilter ( Clause )>
<!ELEMENT RegistryEntryFilter ( Clause )>
<!ELEMENT IntrinsicObjectFilter ( Clause )>
<!ELEMENT ExtrinsicObjectFilter ( Clause )>
<!ELEMENT PackageFilter ( Clause )>
<!ELEMENT OrganizationFilter ( Clause )>
<!ELEMENT ContactFilter ( Clause )>
<!ELEMENT ClassificationNodeFilter ( Clause )>
<!ELEMENT AssociationFilter ( Clause )>
<!ELEMENT ClassificationFilter ( Clause )>
<!ELEMENT ExternalLinkFilter ( Clause )>
<!ELEMENT ExternalIdentifierFilter ( Clause )>
<!ELEMENT SlotFilter ( Clause )>
<!ELEMENT AuditableEventFilter ( Clause )>
<!ELEMENT UserFilter ( Clause )>
```

8.2.9.3 Semantic rules

1. The Clause element is defined in Section 8.2.10, Clause.

2. For every ObjectFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the RegistryObject UML class defined in [ebRIM]. If not, raise exception: *object attribute error*. The ObjectFilter returns a set of identifiers for RegistryObject instances whose attribute values evaluate to *True* for the Clause predicate.

3. For every RegistryEntryFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the RegistryEntry UML class defined in [ebRIM].

If not, raise exception: *registry entry attribute error*. The RegistryEntryFilter returns a set of identifiers for RegistryEntry instances whose attribute values evaluate to *True* for the Clause predicate.

4. For every IntrinsicObjectFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the IntrinsicObject UML class defined in [ebRIM]. If not, raise exception: *intrinsic object attribute error*. The IntrinsicObjectFilter returns a set of identifiers for IntrinsicObject instances whose attribute values evaluate to *True* for the Clause predicate.

5. For every ExtrinsicObjectFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the ExtrinsicObject UML class defined in [ebRIM]. If not, raise exception: *extrinsic object attribute error*. The ExtrinsicObjectFilter returns a set of identifiers for ExtrinsicObject instances whose attribute values evaluate to *True* for the Clause predicate.

6. For every PackageFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the Package UML class defined in [ebRIM]. If not, raise exception: *package attribute error*. The PackageFilter returns a set of identifiers for Package instances whose attribute values evaluate to *True* for the Clause predicate.

7. For every OrganizationFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the Organization or PostalAddress UML classes defined in [ebRIM]. If not, raise exception: *organization attribute error*. The OrganizationFilter returns a set of identifiers for Organization instances whose attribute values evaluate to *True* for the Clause predicate.

8. For every ContactFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the Contact or PostalAddress UML class defined in [ebRIM]. If not, raise exception: *contact attribute error*. The ContactFilter returns a set of identifiers for Contact instances whose attribute values evaluate to *True* for the Clause predicate.

9. For every ClassificationNodeFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the ClassificationNode UML class defined in [ebRIM]. If not, raise exception: *classification node attribute error*. The ClassificationNodeFilter returns a set of identifiers for ClassificationNode instances whose attribute values evaluate to *True* for the Clause predicate.

10. For every AssociationFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the Association UML class defined in [ebRIM]. If not, raise exception: *association attribute error*. The AssociationFilter returns a set of identifiers for Association instances whose attribute values evaluate to *True* for the Clause predicate.

11. For every ClassificationFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the Classification UML class defined in [ebRIM]. If not, raise exception: *classification attribute error*. The ClassificationFilter returns a set of identifiers for Classification instances whose attribute values evaluate to *True* for the Clause predicate.

12. For every ExternalLinkFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the ExternalLink UML class defined in [ebRIM]. If not, raise exception: *external link attribute error*. The ExternalLinkFilter returns a set of identifiers for ExternalLink instances whose attribute values evaluate to *True* for the Clause predicate.

13. For every ExternalIdentiferFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the ExternalIdentifier UML class defined in [ebRIM]. If not, raise exception: *external identifier attribute error*. The ExternalIdentifierFilter returns a set of identifiers for ExternalIdentifier instances whose attribute values evaluate to *True* for the Clause predicate.

14. For every SlotFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the Slot UML class defined in [ebRIM]. If not, raise exception: *slot attribute error*. The SlotFilter returns a set of identifiers for Slot instances whose attribute values evaluate to *True* for the Clause predicate.

15. For every AuditableEventFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the AuditableEvent UML class defined in [ebRIM]. If not, raise exception: *auditable event attribute error*. The AuditableEventFilter returns a set of identifiers for AuditableEvent instances whose attribute values evaluate to *True* for the Clause predicate.

16. For every UserFilter XML element, the leftArgument attribute of any containing SimpleClause shall identify a public attribute of the User UML class defined in [ebRIM]. If not, raise exception: *auditable identity attribute error*. The UserFilter returns a set of identifiers for User instances whose attribute values evaluate to *True* for the Clause predicate.

8.2.9.4 Example

The following is a complete example of RegistryEntryQuery combined with Clause expansion of RegistryEntryFilter to return a set of RegistryEntry instances whose objectType attibute is “CPP” and whose status attribute is “Approved”.

```
<RegistryEntryQuery>
   <RegistryEntryFilter>
       <Clause>
          <CompoundClause   connectivePredicate="And" >
             <Clause>
                <SimpleClause  leftArgument="objectType" >
           <StringClause  stringPredicate="equal" >CPP</StringClause>
                </SimpleClause>
```

```
              </Clause>
              <Clause>
                 <SimpleClause  leftArgument="status" >
            <StringClause  stringPredicate="equal" >Approved</StringClause>
                 </SimpleClause>
              </Clause>
           </CompoundClause>
        </Clause>
    </RegistryEntryFilter>
 </RegistryEntryQuery>
```

8.2.10 XML clause constraint representation

8.2.10.1 Purpose

The simple XML FilterQuery utilizes a formal XML structure based on *Predicate Clauses*. Predicate Clauses are utilized to formally define the constraint mechanism, and are referred to simply as **Clauses** in this specification.

8.2.10.2 Conceptual UML diagram

The following is a conceptual diagram outlining the Clause base structure. It is expressed in UML for visual depiction.

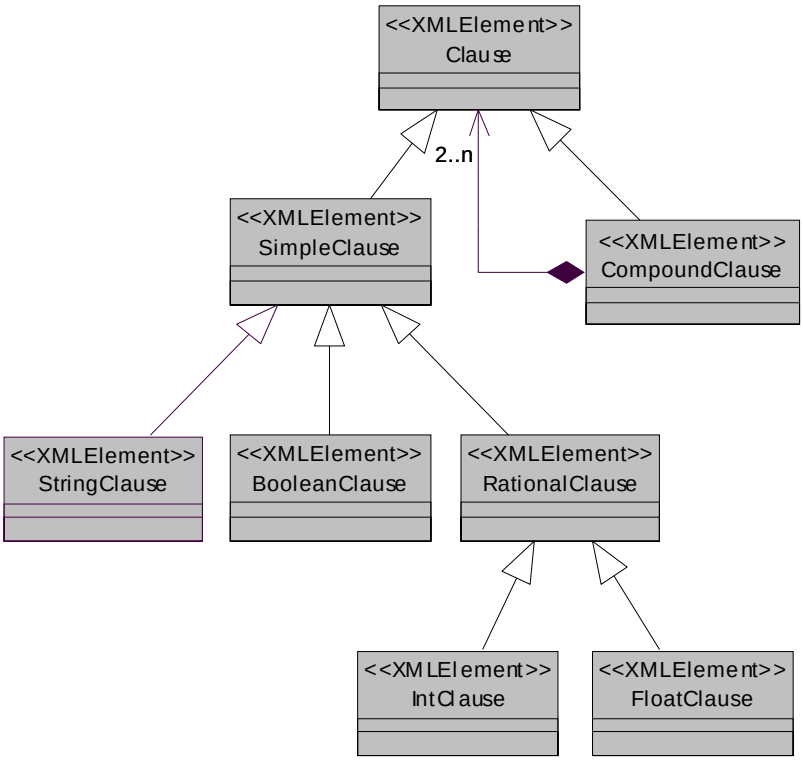


Figure 20: The Clause base structure

8.2.10.3 Semantic rules

Predicates and *Arguments* are combined into a "LeftArgument - Predicate - RightArgument" format to form a *Clause*. There are two types of Clauses: *SimpleClauses* and *CompoundClauses*.

SimpleClauses

A SimpleClause always defines the leftArgument as a text string, sometimes referred to as the *Subject* of the Clause. SimpleClause itself is incomplete (abstract) and must be extended. SimpleClause is extended to support BooleanClause, StringClause, and RationalClause (abstract).

BooleanClause implicitly defines the predicate as ‘equal to’, with the right argument as a boolean. StringClause defines the predicate as an enumerated attribute of appropriate string-compare operations and a right argument as the element’s text data. Rational number support is provided through a common RationalClause providing an enumeration of appropriate rational number compare operations, which is further extended to IntClause and FloatClause, each with appropriate signatures for the right argument.

CompoundClauses

A CompoundClause contains two or more Clauses (Simple or Compound) and a connective predicate. This provides for arbitrarily complex Clauses to be formed.

8.2.10.4 Definition

```
<!ELEMENT Clause ( SimpleClause | CompoundClause )>
<!ELEMENT SimpleClause
   ( BooleanClause | RationalClause | StringClause )>
<!ATTLIST SimpleClause
   leftArgument  CDATA #REQUIRED >
<!ELEMENT CompoundClause ( Clause, Clause+ )>
<!ATTLIST CompoundClause
   connectivePredicate ( And | Or ) #REQUIRED>
<!ELEMENT BooleanClause EMPTY >
<!ATTLIST BooleanClause
   booleanPredicate ( True | False ) #REQUIRED>
<!ELEMENT RationalClause ( IntClause | FloatClause )>
<!ATTLIST RationalClause
   logicalPredicate ( LE | LT | GE | GT | EQ | NE ) #REQUIRED >
<!ELEMENT IntClause ( #PCDATA )
<!ATTLIST IntClause
   e-dtype NMTOKEN #FIXED 'int' >
<!ELEMENT FloatClause ( #PCDATA )>
<!ATTLIST FloatClause
   e-dtype NMTOKEN #FIXED 'float' >
<!ELEMENT StringClause ( #PCDATA )>
<!ATTLIST StringClause
   stringPredicate
       ( contains | -contains |
         startswith | -startswith |
         equal | -equal
         endswith | -endswith ) #REQUIRED >
```

8.2.10.5 Examples

Simple BooleanClause: "Smoker" = True

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE Clause SYSTEM "Clause.dtd" >
<Clause>
  <SimpleClause leftArgument="Smoker">
    <BooleanClause booleanPredicate="True"/>
  </SimpleClause>
</Clause>
```

Simple StringClause: "Smoker" contains "mo"

