Interoperability of Federations of Learning Object Repositories Draft 0.1 - September 2008

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Abstract

This paper proposes an information model for a registry of learning object repositories (LOR). This is a work in progress and will be used as a starting point for a discussion on LOR registries organized during the SE@M'08 workshop.

1 Introduction

For the last ten years much research and development has been conducted in the area of learning content, advancing the state of the art from web-sites containing content, to repositories of learning objects, to federations of learning object repositories such as EUN's Learning Resource Exchange[1], ARIADNE[2], GLOBE[3], and FRED [4]. In order to achieve interoperability many standards and specifications have been elaborated over the years and access to learning resources has increased dramatically. Indeed users have been able to discover resources in websites, repositories, and now federation of repositories, and yet the vast majority of learning resources is still not yet available to learners and teachers.

In order to achieve this, a next step is required. Federations of learning object repositories (LOR) should be able to exchange information about their resources and more in particular about collections of resources. At the same time it becomes more and more difficult for consumers of learning content to identify relevant learning content.

It is therefore not surprising that important players in this field are currently addressing the problem of LOR federation interoperability. Indeed the IMS global consortium established in 2007 a project group for the Learning Object Discovery and Exchange (LODE) [5], while also the GLOBE consortium has started practical work in this area in earnest in 2007. Finally, the ASPECT project [6] aims at providing best practice solutions for LOR federation interoperability.

In the rest of this paper we further elaborate (a) the requirements for LOR federation interoperability by investigating different usages, (b) provide an information model for this, (c) describe the architecture and (d) draw conclusions. However, first we introduce the basic operations, which are usually found in LOR federations, in order to set the stage.

2 Requirements

The way that interoperability of LOR federations can be achieved is by describing the content of each federation and establishing interoperability of this. Earlier approaches stemming from

the library world used the notion of collections and collection level descriptors. This approach have been suggested and implemented by earlier projects such as

- The European Treasury Browser project [7]
- The UK Research Support Libraries Programme collection description project [8]
- The Renardus project[1]
- The Agora project [9]

However, these earlier projects provided passive directories. Now that harvesting and federated search is becoming mature, the way one can get access to repositories can be described in a machine readable way to the extent that it could drive harvesters and brokerage systems and serve portals and VLEs. These descriptions can be recorded in a so-called registry.

Combining both ideas, i.e. describing collections and active registries driving a federation, we obtain the notion of an active collection registry. A collection typically consists of a set of learning objects and a collection description describes this set. A collection registry then holds all these collection descriptions and an active collection registry describes the collections in such a way that systems, such as a brokerage system, can be driven by the registry. Such an approach is followed by the European Library [10]. What this paper proposes is to develop specifications such that registries describing collections and driving a federation are interoperable, such that they can work together in a peer network.

Given that a collection consists of a set of learning objects, it can correspond to a repository, a part of a repository, or the union (of parts) of more than one repository. An example of the latter could be a collection of resources pertaining to Math, Science, and Technology that come from repositories in Belgium, Spain, and Austria.

Actors of such a registry are typically providers of collection descriptions, consumers of collection descriptions, and managers of collection descriptions (see for instance in [11]). Some usage scenarios read as follow:

- A broker[2] finds some interesting collections and describes them in the registry. The broker (here as registry manager) can also give permission to a content provider to describe his collections in the broker's registry. The broker himself may wish to annotate the content provider's collection description.
- A content provider (e.g. a publisher) could describe all his collections in his own registry and give access to others to read these collection descriptions.
- The responsible for LOs in a school (e.g. a librarian) may describe selected collections in their local VLE or in a registry provided by an educational authority acting as a broker. In addition the librarian may annotate certain collections and even search the collections based on the annotations.