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE Clause SYSTEM "Clause.dtd" >
<Clause>
  <SimpleClause leftArgument="Smoker">
    <StringClause stringcomparepredicate="contains">
      mo
    </StringClause>
  </SimpleClause>
</Clause>
```

Simple IntClause: "Age" >= 7

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE Clause SYSTEM "Clause.dtd" >
<Clause>
  <SimpleClause leftArgument="Age">
    <RationalClause logicalPredicate="GE">
      <IntClause e-dtype="int">7</IntClause>
    </RationalClause>
  </SimpleClause>
</Clause>
```

Simple FloatClause: "Size" = 4.3

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE Clause SYSTEM "Clause.dtd" >
<Clause>
  <SimpleClause leftArgument="Size">
    <RationalClause logicalPredicate="E">
      <FloatClause e-dtype="float">4.3</FloatClause>
    </RationalClause>
  </SimpleClause>
</Clause>
```

Compound with two Simples (("Smoker" = False)AND("Age" =< 45))

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE Clause SYSTEM "Clause.dtd" >
<Clause>
  <CompoundClause connectivePredicate="And">
    <Clause>
      <SimpleClause leftArgument="Smoker">
        <BooleanClause booleanPredicate="False"/>
      </SimpleClause>
    </Clause>
    <Clause>
      <SimpleClause leftArgument="Age">
        <RationalClause logicalPredicate="EL">
          <IntClause e-dtype="int">45</IntClause>
        </RationalClause>
      </SimpleClause>
    </Clause>
  </CompoundClause>
</Clause>
```

Coumpound with one Simple and one Compound

(("Smoker" = False)And(("Age" =< 45)Or("American"=True)))

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE Clause SYSTEM "Clause.dtd" >
<Clause>
  <CompoundClause connectivePredicate="And">
    <Clause>
      <SimpleClause leftArgument="Smoker">
        <BooleanClause booleanPredicate="False"/>
      </SimpleClause>
```

```
      </Clause>
      <Clause>
        <CompoundClause connectivePredicate="Or">
          <Clause>
            <SimpleClause leftArgument="Age">
              <RationalClause logicalPredicate="EL">
                <IntClause e-dtype="int">45</IntClause>
              </RationalClause>
            </SimpleClause>
          </Clause>
          <Clause>
            <SimpleClause leftArgument="American">
              <BooleanClause booleanPredicate="True"/>
            </SimpleClause>
          </Clause>
        </CompoundClause>
      </Clause>
    </CompoundClause>
  </Clause>
```

8.3 SQL query support

The Registry may optionally support an SQL based query capability that is designed for Registry clients that demand more complex query capability. The optional SQLQuery element in the AdhocQueryRequest allows a client to submit complex SQL queries using a declarative query language.

The syntax for the SQLQuery of the Registry is defined by a stylized use of a proper subset of the "SELECT" statement of Entry level SQL defined by ISO/IEC 9075:1992, Database Language SQL [SQL], extended to include `<sql invoked routines>` (also known as stored procedures) as specified in ISO/IEC 9075-4 [SQL-PSM] and pre-defined routines defined in template form in Appendix C. The exact syntax of the Registry query language is defined by the BNF grammar in "SQL query syntax specification."

Note The use of a subset of SQL syntax for SQLQuery does not imply a requirement to use relational databases in a Registry implementation.

8.3.1 SQL query syntax binding To [ebRIM]

SQL Queries are defined based upon the query syntax in in Appendix C and a fixed relational schema defined in "Relational schema for SQL queries." The relational schema is an algorithmic binding to [ebRIM] as described in the following sections.

8.3.1.1 Interface and class binding

A subset of the Interface and class names defined in [ebRIM] map to table names that may be queried by an SQL query. Appendix C, "Relational schema for SQL queries," defines the names of the ebRIM interfaces and classes that may be queried by an SQL query.

The algorithm used to define the binding of [ebRIM] classes to table definitions in Appendix C, "Relational schema for SQL queries," is as follows:

- Only those classes and interfaces that have concrete instances are mapped to relational tables. This results in intermediate interfaces in the inheritance hierarchy, such as RegistryObject and IntrinsicObject, to not map to SQL tables. An exception to this rule is RegistryEntry, which is defined next.

- A special view called RegistryEntry is defined to allow SQL queries to be made against RegistryEntry instances. This is the only interface defined in [ebRIM] that does not have concrete instances but is queryable by SQL queries.

- The names of relational tables are the same as the corresponding [ebRIM] class or interface name. However, the name binding is case insensitive.

- Each [ebRIM] class or interface that maps to a table in Appendix C includes column definitions in : Relational schema for SQL queries," where the column definitions are based on a subset of attributes defined for that class or interface in [ebRIM]. The attributes that map to columns include the inherited attributes for the [ebRIM] class or interface. Comments indicate which ancestor class or interface contributed which column definitions.

An SQLQuery against a table not defined in Appendix C, "Relational schema for SQL queries," may raise an error condition: InvalidQueryException.

The following sections describe the algorithm for mapping attributes of [ebRIM] to SQLcolumn definitions.

8.3.1.2 Accessor method to attribute binding

Most of the [ebRIM] interfaces methods are simple get methods that map directly to attributes. For example the getName method on RegistryObject maps to a name attribute of type String. Each get method in [ebRIM] defines the exact attribute name that it maps to in the interface definitions in [ebRIM].

8.3.1.3 Primitive attributes binding

Attributes defined by [ebRIM] that are of primitive types (e.g. String) may be used in the same way as column names in SQL. Again the exact attribute names are defined in the interface definitions in [ebRIM]. Note that while names are in mixed case, SQL-92 is case insensitive. It is therefore valid for a query to contain attribute names that do not exactly match the case defined in [ebRIM].

8.3.1.4 Reference attribute binding

A few of the [ebRIM] interface methods return references to instances of interfaces or classes defined by [ebRIM]. For example, the getAccessControlPolicy method of the RegistryObject class returns a reference to an instance of an AccessControlPolicy object.

In such cases the reference maps to the `id` attribute for the referenced object. The name of the resulting column is the same as the attribute name in [ebRIM] as defined by 8.3.1.3. The data type for the column is UUID as defined in Appendix C, Relational schema for SQL queries."

When a reference attribute value holds a null reference, it maps to a null value in the SQL binding and may be tested with the <null specification> as defined by [SQL].

Reference attribute binding is a special case of a primitive attribute mapping.

8.3.1.5 Complex attribute binding

A few of the [ebRIM] interfaces define attributes that are not primitive types. Instead they are of a complex type as defined by an entity class in [ebRIM]. Examples include attributes of type TelephoneNumber, Contact, PersonName etc. in interface Organization and class Contact.

The SQL query schema algorithmically maps such complex attributes as multiple primitive attributes within the parent table. The mapping simply flattens out the entity class attributes within the parent table. The attribute name for the flattened attributes are composed of a concatenation of attribute names in the refernce chain. For example Organization has a contact attribute of type Contact. Contact has an address attribute of type PostalAddress. PostalAddress has a String attribute named city. This city attribute will be named contact_address_city.

8.3.1.6 Collection attribute binding

A few of the [ebRIM] interface methods return a collection of references to instances of interfaces or classes defined by [ebRIM]. For example, the getPackages method of the ManagedObject class returns a Collection of references to instances of Packages that the object is a member of.

Such collection attributes in [ebRIM] classes have been mapped to stored procedures in Appendix C such that these stored procedures return a collection of `id` attribute values. The returned value of these stored procedures can be treated as the result of a table sub-query in SQL.

These stored procedures may be used as the right-hand-side of an SQL IN clause to test for membership of an object in such collections of references.

8.3.2 Semantic constraints on query syntax

This section defines simplifying constraints on the query syntax that cannot be expressed in the BNF for the query syntax. These constraints must be applied in the semantic analysis of the query.

1. Class names and attribute names must be processed in a case insensitive manner.

2. The syntax used for stored procedure invocation must be consistent with the syntax of an SQL procedure invocation as specified by ISO/IEC 9075-4 [SQL/PSM].

3. For this version of the specification, the SQL select column list consists of exactly one column, and must always be t.`id`, where t is a table reference in the FROM clause.

8.3.3 SQL query results

The results of an SQL query is always an ObjectRefList as defined by the AdHocQueryResponse in 8.4. This means the result of an SQL query is always a collection of references to instances of a sub-class of the RegistryObject interface in [ebRIM]. This is reflected in a semantic constraint that requires that the SQL select column specified must always be an `id` column in a table in Appendix C, "Relational schema for SQL queries," for this version of the specification.

8.3.4 Simple metadata based queries

The simplest form of an SQL query is based upon metadata attributes specified for a single class within [ebRIM]. This section gives some examples of simple metadata based queries.

For example, to get the collection of ExtrinsicObjects whose name contains the word 'Acme' and that have a version greater than 1.3, the following query predicates must be supported:

```
SELECT id FROM ExtrinsicObject  WHERE name LIKE '%Acme%' AND
       majorVersion >= 1 AND
       (majorVersion >= 2 OR  minorVersion > 3);
```

Note The query syntax allows for conjugation of simpler predicates into more complex queries as shown in the simple example above.

8.3.5 RegistryEntry queries

Given the central role played by the RegistryEntry interface in ebRIM, the schema for the SQL query defines a special view called RegistryEntry that allows doing a polymorphic query against all RegistryEntry instances regardless of their actual concrete type or table name.

The following example is the same as Section 8.3.4 except that it is applied against all RegistryEntry instances rather than just ExtrinsicObject instances. The result set will include id

for all qualifying RegistryEntry instances whose name contains the word ‘Acme’ and that have a version greater than 1.3.

```
SELECT id FROM RegistryEntry WHERE name LIKE ‘%Acme%’ AND
       objectType = ‘ExtrinsicObject’ AND
       majorVersion >= 1 AND
       (majorVersion >= 2 OR  minorVersion > 3);
```

8.3.6 Classification queries

This section describes the various classification related queries that must be supported.

8.3.6.1 Identifying ClassificationNodes

Like all objects in [ebRIM], ClassificationNodes are identified by their ID. However, they may also be identified as a path attribute that specifies an XPATH expression [XPT] from a root classification node to the specified classification node in the XML document that would represent the ClassificationNode tree including the said ClassificationNode.

8.3.6.2 Getting root ClassificationNodes

To get the collection of root ClassificationNodes the following query predicate must be supported:

```
SELECT cn.id FROM ClassificationNode cn WHERE parent IS NULL
```

The above query returns all ClassificationNodes that have their parent attribute set to null. Note that the above query may also specify a predicate on the name if a specific root ClassificationNode is desired.

8.3.6.3 Getting children of specified ClassificationNode

To get the children of a ClassificationNode given the ID of that node the following style of query must be supported:

```
SELECT cn.id FROM ClassificationNode cn WHERE parent = <id>
```

The above query returns all ClassificationNodes that have the node specified by <id> as their parent attribute.

8.3.6.4 Getting objects classified by a ClassificationNode

To get the collection of ExtrinsicObjects classified by specified ClassificationNodes the following style of query must be supported:

```
SELECT id FROM ExtrinsicObject
WHERE
   id IN (SELECT classifiedObject FROM Classification
```

```
        WHERE
             classificationNode IN (SELECT id FROM ClassificationNode
              WHERE path = '/Geography/Asia/Japan'))
  AND
   id IN (SELECT classifiedObject FROM Classification
        WHERE
             classificationNode IN (SELECT id FROM ClassificationNode
              WHERE path = '/Industry/Automotive'))
```

The above query gets the collection of ExtrinsicObjects that are classified by the Automotive Industry and the Japan Geography. Note that according to the semantics defined for GetClassifiedObjectsRequest, the query will also contain any objects that are classified by descendents of the specified ClassificationNodes.

8.3.6.5 Getting ClassificationNodes that classify an object

To get the collection of ClassificationNodes that classify a specified Object the following style of query must be supported:

```
SELECT id FROM ClassificationNode
       WHERE id IN (RegistryEntry_classificationNodes(<id>))
```

8.3.7 Association queries

This section describes the various Association related queries that must be supported.

8.3.7.1 Getting all association with specified object as its source

To get the collection of Associations that have the specified Object as its source, the following query must be supported:

```
SELECT id FROM Association WHERE sourceObject = <id>
```

8.3.7.2 Getting all association with specified object as its target

To get the collection of Associations that have the specified Object as its target, the following query must be supported:

```
SELECT id FROM Association WHERE targetObject = <id>
```

8.3.7.3 Getting associated objects based on association attributes

To get the collection of Associations that have specified Association attributes, the following queries must be supported:

Select Associations that have the specified name.