The important point from the above usage scenarios is that a registry manager may allow others to provide collection descriptions as well as annotations. He may leave the ownership of collection descriptions with others. It may sometimes even be the case that he may use the

[1] The RENARDUS project (http://www.renardus.org/) is not any longer on-line but the ideas have been picked up by others.
[2] The role of a broker in this context is to match the demand for learning objects with the supply. Typically it is for multiple consumers and multiple providers.

collection descriptions but not alter them, for example if the collection description has a non-derivative use specified as part of the rights defined on the collection description.

3 The information model of the registry

Initial ideas about the information model as developed in the context of the ASPECT project are given in the following sections. The information model of the registry is depicted in figure 1. The object classes are as follows:

Some metadata elements could apply to all of the metadata or content or only to a subset of the metadata or content of a given collection. For example all content in the collection could have metadata in French, German, and English while in another collection some content might be in English and some other content in French. Data elements with a scope = all, can be inherited. For example if a quality assurance procedure is defined at the collection level and it holds for all resources belonging to that collection then whenever metadata is presented, a system could also provide the quality assurance procedures of the resource by taking it from the collection level. Data elements provided at the resource (e.g. Learning Object) level overwrite the ones at the collection level.

Descriptors of **collections** would for example be:

General
- Identifier
- Title
- Description
- Referatory. This can be yes, no, or mixed. If yes then Content.technical should be empty)

Meta-metadata
- Identifier
- Contribution
- Metadata Schema
- Language
- Sharable. I.e. this collection descriptor can be exposed to any other registry

Metadata
- Language
- Lifecycle
    - Version
    - Status
    - Contribution: Roles in contribution include ‘owner’, ‘provider’
- Quality assurance procedures
- Rights
- Technical
    - Contact
        - Name
        - Email address
    - CollectionAccess (see relationship to CollectionAccess in figure 1)
        - Public/Private
        - AccessPoint (see relationship to AccessPoint in figure 1)

Content

- Subject
- Language
- Audience
- Context
- Type
- Lifecycle
    - Version
    - Status
    - Contribution: Roles in contribution include ‘owner’, ‘provider’
- Quality Assurance procedures
- Rights
- Technical
    - Contact
        - Name
        - Email address
    - CollectionAccess (see relationship to CollectionAccess in figure 1)
        - Public/Private
        - AccessPoint (see relationship to AccessPoint in figure 1)
- Examples (Media descriptor[3])

Sub-Collection: every collection can have one or more sub-collections.

- Identifier

Annotation

- Contribution
- Date
- Tag
- Description
- Rating
- Selection. This allows users to construct a selection of collections they are interested in.

Each **AccessPoint** uses a protocol (depicted as a relationship in figure 1) and might have a name (e.g. ‘lre-registry.eun.org’), a description, and a service name (e.g. ‘sqi’ or ‘oai-pmh’) by which all information concerning the access point is given. For example for an *SQI [12] access point* one would expect:

- Description
- Session Management
- Communication mode
- Query format
- Query information model
- Result format
- Result information model

For an *OAI-PMH [13] access point* one would expect:

- earliestDatestamp
- deletedRecord
- Granualarity

[3] A Media Descriptor typically provides a URL and a note describing what you can find at this URL.

- Metadata formats
- metadataPrefix
- schema
- metadatanamespace
- version

Each **Protocol** might have a name, a description, and a reference to the specification. Example protocols are SQI, OAI-PMH.

Each **Service** might have a name, and a description. Examples of services are 'search collection', 'obtain collection', 'publish collection', 'obtain registries'. As can be seen a party may provide multiple services.