```
SELECT id FROM Association WHERE name = <name>
```

Select Associations that have the specified source role name.

```
SELECT id FROM Association  WHERE sourceRole = <roleName>
```

Select Associations that have the specified target role name.

```
SELECT id FROM Association WHERE targetRole = <roleName>
```

Select Associations that have the specified association type, where association type is a string containing the corresponding field name described in [ebRIM].

```
SELECT id FROM Association WHERE
        associationType = <associationType>
```

8.3.7.4 Complex association queries

The various forms of Association queries may be combined into complex predicates. The following query selects Associations from an object with a specified id, that have the sourceRole “buysFrom” and targetRole “sellsTo”:

```
SELECT id FROM Association WHERE
        sourceObject = <id> AND
        sourceRole = ‘buysFrom’ AND
        targetRole = ‘sellsTo’
```

8.3.8 Package queries

To find all Packages that a specified ExtrinsicObject belongs to, the following query is specified:

```
SELECT id FROM Package WHERE id IN (RegistryEntry_packages(<id>))
```

8.3.8.1 Complex package queries

The following query gets all Packages that a specified object belongs to, that are not deprecated and where name contains "RosettaNet."

```
SELECT id FROM Package WHERE
        id IN (RegistryEntry_packages(<id>)) AND
        name LIKE ‘%RosettaNet%’ AND
        status <> ‘Deprecated’
```

8.3.9 ExternalLink queries

To find all ExternalLinks that a specified ExtrinsicObject is linked to, the following query is specified:

```
SELECT id From ExternalLink WHERE id IN (RegistryEntry_externalLinks(<id>))
```

To find all ExtrinsicObjects that are linked by a specified ExternalLink, the following query is specified:

```
SELECT id From ExtrinsicObject WHERE id IN (RegistryEntry_linkedObjects(<id>))
```

8.3.9.1 Complex ExternalLink queries

The following query gets all ExternalLinks that a specified ExtrinsicObject belongs to, that contain the word ‘legal’ in their description and have a URL for their externalURI.

```
SELECT id FROM ExternalLink WHERE
       id IN (RegistryEntry_externalLinks(<id>)) AND
       description LIKE ‘%legal%’ AND
       externalURI LIKE ‘%http://%’
```

8.3.10 Audit Trail queries

To get the complete collection of AuditableEvent objects for a specified ManagedObject, the following query is specified:

```
SELECT id FROM AuditableEvent WHERE  registryEntry = <id>
```

8.4 Ad hoc query request/response

A client submits an ad hoc query to the ObjectQueryManager by sending an AdhocQueryRequest. The AdhocQueryRequest contains a sub-element that defines a query in one of the supported Registry query mechanisms.

The ObjectQueryManager sends an AdhocQueryResponse either synchronously or asynchronously back to the client. The AdhocQueryResponse returns a collection of objects whose element type is in the set of element types represented by the leaf nodes of the RegistryEntry hierarchy in [ebRIM].

Figure 21: Submit Ad Hoc Query Sequence Diagram

For details on the schema for the business documents shown in this process refer to 10.

8.5 Content retrieval

A client retrieves content via the Registry by sending the GetContentRequest to the ObjectQueryManager. The GetContentRequest specifies a list of Object references for Objects that need to be retrieved. The ObjectQueryManager returns the specified content by sending a GetContentResponse message to the ObjectQueryManagerClient interface of the client. If there are no errors encountered, the GetContentResponse message includes the specified content as additional payloads within the message. In addition to the GetContentResponse payload, there is one additional payload for each content that was requested. If there are errors encountered, the RegistryResponse payload includes an error and there are no additional content specific payloads.

8.5.1 Identification of content payloads

Since the GetContentResponse message may include several repository items as additional payloads, it is necessary to have a way to identify each payload in the message. To facilitate this identification, the Registry must do the following:

- Use the ID for each RegistryEntry instance that describes the repository item as the DocumentLabel element in the DocumentReference for that object in the Manifest element of the ebXMLHeader.

8.5.2 GetContentResponse message structure

The following message fragment illustrates the structure of the GetContentResponse Message that is returning a Collection of CPPs as a result of a GetContentRequest that specified the IDs for the requested objects. Note that the ID for each object retrieved in the message as additional payloads is used as its DocumentLabel in the Manifest of the ebXMLHeader.

```
…
--PartBoundary
…
<eb:MessageHeader SOAP-ENV:mustUnderstand="1" eb:version="1.0">
…
  <eb:Service eb:type=”ebXMLRegistry”>ObjectManager</eb:Service>
  <eb:Action>submitObjects</eb:Action>
…
</eb:MessageHeader>
…
<eb:Manifest SOAP-ENV:mustUnderstand="1" eb:version="1.0">
  <eb:Reference xlink:href=”cid:registryentries@example.com” …>
    <eb:Description xml:lang="en-us">XML instances that are parameters         for the particular
Registry Interface / Method. These are RIM structures that don’t include repository items, just a
reference – contentURI to them.</eb:Description>
  </eb:Reference>
  <eb:Reference xlink:href=”cid:cpp1@example.com” …>
    <eb:Description xml:lang="en-us">XML instance of CPP 1. This is a repository
item.</eb:Description>
  </eb:Reference>
  <eb:Reference xlink:href=”cid:cpp2@example.com” …>
    <eb:Description xml:lang="en-us">XML instance of CPP 2. This is a repository
item.</eb:Description>
  </eb:Reference>
</eb:Manifest>
--PartBoundary
Content-ID: registryentries@example.com
Content-Type: text/xml
…
<?xml version="1.0" encoding="UTF-8"?>
<RootElement>
<SubmitObjectsRequest>
  <RegistryEntryList>
    <ExtrinsicObject … contentURI=”cid:cpp1@example.com” …/>
    <ExtrinsicObject … contentURI=”cid:cpp2@example.com” …/>
  </RegistryEntryList>
</SubmitObjectsRequest>
```

```
</RootElement>
--PartBoundary
Content-ID: cpp1@example.com
Content-Type: text/xml
…
<CPP>
…
</CPP>
--PartBoundary
Content-ID: cpp2@example.com
Content-Type: text/xml
…
<CPP>
…
</CPP>
--PartBoundary--
```

8.6 Query and retrieval: typical sequence

The following diagram illustrates the use of both browse/drilldown and ad hoc queries followed by a retrieval of content that was selected by the queries.

Figure 23: Typical Query and Retrieval Sequence

9 Registry Security

This chapter describes the security features of the ebXML Registry. It is assumed that the reader is familiar with the security related classes in the Registry information model as described in [ebRIM].

In the current version of this specification, a minimalist approach has been specified for Registry security. The philosophy is that "Any *known* entity can publish content and *anyone* can view published content." The Registry information model has been designed to allow more sophisticated security policies in future versions of this specification.

9.1 Integrity of Registry content

It is assumed that most business registries do not have the resources to validate the veracity of the content submitted to them. The minimal integrity that the Registry must provide is to ensure that content submitted by a Submitting Organization (SO) is maintained in the Registry without any tampering either *en-route* or *within* the Registry. Furthermore, the Registry must make it possible to identify the SO for any Registry content unambiguously.

9.1.1 Message payload signature

Integrity of Registry content requires that all submitted content must be signed by the Registry client as defined by [SEC]. The signature on the submitted content ensures that:

- The content has not been tampered with en-route or within the Registry.
- The content's veracity can be ascertained by its association with a specific submitting organization

9.2 Authentication

The Registry must be able to authenticate the identity of the Principal associated with client requests. *Authentication* is required to identify the ownership of content as well as to identify what "privileges" a Principal can be assigned with respect to the specific objects in the Registry.

The Registry must perform Authentication on a per request basis. From a security point of view, all messages are independent and there is no concept of a session encompassing multiple messages or conversations. Session support may be added as an optimization feature in future versions of this specification.

The Registry must implement a credential-based authentication mechanism based on digital certificates and signatures. The Registry uses the certificate DN from the signature to authenticate the user.

9.2.1 Message header signature

Message headers may be signed by the sending ebXML Messaging Service as defined by [SEC]. Since this specification is not yet finalized, this version does not require that the message header be signed. In the absence of a message header signature, the payload signature is used to authenticate the identity of the requesting client.

9.3 Confidentiality

9.3.1 On-the-wire message confidentiality

It is suggested but not required that message payloads exchanged between clients and the Registry be encrypted during transmission. Payload encryption must abide by any restrictions set forth in [SEC].

9.3.2 Confidentiality of registry content

In the current version of this specification, there are no provisions for confidentiality of Registry content. All content submitted to the Registry may be discovered and read by *any* client. Therefore, the Registry must be able to decrypt any submitted content after it has been received and prior to storing it in its repository. This implies that the Registry and the client have an a priori agreement regarding encryption algorithm, key exchange agreements, etc. This service is not addressed in this specification.

9.4 Authorization

The Registry must provide an authorization mechanism based on the information model defined in [ebRIM]. In this version of the specification the authorization mechanism is based on a default Access Control Policy defined for a pre-defined set of roles for Registry users. Future versions of this specification will allow for custom Access Control Policies to be defined by the Submitting Organization.

9.4.1 Pre-defined roles for registry users

The following roles must be pre-defined in the Registry:

Role	Description
ContentOwner	The submitter or owner of a Registry content. Submitting Organization (SO) in ISO 11179
RegistryAdministrator	A "super" user that is an administrator of the Registry. Registration Authority (RA) in ISO 11179
RegistryGuest	Any unauthenticated user of the Registry. Clients that browse the Registry do not need to be authenticated.

9.4.2 Default access control policies

The Registry must create a default AccessControlPolicy object that grants the default permissions to Registry users based upon their assigned role.

The following table defines the Permissions granted by the Registry to the various pre-defined roles for Registry users based upon the default AccessControlPolicy.

Role	Permissions
ContentOwner	Access to *all* methods on Registry Objects that are owned by the ContentOwner.
RegistryAdministrator	Access to *all* methods on *all* Registry Objects
RegistryGuest	Access to *all* read-only (getXXX) methods on *all* Registry Objects (read-only access to all content).

The following list summarizes the default role-based AccessControlPolicy:

- The Registry must implement the default AccessControlPolicy and associate it with all Objects in the Registry
- Anyone can publish content, but needs to be authenticated
- Anyone can access the content without requiring authentication
- The ContentOwner has access to all methods for Registry Objects owned by them
- The RegistryAdministrator has access to all methods on all Registry Objects
- Unauthenticated clients can access all read-only (getXXX) methods
- At the time of content submission, the Registry must assign the default ContentOwner role to the Submitting Organization (SO) as authenticated by the credentials in the submission message. In the current version of this specification, it will be the DN as identified by the certificate
- Clients that browse the Registry need not use certificates. The Registry must assign the default RegistryGuest role to such clients.

10 References

[Bra97] Keywords for use in RFCs to Indicate Requirement Levels.

[ebGLOSS] ebXML Glossary

http://www.ebxml.org/specs/ebGLOSS.pdf

[TA] ebXML Technical Architecture

http://www.ebxml.org/specs/ebTA.pdf

[OAS] OASIS Information Model

http://www.nist.gov/itl/div897/ctg/regrep/oasis-work.html

[ISO] ISO 11179 Information Model

http://208.226.167.205/SC32/jtc1sc32.nsf/576871ad2f11bba785256621005419d7/b83fc7816a6064c68525690e0065f913?OpenDocument

[ebRIM] ebXML Registry Information Model

http://www.ebxml.org/specs/ebRIM.pdf

[ebBPSS] ebXML Business Process Specification Schema

http://www.ebxml.org/specs/ebBPSS.pdf

[ebCPP] ebXML Collaboration-Protocol Profile and Agreement Specification

http://www.ebxml.org/specs/ebCPP.pdf

[rrUDDI] Using UDDI to Find ebXML Reg/Reps

http://www.ebxml.org/specs/rrUDDI.pdf

[CTB] Context table informal document from Core Components

[ebMS] ebXML Messaging Service Specification, Version 0.21

http://www.ebxml.org/specs/ebMS.pdf

[secRISK] ebXML Risk Assessment Technical Report, Version 1.0

http://www.ebxml.org/specs/secRISK.pdf

[XPT] XML Path Language (XPath) Version 1.0

http://www.w3.org/TR/xpath

[SQL] Structured Query Language (FIPS PUB 127-2)

http://www.itl.nist.gov/fipspubs/fip127-2.htm

[SQL/PSM] Database Language SQL — Part 4: Persistent Stored Modules (SQL/PSM) [ISO/IEC 9075-4:1996]

[IANA] IANA (Internet Assigned Numbers Authority).

Official Names for Character Sets, ed. Keld Simonsen et al.

ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets

[RFC 1766] IETF (Internet Engineering Task Force). RFC 1766:

Tags for the Identification of Languages, ed. H. Alvestrand. 1995.

http://www.cis.ohio-state.edu/htbin/rfc/rfc1766.html

[RFC 2277] IETF (Internet Engineering Task Force). RFC 2277:

IETF policy on character sets and languages, ed. H. Alvestrand. 1998.

http://www.cis.ohio-state.edu/htbin/rfc/rfc2277.html

[RFC 2278] IETF (Internet Engineering Task Force). RFC 2278:

IANA Charset Registration Procedures, ed. N. Freed and J. Postel. 1998.

http://www.cis.ohio-state.edu/htbin/rfc/rfc2278.html

[RFC 3023] IETF (Internet Engineering Task Force). RFC 3023:

XML Media Types, ed. M. Murata. 2001.

ftp://ftp.isi.edu/in-notes/rfc3023.txt

[REC-XML] W3C Recommendation. Extensible Markup language(XML)1.0(Second Edition)

http://www.w3.org/TR/REC-xml

[UUID] DCE 128 bit Universal Unique Identifier

http://www.opengroup.org/onlinepubs/009629399/apdxa.htm#tagcjh_20

http://www.opengroup.org/publications/catalog/c706.htmttp://www.w3.org/TR/REC-xml

11 Disclaimer

The views and specification expressed in this document are those of the authors and are not necessarily those of their employers. The authors and their employers specifically disclaim responsibility for any problems arising from correct or incorrect implementation or use of this design.

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Appendix A ebXML Registry DTD Definition

The following is the definition for the various ebXML Message payloads described in this document.

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Begin information model mapping. -->
<!--
ObjectAttributes are attributes from the RegistryObject interface in ebRIM.
id may be empty. If specified it may be in urn:uuid format or be in some
arbitrary format. If id is empty registry must generate globally unique id.
If id is provided and in proper UUID syntax (starts with urn:uuid:)
registry will honour it.
If id is provided and is not in proper UUID syntax then it is used for
linkage within document and is ignored by the registry. In this case the
registry generates a UUID for id attribute.
id must not be null when object is being retrieved from the registry.
-->
<!ENTITY % ObjectAttributes "
   id          ID     #IMPLIED
   name        CDATA  #IMPLIED
   description CDATA  #IMPLIED
">
<!--
Use as a proxy for an Object that is in the registry already.
Specifies the id attribute of the object in the registry as its id attribute.
id attribute in ObjectAttributes is exactly the same syntax and semantics as
id attribute in RegistryObject.
-->
<!ELEMENT ObjectRef EMPTY>
<!ATTLIST ObjectRef
    id ID #IMPLIED
>
<!ELEMENT ObjectRefList (ObjectRef)*>
<!--
RegistryEntryAttributes are attributes from the RegistryEntry interface
in ebRIM.
It inherits ObjectAttributes
-->
<!ENTITY % RegistryEntryAttributes " %ObjectAttributes;
   majorVersion     CDATA  '1'
   minorVersion     CDATA  '0'
   status           CDATA  #IMPLIED
   userVersion      CDATA  #IMPLIED
   stability        CDATA  'Dynamic'
   expirationDate   CDATA  #IMPLIED">
<!ELEMENT RegistryEntry (SlotList?)>
<!ATTLIST RegistryEntry
        %RegistryEntryAttributes; >
<!ELEMENT Value (#PCDATA)>
```

```
<!ELEMENT ValueList (Value*)>
<!ELEMENT Slot (ValueList?)>
<!ATTLIST Slot
        name CDATA #REQUIRED
        slotType CDATA #IMPLIED
>
<!ELEMENT SlotList (Slot*)>
<!--
ExtrinsicObject are attributes from the ExtrinsicObject interface in ebRIM.
It inherits RegistryEntryAttributes
-->
<!ELEMENT ExtrinsicObject EMPTY >
<!ATTLIST ExtrinsicObject
        %RegistryEntryAttributes;
        contentURI CDATA #REQUIRED
        mimeType CDATA #IMPLIED
        objectType CDATA #REQUIRED
        opaque (true | false) "false"
>
<!ENTITY % IntrinsicObjectAttributes " %RegistryEntryAttributes;">
<!-- Leaf classes that reflect the concrete classes in ebRIM -->
<!ELEMENT RegistryEntryList
(Association | Classification | ClassificationNode | Package |
 ExternalLink | ExternalIdentifier | Organization |
 ExtrinsicObject | ObjectRef)*>
<!--
An ExternalLink specifies a link from a RegistryEntry and an external URI
-->
<!ELEMENT ExternalLink EMPTY>
<!ATTLIST ExternalLink
        %IntrinsicObjectAttributes;
        externalURI CDATA #IMPLIED
>
<!--
An ExternalIdentifier provides an identifier for a RegistryEntry
The value is the value of the identifier (e.g. the social security number)
-->
<!ELEMENT ExternalIdentifier EMPTY>
<!ATTLIST ExternalIdentifier
        %IntrinsicObjectAttributes;
        value CDATA #REQUIRED
>
<!--
An Association specifies references to two previously submitted
registry entrys.
The sourceObject is id of the sourceObject in association
The targetObject is id of the targetObject in association
-->
<!ELEMENT Association EMPTY>
<!ATTLIST Association
        %IntrinsicObjectAttributes;
        sourceRole CDATA #IMPLIED
        targetRole CDATA #IMPLIED
        associationType CDATA #REQUIRED
        bidirection (true | false) "false"
```

```
        sourceObject IDREF #REQUIRED
        targetObject IDREF #REQUIRED
>
<!--
A Classification specifies references to two registry entrys.
The classifiedObject is id of the Object being classified.
The classificationNode is id of the ClassificationNode classying the object
-->
<!ELEMENT Classification EMPTY>
<!ATTLIST Classification
        %IntrinsicObjectAttributes;
        classifiedObject IDREF #REQUIRED
        classificationNode IDREF #REQUIRED
>
<!--
A Package is a named collection of objects.
-->
<!ELEMENT Package EMPTY>
<!ATTLIST Package
        %IntrinsicObjectAttributes;
>
<!-- Attributes inherited by various types of telephone number elements -->
<!ENTITY % TelephoneNumberAttributes " areaCode   CDATA  #REQUIRED
   contryCode CDATA  #REQUIRED
   extension  CDATA  #IMPLIED
   number     CDATA  #REQUIRED
   url        CDATA  #IMPLIED">
<!ELEMENT TelephoneNumber EMPTY>
<!ATTLIST TelephoneNumber
        %TelephoneNumberAttributes;
>
<!ELEMENT FaxNumber EMPTY>
<!ATTLIST FaxNumber
        %TelephoneNumberAttributes;
>
<!ELEMENT PagerNumber EMPTY>
<!ATTLIST PagerNumber
        %TelephoneNumberAttributes;
>
<!ELEMENT MobileTelephoneNumber EMPTY>
<!ATTLIST MobileTelephoneNumber
        %TelephoneNumberAttributes;
>
<!-- PostalAddress -->
<!ELEMENT PostalAddress EMPTY>
<!ATTLIST PostalAddress
        city CDATA #REQUIRED
        country CDATA #REQUIRED
        postalCode CDATA #REQUIRED
        state CDATA #IMPLIED
        street CDATA #REQUIRED
>
<!-- PersonName -->
<!ELEMENT PersonName EMPTY>
<!ATTLIST PersonName
```

```
        firstName CDATA #REQUIRED
        middleName CDATA #IMPLIED
        lastName CDATA #REQUIRED
>
<!-- Organization -->
<!ELEMENT Organization (PostalAddress, FaxNumber?, TelephoneNumber)>
<!ATTLIST Organization
        %IntrinsicObjectAttributes;
        parent IDREF #IMPLIED
        primaryContact IDREF #REQUIRED
>