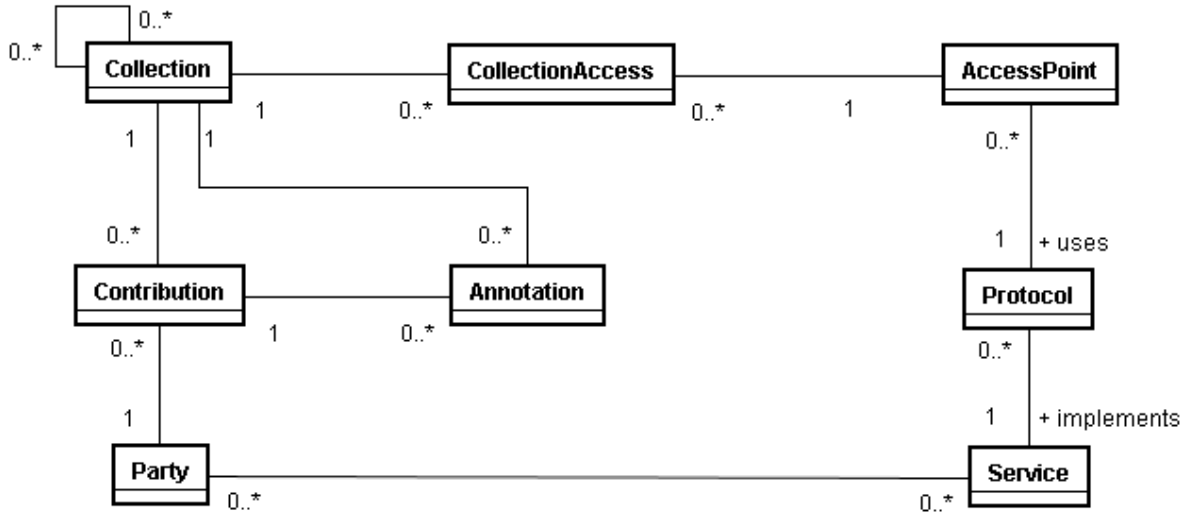

Figure 1: UML class diagram of the Registry Information Model

4 Architecture and functionality

The architecture currently under discussion in the GLOBE consortium as well as the ASPECT project is depicted in figure 2. All registries are peers and can consult each other. For example in a European context one could find national as well as European or world level registries. In a national context one could decide for a single registry or to implement a registry for each region. The basic principle is that the registries are peers that can obtain collection descriptions from each other, if the collection description is sharable.

In order to find existing registries, at certain locations a list of URIs of all registries world wide can be requested from certain partners that have implemented a Collection Registry List (CRL) service. If a country or region wants to set-up a collection registry than its URI is communicated to the CRL service such that every other registry can know that it exists. In that way the Swedish registry would for example know that there is now also a new registry in Brazil and could decide to also consult this registry in order to see whether it has interesting natural science collections about the rain forest. The CRL service holds a simple text file with all registry URIs.

It is the intention to provide the registry software as open source. The software will have built-in peer exchange mechanisms and will know how to obtain the URIs of all registries by using the Collection Registry List service implemented by one or more parties. For example the EUN registry can request information about all collections available at the Swedish registry. The mechanism for doing so is built-in. First, the EUN registry consults CRL service hosted by ARIADNE and obtains the URI for consulting the Swedish registry. Next the EUN registry can obtain from the Swedish registry all information of collections it has.