<!ELEMENT User (PersonName, PostalAddress, TelephoneNumber,
                                           MobileTelephoneNumber?,
                                           FaxNumber?, PagerNumber?)>
<!ATTLIST User
        %ObjectAttributes;
        organization IDREF #IMPLIED
        email CDATA #IMPLIED
        url CDATA #IMPLIED
>
<!ELEMENT AuditableEvent EMPTY>
<!ATTLIST AuditableEvent
        %ObjectAttributes;
        eventType CDATA #REQUIRED
        registryEntry IDREF #REQUIRED
        timestamp CDATA #REQUIRED
        user IDREF #REQUIRED
>
<!--
ClassificationNode is used to submit a Classification tree to the Registry.
parent is the id to the parent node. code is an optional code value for a
                                           ClassificationNode
often defined by an external taxonomy (e.g. NAICS)
-->
<!ELEMENT ClassificationNode EMPTY>
<!ATTLIST ClassificationNode
        %IntrinsicObjectAttributes;
        parent IDREF #IMPLIED
        code CDATA #IMPLIED
>
<!--
End information model mapping.
Begin Registry Services Interface

<!ELEMENT RequestAcceptedResponse EMPTY>
<!ATTLIST RequestAcceptedResponse
        xml:lang NMTOKEN #REQUIRED
>
<!--
```

```
The SubmitObjectsRequest allows one to submit a list of RegistryEntry
elements. Each RegistryEntry element provides metadata for a single submitted
object.  Note that the repository item being submitted is in a separate
document that is not in this DTD. The ebXML Messaging Services Specfication
defines packaging, for submission, of the metadata of a repository item with
the repository item itself. The value of the contentURI attribute of the
ExtrinsicObject element must be the same as the xlink:href attribute within
the Reference element within the Manifest element of the MessageHeader.
-->
<!ELEMENT SubmitObjectsRequest (RegistryEntryList)>
<!ELEMENT AddSlotsRequest (ObjectRef, SlotList)+>
<!-- Only need name in Slot within SlotList -->
<!ELEMENT RemoveSlotsRequest (ObjectRef, SlotList)+>
<!--
The ObjectRefList is the list of
refs to the registry entrys being approved.
-->
<!ELEMENT ApproveObjectsRequest (ObjectRefList)>
<!--
The ObjectRefList is the list of
refs to the registry entrys being deprecated.
-->
<!ELEMENT DeprecateObjectsRequest (ObjectRefList)>
<!--
The ObjectRefList is the list of
refs to the registry entrys being removed
-->
<!ELEMENT RemoveObjectsRequest (ObjectRefList)>
<!ATTLIST RemoveObjectsRequest
        deletionScope (DeleteAll | DeleteRepositoryItemOnly) "DeleteAll"
>
<!ELEMENT GetRootClassificationNodesRequest EMPTY>
<!--
The namePattern follows SQL-92 syntax for the pattern specified in
LIKE clause. It allows for selecting only those root nodes that match
the namePattern. The default value of '*' matches all root nodes.
-->
<!ATTLIST GetRootClassificationNodesRequest
        namePattern CDATA "*"
>
<!--
The response includes one or more ClassificationNodes
-->
<!ELEMENT GetRootClassificationNodesResponse ( ClassificationNode+ )>
<!--
Get the classification tree under the ClassificationNode specified parentRef.
If depth is 1 just fetch immediate child
nodes, otherwise fetch the descendant tree upto the specified depth level.
If depth is 0 that implies fetch entire sub-tree
-->
<!ELEMENT GetClassificationTreeRequest EMPTY>
<!ATTLIST GetClassificationTreeRequest
        parent CDATA #REQUIRED
        depth CDATA "1"
>
```

```
<!--
The response includes one or more ClassificationNodes which includes only
immediate ClassificationNode children nodes if depth attribute in
GetClassificationTreeRequest was 1, otherwise the decendent nodes
upto specified depth level are returned.
-->
<!ELEMENT GetClassificationTreeResponse ( ClassificationNode+ )>
<!--
Get refs to all registry entrys that are classified by all the
ClassificationNodes specified by ObjectRefList.
Note this is an implicit logical AND operation
-->
<!ELEMENT GetClassifiedObjectsRequest (ObjectRefList)>
<!--
objectType attribute can specify the type of objects that the registry
client is interested in, that is classified by this ClassificationNode.
It is a String that matches a choice in the type attribute of
                                              ExtrinsicObject.
The default value of '*' implies that client is interested in all types
of registry entrys that are classified by the specified ClassificationNode.
-->
<!--
The response includes a RegistryEntryList which has zero or more
RegistryEntrys that are classified by the ClassificationNodes
specified in the ObjectRefList in GetClassifiedObjectsRequest.
-->
<!ELEMENT GetClassifiedObjectsResponse ( RegistryEntryList )>
<!--
An Ad hoc query request specifies a query string as defined by [RS] in the
                                              queryString attribute
-->
<!ELEMENT AdhocQueryRequest (FilterQuery | ReturnRegistryEntry |
                                              ReturnRepositoryItem | SQLQuery)>
<!ELEMENT SQLQuery (#PCDATA)>
<!--
The response includes a RegistryEntryList which has zero or more
RegistryEntrys that match the query specified in AdhocQueryRequest.
-->
<!ELEMENT AdhocQueryResponse
 ( RegistryEntryList |
   FilterQueryResult |
   ReturnRegistryEntryResult |
   ReturnRepositoryItemResult )>
<!--
Gets the actual content (not metadata) specified by the ObjectRefList
-->
<!ELEMENT GetContentRequest (ObjectRefList)>
<!--
The GetObjectsResponse will have no sub-elements if there were no errors.
The actual contents will be in the other payloads of the message.
-->
<!ELEMENT GetContentResponse EMPTY >
<!--
Describes the capability profile for the registry and what optional features
are supported
```

```
-->
<!ELEMENT RegistryProfile (OptionalFeaturesSupported)>
<!ATTLIST RegistryProfile
        version CDATA #REQUIRED
>
<!ELEMENT OptionalFeaturesSupported EMPTY>
<!ATTLIST OptionalFeaturesSupported
        sqlQuery (true | false) "false"
        xQuery (true | false) "false"
>
<!-- Begin FilterQuery DTD -->
<!ELEMENT FilterQuery (RegistryEntryQuery | AuditableEventQuery |
                                            ClassificationNodeQuery |
                                            RegistryPackageQuery |
                                            OrganizationQuery)>
<!ELEMENT FilterQueryResult (RegistryEntryQueryResult |
                                            AuditableEventQueryResult |
                                            ClassificationNodeQueryResult |
                                            RegistryPackageQueryResult |
                                            OrganizationQueryResult)>
<!ELEMENT RegistryEntryQueryResult (RegistryEntryView*)>
<!ELEMENT RegistryEntryView EMPTY>
<!ATTLIST RegistryEntryView
        objectURN CDATA #REQUIRED
        contentURI CDATA #IMPLIED
        objectID CDATA #IMPLIED
>
<!ELEMENT AuditableEventQueryResult (AuditableEventView*)>
<!ELEMENT AuditableEventView EMPTY>
<!ATTLIST AuditableEventView
        objectID CDATA #REQUIRED
        timestamp CDATA #REQUIRED
>
<!ELEMENT ClassificationNodeQueryResult (ClassificationNodeView*)>
<!ELEMENT ClassificationNodeView EMPTY>
<!ATTLIST ClassificationNodeView
        objectURN CDATA #REQUIRED
        contentURI CDATA #IMPLIED
        objectID CDATA #IMPLIED
>
<!ELEMENT RegistryPackageQueryResult (RegistryPackageView*)>
<!ELEMENT RegistryPackageView EMPTY>
<!ATTLIST RegistryPackageView
        objectURN CDATA #REQUIRED
        contentURI CDATA #IMPLIED
        objectID CDATA #IMPLIED
>
<!ELEMENT OrganizationQueryResult (OrganizationView*)>
<!ELEMENT OrganizationView EMPTY>
<!ATTLIST OrganizationView
        orgURN CDATA #REQUIRED
        objectID CDATA #IMPLIED
>

<!ELEMENT RegistryEntryQuery
```

```
   (  RegistryEntryFilter?,
      SourceAssociationBranch*,
      TargetAssociationBranch*,
      HasClassificationBranch*,
      SubmittingOrganizationBranch?,
      ResponsibleOrganizationBranch?,
      ExternalIdentifierFilter*,
      ExternalLinkFilter*,
      SlotFilter*,
      HasAuditableEventBranch*          )>

<!ELEMENT SourceAssociationBranch (AssociationFilter?, RegistryEntryFilter?)>
<!ELEMENT TargetAssociationBranch (AssociationFilter?, RegistryEntryFilter?)>
<!ELEMENT HasClassificationBranch (ClassificationFilter?,
                                   ClassificationNodeFilter?)>
<!ELEMENT SubmittingOrganizationBranch (OrganizationFilter?, ContactFilter?)>
<!ELEMENT ResponsibleOrganizationBranch (OrganizationFilter?,
                                   ContactFilter?)>
<!ELEMENT HasAuditableEventBranch (AuditableEventFilter?, UserFilter?,
                                   OrganizationFilter?)>
<!ELEMENT AuditableEventQuery
  (AuditableEventFilter?, RegistryEntryQuery*, InvokedByBranch? )>
<!ELEMENT InvokedByBranch
  ( UserFilter?, OrganizationQuery? )>
<!ELEMENT ClassificationNodeQuery (ClassificationNodeFilter?,
                                   PermitsClassificationBranch*,
                                   HasParentNode?, HasSubnode*)>
<!ELEMENT PermitsClassificationBranch (ClassificationFilter?,
                                   RegistryEntryQuery?)>
<!ELEMENT HasParentNode (ClassificationNodeFilter?, HasParentNode?)>
<!ELEMENT HasSubnode (ClassificationNodeFilter?, HasSubnode*)>
<!ELEMENT RegistryPackageQuery (PackageFilter?, HasMemberBranch*)>
<!ELEMENT HasMemberBranch (RegistryEntryQuery?)>
<!ELEMENT OrganizationQuery (OrganizationFilter?, SubmitsRegistryEntry*,
                                   HasParentOrganization?,
                                   InvokesEventBranch*,
                                   ContactFilter*)>
<!ELEMENT SubmitsRegistryEntry (RegistryEntryQuery?)>
<!ELEMENT HasParentOrganization (OrganizationFilter?,
                                   HasParentOrganization?)>
<!ELEMENT InvokesEventBranch (UserFilter?, AuditableEventFilter?,
                                   RegistryEntryQuery?)>
<!ELEMENT ReturnRegistryEntry (RegistryEntryQuery, WithClassifications?,
                                   WithSourceAssociations?,
                                   WithTargetAssociations?,
                                   WithAuditableEvents?,
                                   WithExternalLinks?)>
<!ELEMENT WithClassifications (ClassificationFilter?)>
<!ELEMENT WithSourceAssociations (AssociationFilter?)>
<!ELEMENT WithTargetAssociations (AssociationFilter?)>
<!ELEMENT WithAuditableEvents (AuditableEventFilter?)>
<!ELEMENT WithExternalLinks (ExternalLinkFilter?)>
<!ELEMENT ReturnRegistryEntryResult (RegistryEntryMetadata*)>
```

```
<!ELEMENT RegistryEntryMetadata (RegistryEntry, Classification*,
                                        SourceAssociations?,
                                        TargetAssociations?,
                                        AuditableEvent*, ExternalLink*)>
<!ELEMENT SourceAssociations (Association*)>
<!ELEMENT TargetAssociations (Association*)>
<!ELEMENT ReturnRepositoryItem (RegistryEntryQuery,
                                        RecursiveAssociationOption?,
                                        WithDescription?)>
<!ELEMENT RecursiveAssociationOption (AssociationType+)>
<!ATTLIST RecursiveAssociationOption
        depthLimit CDATA #IMPLIED
>
<!ELEMENT AssociationType EMPTY>
<!ATTLIST AssociationType
        role CDATA #REQUIRED
>
<!ELEMENT WithDescription EMPTY>
<!ELEMENT ReturnRepositoryItemResult (RepositoryItem*)>
<!ELEMENT RepositoryItem (RegistryPackage | ExtrinsicObject | WithdrawnObject
                                        | ExternalLink)>
<!ATTLIST RepositoryItem
        identifier CDATA #REQUIRED
        name CDATA #REQUIRED
        contentURI CDATA #REQUIRED
        objectType CDATA #REQUIRED
        status CDATA #REQUIRED
        stability CDATA #REQUIRED
        description CDATA #IMPLIED
>
<!ELEMENT RegistryPackage EMPTY>
<!ELEMENT WithdrawnObject EMPTY>
<!ELEMENT ExternalLinkItem EMPTY>
<!ELEMENT ObjectFilter (Clause)>
<!ELEMENT RegistryEntryFilter (Clause)>
<!ELEMENT IntrinsicObjectFilter (Clause)>
<!ELEMENT ExtrinsicObjectFilter (Clause)>
<!ELEMENT PackageFilter (Clause)>
<!ELEMENT OrganizationFilter (Clause)>
<!ELEMENT ContactFilter (Clause)>
<!ELEMENT ClassificationNodeFilter (Clause)>
<!ELEMENT AssociationFilter (Clause)>
<!ELEMENT ClassificationFilter (Clause)>
<!ELEMENT ExternalLinkFilter (Clause)>
<!ELEMENT SlotFilter (Clause)>
<!ELEMENT ExternalIdentifierFilter (Clause)>
<!ELEMENT AuditableEventFilter (Clause)>
<!ELEMENT UserFilter (Clause)>
<!--
The following lines define the XML syntax for Clause.
-->
<!ELEMENT Clause (SimpleClause | CompoundClause)>
<!ELEMENT SimpleClause (BooleanClause | RationalClause | StringClause)>
<!ATTLIST SimpleClause
        leftArgument CDATA #REQUIRED
```

```
>
<!ELEMENT CompoundClause (Clause, Clause+)>
<!ATTLIST CompoundClause
        connectivePredicate (And | Or) #REQUIRED
>
<!ELEMENT BooleanClause EMPTY>
<!ATTLIST BooleanClause
        booleanPredicate (true | false) #REQUIRED
>
<!ELEMENT RationalClause (IntClause | FloatClause)>
<!ATTLIST RationalClause
        logicalPredicate (LE | LT | GE | GT | EQ | NE) #REQUIRED
>
<!ELEMENT IntClause (#PCDATA)>
<!ATTLIST IntClause
        e-dtype NMTOKEN #FIXED "int"
>
<!ELEMENT FloatClause (#PCDATA)>
<!ATTLIST FloatClause
        e-dtype NMTOKEN #FIXED "float"
>
<!ELEMENT StringClause (#PCDATA)>
<!ATTLIST StringClause
        stringPredicate
       (contains | -contains |
          startswith | -startswith |
          equal | -equal |
          endswith | -endswith) #REQUIRED
>
<!-- End FilterQuery DTD -->
<!-- Begin RegistryError definition -->
<!-- The RegistryErrorList is derived from the ErrorList element from the
  ebXML Message Service Specification -->
<!ELEMENT RegistryErrorList ( RegistryError+ )>
<!ATTLIST RegistryErrorList
   highestSeverity  ( Warning | Error ) 'Warning' >

<!ELEMENT RegistryError  (#PCDATA) >
<!ATTLIST RegistryError
   codeContext   CDATA   #REQUIRED
   errorCode     CDATA   #REQUIRED
   severity  ( Warning | Error ) 'Warning'
   location      CDATA   #IMPLIED
   xml:lang     NMTOKEN  #IMPLIED>
<!ELEMENT RegistryResponse
 (( AdhocQueryResponse  |
    GetContentResponse  |
    GetClassificationTreeResponse  |
    GetClassifiedObjectsResponse  |
    GetRootClassificationNodesResponse  )?,
   RegistryErrorList?  )>
<!ATTLIST RegistryResponse
   status  (success | failure )  #REQUIRED >
<!-- The contrived root node -->
<!ELEMENT RootElement
```

```
  ( SubmitObjectsRequest |
    ApproveObjectsRequest |
    DeprecateObjectsRequest |
    RemoveObjectsRequest |
    GetRootClassificationNodesRequest |
    GetClassificationTreeRequest |
    GetClassifiedObjectsRequest |
    AdhocQueryRequest |
    GetContentRequest |
    AddSlotsRequest |
    RemoveSlotsRequest |
    RegistryResponse |
    RegistryProfile) >
<!ELEMENT Href  (#PCDATA )>
<!ELEMENT XMLDocumentErrorLocn  (DocumentId , Xpath )>
<!ELEMENT DocumentId  (#PCDATA )>
<!ELEMENT Xpath (#PCDATA)>
```

Appendix B Interpretation of UML Diagrams

This section describes in *abstract terms* the conventions used to define ebXML business process description in UML.

UML class diagram

A UML class diagram is used to describe the Service Interfaces (as defined by [ebCPP]) required to implement an ebXML Registry Services and clients. See **Figure 2** on page 20 for an example. The UML class diagram contains:

1. A collection of UML interfaces where each interface represents a Service Interface for a Registry service.

2. Tabular description of methods on each interface where each method represents an Action (as defined by [ebCPP]) within the Service Interface representing the UML interface.

3. Each method within a UML interface specifies one or more parameters, where the type of each method argument represents the ebXML message type that is exchanged as part of the Action corresponding to the method. Multiple arguments imply multiple payload documents within the body of the corresponding ebXML message.

UML sequence diagram

A UML sequence diagram is used to specify the business protocol representing the interactions between the UML interfaces for a Registry specific ebXML business process. A UML sequence diagram provides the necessary information to determine the sequencing of messages, request to response association as well as request to error response association as described by [ebCPP].

Each sequence diagram shows the sequence for a specific conversation protocol as method calls from the requestor to the responder. Method invocation may be synchronous or asynchronous based on the UML notation used on the arrow-head for the link. A half arrow-head represents asynchronous communication. A full arrow-head represents synchronous communication.

Each method invocation may be followed by a response method invocation from the responder to the requestor to indicate the ResponseName for the previous Request. Possible error response is indicated by a conditional response method invocation from the responder to the requestor. See on page 27 for an example.

Appendix C SQL Query

SQL query syntax specification

This section specifies the rules that define the SQL Query syntax as a subset of SQL-92. The terms enclosed in angle brackets are defined in [SQL] or in [SQL/PSM]. The SQL query syntax conforms to the <query specification>, modulo the restrictions identified below:

1. A <select list> may contain at most one <select sublist>.
2. In a <select list> must be is a single column whose data type is UUID, from the table in the <from clause>.
3. A <derived column> may not have an <as clause>.
4. <table expression> does not contain the optional <group by clause> and <having clause> clauses.
5. A <table reference> can only consist of <table name> and <correlation name>.
6. A <table reference> does not have the optional AS between <table name> and <correlation name>.
7. There can only be one <table reference> in the <from clause>.
8. Restricted use of sub-queries is allowed by the syntax as follows. The <in predicate> allows for the right hand side of the <in predicate> to be limited to a restricted <query specification> as defined above.
9. A <search condition> within the <where clause> may not include a <query expression>.
10. The SQL query syntax allows for the use of `<sql invoked routines>` invocation from [SQL/PSM] as the RHS of the `<in predicate>`.

Non-normative BNF for query syntax grammar

The following BNF exemplifies the grammar for the registry query syntax. It is provided here as an aid to implementors. Since this BNF is not based on [SQL] it is provided as non-normative syntax. For the normative syntax rules see the previous section.

```
/*****************************************************************
 * The Registry Query (Subset of SQL-92) grammar starts here
 *****************************************************************/
RegistryQuery = SQLSelect [";"]
SQLSelect = "SELECT" SQLSelectCols "FROM" SQLTableList [ SQLWhere ]
SQLSelectCols =  ID
SQLTableList = SQLTableRef
SQLTableRef = ID
SQLWhere = "WHERE" SQLOrExpr
SQLOrExpr = SQLAndExpr ( "OR" SQLAndExpr)*
SQLAndExpr = SQLNotExpr ("AND" SQLNotExpr)*
SQLNotExpr = [ "NOT" ] SQLCompareExpr

SQLCompareExpr =
    (SQLColRef "IS") SQLIsClause
  | SQLSumExpr [ SQLCompareExprRight ]
SQLCompareExprRight =
    SQLLikeClause
  | SQLInClause
  | SQLCompareOp SQLSumExpr

SQLCompareOp =
    "="
  | "<>"
  | ">"
  | ">="
  | "<"
  | "<="
SQLInClause = [ "NOT" ] "IN" "(" SQLLValueList ")"
SQLLValueList = SQLLValueElement ( "," SQLLValueElement )*
SQLLValueElement = "NULL" | SQLSelect
SQLIsClause =  SQLColRef "IS" [ "NOT" ] "NULL"
SQLLikeClause = [ "NOT" ] "LIKE" SQLPattern
SQLPattern = STRING_LITERAL
SQLLiteral =
    STRING_LITERAL
  | INTEGER_LITERAL
  | FLOATING_POINT_LITERAL
SQLColRef = SQLLvalue
SQLLvalue =  SQLLvalueTerm
SQLLvalueTerm = ID ( "."  ID )*
SQLSumExpr = SQLProductExpr (( "+" | "-" ) SQLProductExpr )*
```

```
SQLProductExpr = SQLUnaryExpr (( "*" | "/" ) SQLUnaryExpr )*
SQLUnaryExpr = [ ( "+" | "-") ] SQLTerm
SQLTerm = "(" SQLOrExpr ")"
  | SQLColRef
  | SQLLiteral
INTEGER_LITERAL = (["0"-"9"])+
FLOATING_POINT_LITERAL =
          (["0"-"9"])+ "." (["0"-"9"])+ (EXPONENT)?
        | "." (["0"-"9"])+ (EXPONENT)?
        | (["0"-"9"])+ EXPONENT
        | (["0"-"9"])+ (EXPONENT)?
EXPONENT = ["e","E"] (["+","-"])? (["0"-"9"])+
STRING_LITERAL: "'" (~["'"])* ( "''" (~["'"])* )* "'"
ID = ( <LETTER> )+ ( "_" | "$" | "#" | <DIGIT> | <LETTER> )*
LETTER = ["A"-"Z", "a"-"z"]
DIGIT = ["0"-"9"]
```