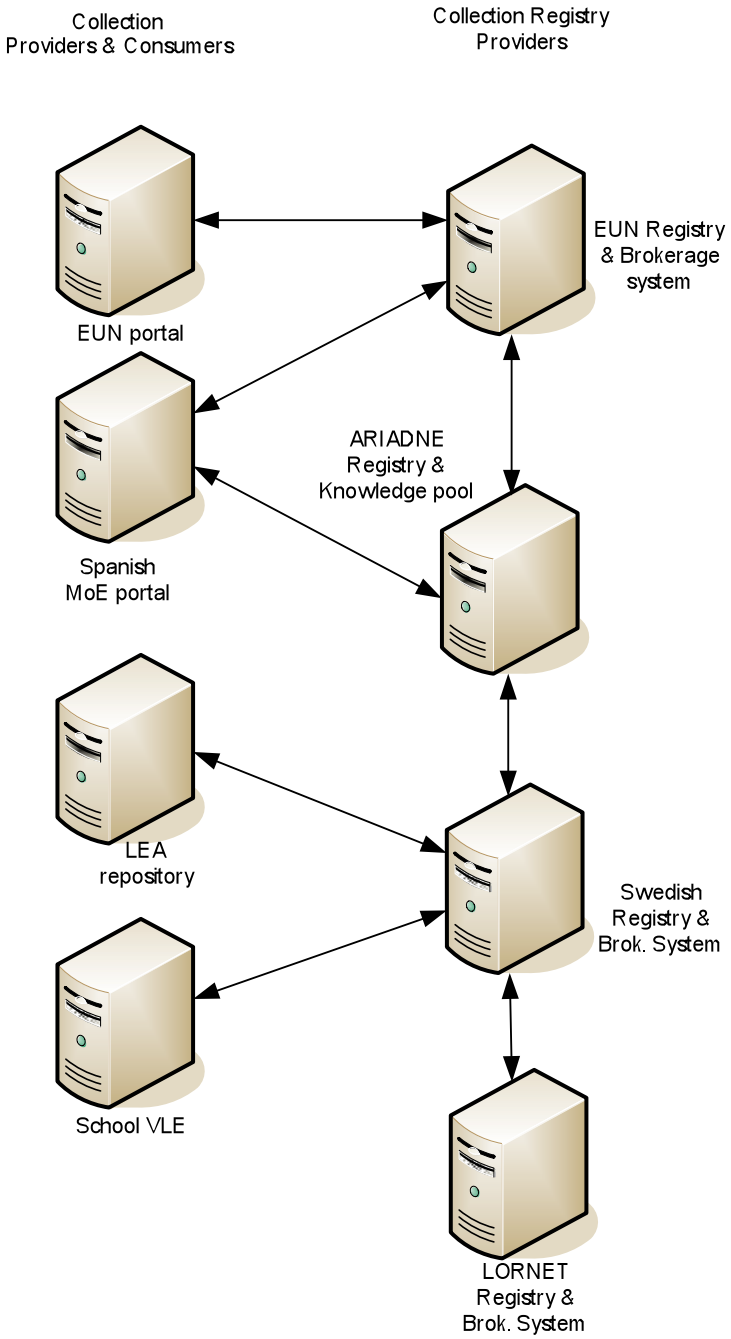

Fig. 2. Example of Deployment of the Registries

However, any registry can still decide not to share information about its own collections by setting the metadata element collection.sharable to false.

A collection description registry provides also a website where the public collection descriptions can be found and searched.

5 Example usage scenarios elaborated

In this section, the usage scenarios of section 3 are revisited and an explanation on how they would operate given the information model and architecture.

The broker
The broker typically will harvest metadata from providers and/or implement a federated search. The broker, for example EUN with name 'lre-registry.eun.org', would hence implement a collection registry and provide access points to its different collections. This might be the totality of all metadata available at the broker or a subset, for example the European Mathematics collection for schools. As depicted in figure 1, a collection might consist of a number of sub-collections; in our example the European Mathematics collection for schools consists of the mathematics collections of all ministries of education. Each of these sub-collections will in turn have an access point that can now be used to implement a federated search and/or for harvesting.

The EUN is also interested in obtaining metadata about collections that have been registered in the ARIADNE registry. Since, the registry software is built such that deployed registry systems can query each other, the EUN obtains information about other mathematics collections that have been registered in the ARIADNE registry and adds these collections information to its own registry.

The content provider
A provider, of for example architectural learning material, would like to make his collection available to a wider audience. He therefore consults the European Collection Registry list and finds the ARIADNE broker an interesting partner. Once granted access to the registry by the ARIADNE broker, he provides all registry data required. Since he has access to the collection metadata, he can easily change for example the technical contact person for his collection at a later stage.

The tools provider
A VLE provider wants to give his customers the facility to define collections. He implements the registry software as part of the VLE administration functionality, allowing administrators to define interesting collections that can be searched from within the VLE. The VLE also provides the search capabilities that will search all collections of which descriptions have been imported.