Relational schema for SQL queries

```
--SQL Load file for creating the ebXML Registry tables
--Minimal use of SQL-99 features in DDL is illustrative and may be easily mapped to SQL-92
CREATE TYPE ShortName AS VARCHAR(64) NOT FINAL;
CREATE TYPE LongName AS VARCHAR(128) NOT FINAL;
CREATE TYPE FreeFormText AS VARCHAR(256) NOT FINAL;
CREATE TYPE UUID UNDER ShortName FINAL;
CREATE TYPE URI UNDER LongName FINAL;
CREATE TABLE ExtrinsicObject (
--RegistryObject Attributes
  id                                UUID PRIMARY KEY NOT NULL,
  name                              LongName,
  description               FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--Versionable attributes
  majorVersion              INT DEFAULT 0 NOT NULL,
  minorVersion              INT DEFAULT 1 NOT NULL,
--RegistryEntry attributes
  status                            INT DEFAULT 0 NOT NULL,
  userVersion               ShortName,
  stability                         INT    DEFAULT 0 NOT NULL,
  expirationDate            TIMESTAMP,
```

```
--ExtrinsicObject attributes
  contentURI                  URI,
  mimeType                            ShortName,
  objectType                  INT DEFAULT 0 NOT NULL,
  opaque                              BOOLEAN DEFAULT false NOT NULL
);
CREATE PROCEDURE RegistryEntry_associatedObjects(registryEntryId) {
--Must return a collection of UUIDs for related RegistryEntry instances
}
CREATE PROCEDURE RegistryEntry_auditTrail(registryEntryId) {
--Must return an collection of UUIDs for AuditableEvents related to the RegistryEntry.
--Collection must be in ascending order by timestamp
}
CREATE PROCEDURE RegistryEntry_externalLinks(registryEntryId) {
--Must return a collection of UUIDs for ExternalLinks annotating this RegistryEntry.
}
CREATE PROCEDURE RegistryEntry_externalIdentifiers(registryEntryId) {
--Must return a collection of UUIDs for ExternalIdentifiers for this RegistryEntry.
}
CREATE PROCEDURE RegistryEntry_classificationNodes(registryEntryId) {
--Must return a collection of UUIDs for ClassificationNodes classifying this RegistryEntry.
}
CREATE PROCEDURE RegistryEntry_packages(registryEntryId) {
--Must return a collection of UUIDs for Packages that this RegistryEntry belongs to.
}
CREATE TABLE Package (
--RegistryObject Attributes
  id                                  UUID PRIMARY KEY NOT NULL,
  name                                LongName,
  description                 FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--Versionable attributes
  majorVersion                INT DEFAULT 0 NOT NULL,
  minorVersion                INT DEFAULT 1 NOT NULL,
--RegistryEntry attributes
  status                              INT DEFAULT 0 NOT NULL,
  userVersion                 ShortName,
  stability                           INT    DEFAULT 0 NOT NULL,
  expirationDate              TIMESTAMP,
--Package attributes
);
CREATE PROCEDURE Package_memberbjects(packageId) {
```

```
--Must return a collection of UUIDs for RegistryEntrys that are memebers of this Package.
}
CREATE TABLE ExternalLink (
--RegistryObject Attributes
  id                                UUID PRIMARY KEY NOT NULL,
  name                              LongName,
  description                FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--Versionable attributes
  majorVersion               INT DEFAULT 0 NOT NULL,
  minorVersion               INT DEFAULT 1 NOT NULL,
--RegistryEntry attributes
  status                            INT DEFAULT 0 NOT NULL,
  userVersion                ShortName,
  stability                         INT    DEFAULT 0 NOT NULL,
  expirationDate             TIMESTAMP,
--ExternalLink attributes
  externalURI                URI NOT NULL
);
CREATE PROCEDURE ExternalLink_linkedObjects(registryEntryId) {
--Must return a collection of UUIDs for objects in this relationship
}
CREATE TABLE ExternalIdentifier (
--RegistryObject Attributes
  id                                UUID PRIMARY KEY NOT NULL,
  name                              LongName,
  description                FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--Versionable attributes
  majorVersion               INT DEFAULT 0 NOT NULL,
  minorVersion               INT DEFAULT 1 NOT NULL,
--RegistryEntry attributes
  status                            INT DEFAULT 0 NOT NULL,
  userVersion                ShortName,
  stability                         INT    DEFAULT 0 NOT NULL,
  expirationDate             TIMESTAMP,
--ExternalIdentifier attributes
  value                             ShortName NOT NULL
);
--A SlotValue row represents one value of one slot in some
--RegistryEntry
CREATE TABLE SlotValue (
```

```
--RegistryObject Attributes
  registryEntry               UUID    PRIMARY KEY NOT NULL,
--Slot attributes
  name                        LongName NOT NULL PRIMARY KEY NOT NULL,
  value                       ShortName NOT NULL
);
CREATE TABLE Association (
--RegistryObject Attributes
  id                                  UUID PRIMARY KEY NOT NULL,
  name                                LongName,
  description                 FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--Versionable attributes
  majorVersion                INT DEFAULT 0 NOT NULL,
  minorVersion                INT DEFAULT 1 NOT NULL,
--RegistryEntry attributes
  status                              INT DEFAULT 0 NOT NULL,
  userVersion                 ShortName,
  stability                           INT     DEFAULT 0 NOT NULL,
  expirationDate              TIMESTAMP,
--Association attributes
  associationType             INT NOT NULL,
  bidirectional                       BOOLEAN DEFAULT false NOT NULL,
  sourceObject                UUID NOT NULL,
  sourceRole                  ShortName,
  label                               ShortName,
  targetObject                UUID NOT NULL,
  targetRole                  ShortName
);
--Classification is currently identical to Association
CREATE TABLE Classification (
--RegistryObject Attributes
  id                                  UUID PRIMARY KEY NOT NULL,
  name                                LongName,
  description                 FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--Versionable attributes
  majorVersion                INT DEFAULT 0 NOT NULL,
  minorVersion                INT DEFAULT 1 NOT NULL,
--RegistryEntry attributes
  status                              INT DEFAULT 0 NOT NULL,
  userVersion                 ShortName,
```

```
  stability                         INT     DEFAULT 0 NOT NULL,
  expirationDate              TIMESTAMP,
--Classification attributes. Assumes not derived from Association
  sourceObject                UUID NOT NULL,
  targetObject                UUID NOT NULL,
);
CREATE TABLE ClassificationNode (
--RegistryObject Attributes
  id                                UUID PRIMARY KEY NOT NULL,
  name                              LongName,
  description                 FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--Versionable attributes
  majorVersion                INT DEFAULT 0 NOT NULL,
  minorVersion                INT DEFAULT 1 NOT NULL,
--RegistryEntry attributes
  status                            INT DEFAULT 0 NOT NULL,
  userVersion                 ShortName,
  stability                         INT     DEFAULT 0 NOT NULL,
  expirationDate              TIMESTAMP,
--ClassificationNode attributes
  parent                            UUID,
  path                              VARCHAR(512) NOT NULL,
  code                              ShortName
);
CREATE PROCEDURE ClassificationNode_classifiedObjects(classificationNodeId) {
--Must return a collection of UUIDs for RegistryEntries classified by this ClassificationNode
}
--Begin Registry Audit Trail tables
CREATE TABLE AuditableEvent (
--RegistryObject Attributes
  id                                UUID PRIMARY KEY NOT NULL,
  name                              LongName,
  description                 FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--AuditableEvent attributes
  user         UUID,
  eventType                         INT DEFAULT 0 NOT NULL,
  registryEntry                     UUID NOT NULL,
  timestamp                         TIMESTAMP NOT NULL,
);
CREATE TABLE User (
```

```
--RegistryObject Attributes
  id                                UUID PRIMARY KEY NOT NULL,
  name                              LongName,
  description                FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--User attributes
  organization         UUID NOT NULL
--address attributes flattened
  address_city         ShortName,
  address_country      ShortName,
  address_postalCode   ShortName,
  address_state                ShortName,
  address_street       ShortName,
  email                        ShortName,
--fax attribute flattened
  fax_areaCode         VARCHAR(4) NOT NULL,
  fax_countryCode      VARCHAR(4),
  fax_extension                VARCHAR(8),
  fax_umber                    VARCHAR(8) NOT NULL,
  fax_url                      URI

 --mobilePhone attribute flattened
  mobilePhone_areaCode         VARCHAR(4) NOT NULL,
  mobilePhone_countryCode      VARCHAR(4),
  mobilePhone_extension                VARCHAR(8),
  mobilePhone_umber                    VARCHAR(8) NOT NULL,
  mobilePhone_url                      URI

--name attribute flattened
  name_firstName       ShortName,
  name_middleName      ShortName,
  name_lastName                ShortName,
--pager attribute flattened
  pager_areaCode       VARCHAR(4) NOT NULL,
  pager_countryCode    VARCHAR(4),
  pager_extension      VARCHAR(8),
  pager_umber          VARCHAR(8) NOT NULL,
  pager_url                    URI

--telephone attribute flattened
  telephone_areaCode           VARCHAR(4) NOT NULL,
  telephone_countryCode                VARCHAR(4),
```

```
  telephone_extension         VARCHAR(8),
  telephone_umber                     VARCHAR(8) NOT NULL,
  telephone_url                       URI,

  url                                 URI,

);
CREATE TABLE Organization (
--RegistryObject Attributes
  id                                  UUID PRIMARY KEY NOT NULL,
  name                                LongName,
  description                 FreeFormText,
  accessControlPolicy  UUID NOT NULL,
--Versionable attributes
  majorVersion                INT DEFAULT 0 NOT NULL,
  minorVersion                INT DEFAULT 1 NOT NULL,
--RegistryEntry attributes
  status                              INT DEFAULT 0 NOT NULL,
  userVersion                 ShortName,
  stability                           INT     DEFAULT 0 NOT NULL,
  expirationDate              TIMESTAMP,
--Organization attributes
--Organization.address attribute flattened
  address_city                ShortName,
  address_country             ShortName,
  address_postalCode   ShortName,
  address_state                       ShortName,
  address_street              ShortName,
--primary contact for Organization, points to a User.
--Note many Users may belong to the same Organization
  contact                             UUID NOT NULL,
--Organization.fax attribute falttened
  fax_areaCode         VARCHAR(4) NOT NULL,
  fax_countryCode      VARCHAR(4),
  fax_extension               VARCHAR(8),
  fax_umber                   VARCHAR(8) NOT NULL,
  fax_url                     URI,
--Organization.parent attribute
  parent                      UUID,
--Organization.telephone attribute falttened
  telephone_areaCode          VARCHAR(4) NOT NULL,
  telephone_countryCode               VARCHAR(4),
```

```
  telephone_extension         VARCHAR(8),
  telephone_umber                     VARCHAR(8) NOT NULL,
  telephone_url                             URI
);
--Note that the ebRIM security view is not visible through the public query mechanism
--in the current release
--The RegistryEntry View allows polymorphic queries over all ebRIM classes derived
--from RegistryEntry
CREATE VIEW RegistryEntry (
--RegistryObject Attributes
  id,
  name,
  description,
  accessControlPolicy,
--Versionable attributes
  majorVersion,
  minorVersion,
--RegistryEntry attributes
  status,
  userVersion,
  stability,
  expirationDate
) AS
 SELECT
--RegistryObject Attributes
  id,
  name,
  description,
  accessControlPolicy,
--Versionable attributes
  majorVersion,
  minorVersion,
--RegistryEntry attributes
  status,
  userVersion,
  stability,
  expirationDate

 FROM ExtrinsicObject
 UNION
 SELECT
--RegistryObject Attributes
```

```
  id,
  name,
  description,
  accessControlPolicy,
--Versionable attributes
  majorVersion,
  minorVersion,
--RegistryEntry attributes
  status,
  userVersion,
  stability,
  expirationDate
 FROM (Registry)Package
 UNION
 SELECT
--RegistryObject Attributes
  id,
  name,
  description,
  accessControlPolicy,
--Versionable attributes
  majorVersion,
  minorVersion,
--RegistryEntry attributes
  status,
  userVersion,
  stability,
  expirationDate
FROM ClassificationNode;
```