The consumer
A large secondary school in Spain is a customer of the VLE provider just described. The responsible for learning materials consults the registry of the Spanish ministry of education and selects a number of interesting collection descriptions to be imported in its school VLE. This is all that the administrator needs to do, in order to give the teachers and learners of the school access to the all metadata of those collections. In addition if the learning objects of these collections have for example a creative commons license, then the learning material can be used immediately by all teachers and learners by utilising the VLE.

An Swedish institute has deployed a collection registry that drives its brokerage system connecting several Swedish repositories. A Swedish school gets permission to annotate the collections and marks a number of collections with annotation.selection = true. In that way it selects a number of collections of interest to the school. The Swedish institute runs also a portal on top of the brokerage system and provides a facility to schools to search only in their favourite (i.e. with annotation.selection = true) collections. In this way the Swedish institute can customise its portal for different schools.

6 Conclusions

Despite the dramatic increase of access to learning material through the development of federations of repositories, most of the learning resources remain undiscovered. The reason is that the repositories themselves and the collections of learning material they contain are hardly known and if they known, accessing them is too difficult. The use of a number of registries of descriptions of collections of learning resources can make a substantial difference if the same format is used globally. All parties: brokers, content providers, tools providers, and especially content consumers can benefit from interoperability of the collection descriptions and the registries holding them. Indeed, collection registries facilitate access to all learning material and this improves recall. The notion of collection and the fact that they can be selected by consumers improves precision. Only a comprehensive approach as presented in this paper will ensure that all parties involved will be able to work in a concerted fashion.

7 Acknowledgement

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8 References

[1] Learning Resource Exchange: http://lre.eun.org
[2] ARIADNE: http://www.ariadne-eu.org/
[3] GLOBE: http://www.globe-info.org/
[4] FRED: http://fred.usq.edu.au/
[5] IMS LODE: http://www.imsglobal.org/lode.html
[6] ASPECT Project: http://aspect.org
[7] European Treasury Browser: http://etb.eun.org
[9] AGORA: http://hosted.ukoln.ac.uk/agora/
[10] The European Library: http://www.theeuropeanlibrary.org/
[11] The IMS LODE Charter: http://www.imsglobal.org/getpdf.cfm?DocName=lodeCharter.pdf
[12] SQI: http://fire.eun.org/CWA15454-00-2005-Nov.pdf
[13] OAI-PMH: http://www.openarchives.org/OAI/openarchivesprotocol.html

This appendix describes a draft full element set for collection metadata. The data types are as described in other specifications and application profiles. However, a new concept has been used. Given that the collection metadata describe a set of learning objects. It is for certain categories important to indicate whether they apply to all learning objects of the collection or only to some. For example the collection might have metadata in the Dutch and French for all learning objects but only some learning objects have also English metadata.

In order to indicate these differences we introduce the 'scope' qualifiers: "all" and "some". A scoped LangString is then a LangString that can take one of these scope qualifiers.

COLLECTION METADATA FULL ELEMENT SET v0.1								
Nr	**Name**	**Description**	**Multiplicity**	**Order**	**Value space**	**Data type**	**Note**	**Example**
1	General	This category groups the general information that describes this collection as a whole.	1	Unspecified	-	-		-
1.1	Identifier	A globally unique label that identifies this collection.	1..* (10)	Unordered	-	-		-
1.1.1	Catalog	The name or designator of the identification or cataloging scheme for this entry. A namespace scheme.	1	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)		"CELEBRATE", "ISBN", "ARIADNE", "URI"
1.1.2	Entry	The value of the identifier within the identification or cataloging scheme that designates or identifies this collection. A namespace specific string.	1	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)		"DB123456", "2-7342-0318", "LEAO875", "http://foo.org/1234"
1.2	Title	Name given to this collection.	1	Unspecified	-	LangString (smallest permitted maximum: 1000 char)		("en", "Animal sounds from conifer forest")
1.3	Description	A textual description of	0..* (10)	Unordered	-	LangString	This element corresponds	("en", "This is a collection of animal

		the content of this collection.				(smallest permitted maximum: 2000 char)	to the Dublin Core element DC.Description.	sounds recorded in a conifer forest at different seasons")
1.4	RepositoryType	The type of repository or repositories to which this collection belongs	0..1	Unspecified	referatory repository mixed	VocabularyTerm	'referatory' means that the collection consists only of metadata. 'repository' means that the collections consists of metadata and the learning resources as well 'mixed' means that the collection consists of metadata and that for some metadata also the learning resources are available If this collection is a virtual collection spanning more than one repository then the sub-collections must all be the repositoryType 'referatory' for this collection to also have the repositoryType 'referatory'. The same holds for 'repository' mutatis mutandis. Otherwise the repositoryType is 'mixed'	
2	Life Cycle	This category describes the history and current state of this collection and those entities that have affected this collection during its evolution.	0..1	Unspecified	-	-		-
2.1	Version	The edition of this collection.	0..1	Unspecified	-	LangString (smallest permitted maximum: 50 char)	Providers may wish to give a new version number to the collection if it changes significantly. Typically one would not consider that there is a new version if a single resource is added to or deleted from the collection	("en","1.2.alpha"),
2.3	Contribute	Those entities (i.e.,	0..* (30)	Ordered	-	-	This data element should	-

		people, organizations) that have contributed to the state of this collection during its life cycle (e.g., validation, publication).					be considered in a very broad sense here, as all actions that affect the state of the collection.	
2.3.1	Role	Kind of contribution.	1	Unspecified	publisher unknown validator content provider educational validator subject matter expert	VocabularyTerm		-
2.3.2	Entity	The identification of and information about entities (i.e., people, organizations) contributing to this collection. The entities shall be ordered as most relevant first.	1..* (40)	Ordered	vCard, as defined by IMC vCard 3.0 (RFC 2425, RFC 2426).	CharacterString (smallest permitted maximum: 1000 char)		-
2.3.3	Date	The date of the contribution.	0..1	Unspecified	-	DateTime	-	“2003-03-13”
3	Meta-Metadata	This category describes how this collection metadata instance can be identified, who created this metadata instance, how, when, and with what references.	0..1	Unspecified	-	-	-	-
3.1	Identifier	A globally unique label that identifies this metadata record.	0..* (10)	Unordered	-	-	-	-
3.1.1	Catalog	The name or designator of the identification or cataloging scheme for this entry. A namespace scheme.	1	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"ARIADNE", "URI"
3.1.2	Entry	The value of the identifier within the identification or cataloging scheme that designates or identifies this collection. A	1	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"KUL532", “http://foo.org/desc/1234”

		namespace specific string.						
3.2	Contribute	Those entities (i.e., people, organizations) that have affected the state of this metadata during its life cycle (e.g., creation, provision, validation).	0..* (10)	Ordered	-	-	This data element is concerned with contributions to the metadata. To the metadata of this collection.	-
3.2.1	Role	Kind of contribution.	1	Unspecified	creator provider validator	VocabularyTerm some coming from LOMv1.0 and LREv3.0 (see section	-	-
3.2.2	Entity	The identification of and information about entities (i.e., people, organizations) contributing to this collection metadata. The entities shall be ordered as most relevant first.	1..* (10)	Ordered	vCard, as defined by IMC vCard 3.0 (RFC 2425, RFC 2426).	CharacterString (smallest permitted maximum: 1000 char)	-	-
3.2.3	Date	The date of the contribution.	0..1	Unspecified	-	DateTime	-	“2003-03-13”
3.3	Metadata Schema	The name and version of the authoritative specification used to create this metadata instance.	0..* (10)	Unordered	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 30 char)	If multiple values are provided, then the metadata instance shall conform to multiple metadata schemas. NOTE: This element is not supposed to be exposed to the users.	“IMS-LODEv1.1” “GLOBEv1.0”
3.4	Language	Language of this collection metadata instance. This is the default language for all LangString values in this metadata instance. If a value for this data element is not present in a metadata instance, then there is no default language for LangString	0..1	Unspecified	See 1.3:General.Language For this data element, "none" shall not be an acceptable value.	CharacterString (smallest permitted maximum: 100 char)	This data element concerns the language of the collection metadata instance.	“en”