Appendix D Non-normative Content Based Ad Hoc Queries

The Registry SQL query capability supports the ability to search for content based not only on metadata that catalogs the content but also the data contained within the content itself. For example it is possible for a client to submit a query that searches for all Collaboration Party Profiles that define a role named “seller” within a RoleName element in the CPP document itself. Currently content-based query capability is restricted to XML content.

Automatic classification of XML content

Content-based queries are indirectly supported through the existing classification mechanism supported by the Registry.

A submitting organization may define logical indexes on any XML schema or DTD when it is submitted. An instance of such a logical index defines a link between a specific attribute or element node in an XML document tree and a ClassificationNode in a classification scheme within the registry.

The registry utilizes this index to automatically classify documents that are instances of the schema at the time the document instance is submitted. Such documents are classified according to the data contained within the document itself.

Such automatically classified content may subsequently be discovered by clients using the existing classification-based discovery mechanism of the Registry and the query facilities of the ObjectQueryManager.

[Note] This approach is conceptually similar to the way databases support indexed retrieval. DBAs define indexes on tables in the schema. When data is added to the table, the data gets automatically indexed.

Index definition

This section describes how the logical indexes are defined in the SubmittedObject element defined in the Registry DTD. The complete Registry DTD is specified in Appendix A.

A SubmittedObject element for a schema or DTD may define a collection of ClassificationIndexes in a ClassificationIndexList optional element. The ClassificationIndexList is ignored if the content being submitted is not of the SCHEMA objectType.

The ClassificationIndex element inherits the attributes of the base class RegistryObject in [ebRIM]. It then defines specialized attributes as follows:

1. classificationNode: This attribute references a specific ClassificationNode by its ID.

2. contentIdentifier: This attribute identifies a specific data element within the document instances of the schema using an XPATH expression as defined by [XPT].

Example of index definition

To define an index that automatically classifies a CPP based upon the roles defined within its RoleName elements, the following index must be defined on the CPP schema or DTD:

```
<ClassificationIndex
       classificationNode='id-for-role-classification-scheme'
       contentIdentifier='/Role//RoleName'
/>
```

Proposed XML definition

```
<!--
A ClassificationIndexList is specified on ExtrinsicObjects of objectType
'Schema' to define an automatic Classification of instance objects of the
schema using the specified classificationNode as parent and a
ClassificationNode created or selected by the object content as selected by
the contentIdentifier
-->
<!ELEMENT ClassificationIndex EMPTY>
<!ATTLIST ClassificationIndex
        %ObjectAttributes;
        classificationNode IDREF #REQUIRED
        contentIdentifier CDATA #REQUIRED
>
<!-- ClassificationIndexList contains new ClassificationIndexes  -->
<!ELEMENT ClassificationIndexList (ClassificationIndex)*>
```

Example of automatic classification

Assume that a CPP is submitted that defines two roles as "seller" and "buyer." When the CPP is submitted it will automatically be classified by two ClassificationNodes named "buyer" and "seller" that are both children of the ClassificationNode (e.g. a node named Role) specified in the classificationNode attribute of the ClassificationIndex. Note that if either of the two ClassificationNodes named "buyer" and "seller" did not previously exist, the ObjectManager would automatically create these ClassificationNodes.

Appendix E Security Implementation Guideline

This section provides a suggested blueprint for how security processing may be implemented in the Registry. It is meant to be illustrative not prescriptive. Registries may choose to have different implementations as long as they support the default security roles and authorization rules described in this document.

Authentication

1. As soon as a message is received, the first work is the authentication. A principal object is created.
2. If the message is signed, it is verified (including the validity of the certificate) and the DN of the certificate becomes the identity of the principal. Then the Registry is searched for the principal and if found, the roles and groups are filled in.
3. If the message is not signed, an empty principal is created with the role RegistryGuest. This step is for symmetry and to decouple the rest of the processing.
4. Then the message is processed for the command and the objects it will act on.

Authorization

For every object, the access controller will iterate through all the AccessControlPolicy objects with the object and see if there is a chain through the permission objects to verify that the requested method is permitted for the Principal. If any of the permission objects which the object is associated with has a common role, or identity, or group with the principal, the action is permitted.

Registry bootstrap

When a Registry is newly created, a default Principal object should be created with the identity of the Registry Admin's certificate DN with a role RegistryAdmin. This way, any message signed by the Registry Admin will get all the privileges.

When a Registry is newly created, a singleton instance of AccessControlPolicy is created as the default AccessControlPolicy. This includes the creation of the necessary Permission instances as well as the Privilges and Privilege attributes.

Content submission – client responsibility

The Registry client has to sign the contents before submission – otherwise the content will be rejected.

Content submission – Registry responsibility

1. Like any other request, the client will be first authenticated. In this case, the Principal object will get the DN from the certificate.
2. As per the request in the message, the RegistryEntry will be created.
3. The RegistryEntry is assigned the singleton default AccessControlPolicy.
4. If a principal with the identity of the SO is not available, an identity object with the SO's DN is created
5. A principal with this identity is created

Content delete/deprecate – client responsibility

The Registry client has to sign the payload (not entire message) before submission, for authentication purposes; otherwise, the request will be rejected

Content delete/deprecate – Registry responsibility

1. Like any other request, the client will be first authenticated. In this case, the Principal object will get the DN from the certificate. As there will be a principal with this identity in the Registry, the Principal object will get all the roles from that object
2. As per the request in the message (delete or deprecate), the appropriate method in the RegistryObject class will be accessed.
3. The access controller performs the authorization by iterating through the Permission objects associated with this object via the singleton default AccessControlPolicy.

4. If authorization succeeds then the action will be permitted. Otherwise an error response is sent back with a suitable AuthorizationException error message.

Appendix F Native language support (NLS)

Definitions

Although this section discusses only character set and language, the following terms have to be defined clearly.

Coded character set (CCS):

CCS is a mapping from a set of abstract characters to a set of integers. [RFC 2130]. Examples of CCS are ISO-10646, US-ASCII, ISO-8859-1, and so on.

Character encoding scheme (CES):

CES is a mapping from a CCS (or several) to a set of octets. [RFC 2130]. Examples of CES are ISO-2022, UTF-8.

Character set (charset):

charset is a set of rules for mapping from a sequence of octets to a sequence of characters.[RFC 2277],[RFC 2278]. Examples of character set are ISO-2022-JP, EUC-KR.

A list of registered character sets can be found at [IANA].

NLS and request/response messages

For the accurate processing of data in both registry client and registry services, it is essential to know which character set is used. Although the body part of the transaction may contain the charset in xml encoding declaration, registry client and registry services shall specify charset parameter in MIME header when they use text/xml. Because as defined in [RFC 3023], if a text/xml entity is received with the charset parameter omitted, MIME processors and XML processors MUST use the default charset value of "us-ascii".

Ex. Content-Type: text/xml; charset=ISO-2022-JP

Also, when an application/xml entity is used, the charset parameter is optional, and registry client and registry services must follow the requirements in Section 4.3.3 of [REC-XML] which directly address this contingency.

If another Content-Type is chosen to be used, usage of charset must follow [RFC 3023].

NLS and storing of RegistryEntry

This section provides NLS guidelines on how a registry should store **RegistryEntry** instances.

Character set of RegistryEntry

This is basically an implementation issue because the actual character set that the RegistryEntry is stored with, does not affect the interface. However, it is highly recommended to use UTF-16 or UTF-8 for covering various languages.

Language information of RegistryEntry

The language may be specified in xml:lang attribute (Section 2.12 [REC-XML]). If the xml:lang attribute is specified, then the registry may use that language code as the value of a special Slot with name language and sloType of nls in the RegistryEntry. The value must be compliant to [RFC 1766]. Slots are defined in [ebRIM].

NLS and storing of repository items

This section provides NLS guidelines on how a registry should store repository items.

Character set of repository Items

Unlike the character set of **RegistryEntry**, the charset of a repository item must be preserved as it is originally specified in the transaction. The registry may use a special Slot with name **repositoryItemCharset,** and sloType of **nls** for the **RegistryEntry** for storing the charset of the corresponding repository item. Value must be the one defined in [RFC 2277], [RFC 2278]. The **repositoryItemCharset** is optional because not all repository items require it.

Language information of repository item

Specifying only character set is not enough to tell which language is used in the repository item. A registry may use a special Slot with name **repositoryItemLang,** and sloType of **nls** to store that information. This attribute is optional because not all repository items require it. Value must be compliant to [RFC 1766]

This document currently specifies only the method of sending the information of character set and language, and how it is stored in a registry. However, the language information may be used as one of the query criteria, such as retrieving only DTD written in French. Furthermore, a

language negotiation procedure, like registry client is asking a favorite language for messages from registry services, could be another functionality for the future revision of this document.

Appendix G Terminology Mapping

While every attempt has been made to use the same terminology used in other works there are some terminology differences.

The following table shows the terminology mapping between this specification and that used in other specifications and working groups.

This Document	OASIS	ISO 11179
“repository item”	RegisteredObject	
RegistryEntry	RegistryEntry	Administered Component
ExternalLink	RelatedData	N/A
Object.id	regEntryId, orgId, etc.	
ExtrinsicObject.uri	objectURL	
ExtrinsicObject.objectType	defnSource, objectType	
RegistryEntry.name	commonName	
Object.description	shortDescription, Description	
ExtrinsicObject.mimeType	objectType=“mime” fileType=“<mime type>“	
Versionable.majorVersion	userVersion only	
Versionable.minorVersion	userVersion only	
RegistryEntry.status	registrationStatus	

Table 1: Terminology Mapping Table