		values.						
3.5	Rights	Descriptions of the conditions of use of the collection metadata (i.e. this instance)	0..* (10)	Unordered		LangString (smallest permitted maximum: 1000 char)	This concerns the rights on this collection metadata. The rights are specified to the whole collection metadata except section 7 (annotations), where the contributors of the annotations hold their own rights. It is recommended to use a creative commons scheme for this category	
3.6	Sharable	Indicates whether this collection metadata record can be exposed to another registry	0..1	unspecified	yes no	VocabularyTerm		
4	Metadata	This category describes the metadata of the learning objects of this collection	1	Unspecified	-	-		-
4.1	Language	The language of the learning objects in this collection	0..* (100)	Unordered	See 1.3:General.Language For this data element, "none" shall not be an acceptable value.	Scoped CharacterString (smallest permitted maximum: 100 char)	This data element concerns the language(s) of the metadata of the learning objects of this collection.	<”all”,”nl”>, <”all”,”fr”> <”some”,“en”>
4.2	Involved Party	Those entities (i.e., people, organizations) that have affected the state of the learning objects in this collection during its life cycle (e.g., creation, validation).	0..* (10)	Ordered	-	Scoped	This data element is concerned with contributions to the metadata of the learning objects of this collection.	-
4.2.1	Role	Kind of contribution.	1	Unspecified	creator owner provider validator technical contact	VocabularyTerm	With the value ‘owner’ one refers to the rights owner of the LO metadata of this collection	-
4.2.2	Entity	The identification of and information about entities (i.e., people, organizations) contributing to this metadata. The entities shall be ordered as most	1..* (10)	Ordered	vCard, as defined by IMC vCard 3.0 (RFC 2425, RFC 2426).	CharacterString (smallest permitted maximum: 1000 char)	-	-

		relevant first.						
4.2.3	Date	The date of the contribution.	0..1	Unspecified	-	DateTime	-	“2003-03-13”
4.3	QA Procedures	The quality assurance procedures used for the metadata of the learning objects in this collection	0..* (10)	Unordered		Scoped LangString (smallest permitted maximum: 1000 char)	-	
4.4	Rights	Description of the conditions of use of for the metadata of the learning objects in this collection	0..* (10)	Unordered		Scoped LangString (smallest permitted maximum: 1000 char)	This concerns the rights on the metadata of the learning objects of this collection	
4.5	Collection Access	This category describes how the collection can be accessed	1..* (10)	Unordered	-	-	-	-
4.5.1	Visibility	An indication of the access is private or public	0..1	Unspecified	private public	VocabularyTerm	If no value is provided, typically an application profile would specify that the collection is assumed to be private	
4.5.2	Access Point	A globally unique label that gives access to the collection in conjunction with the collection identifier	1	Unspecified		CharacterString (smallest permitted maximum: 1000 char)	In ordered to obtain access to this collection, the application profile should specify which collection identifier(s) (see 1.1) should be used.	“lre-registry.eun.org/sqi”
5	Content	This category describes the content of the collection.	0	Unspecified	-	-		-
5.1	Keyword	A keyword or phrase describing the topic of the learning objects in this collection	0..* (10)	Unordered	-	Scoped Langstring		<”all”,“mathematics”> <”some”,”geometry”>
5.2	Language	Language of the learning objects in this collection.	0..* (100)	Unordered	See 1.3:General.Language For this data element, "none" shall not be an acceptable value.	Scoped CharacterString (smallest permitted maximum: 100 char)		“en”
5.4	Learning Resource Type	Language of the learning objects in this collection.	0..* (100)	Ordered		Scoped VocabularyTerm	Vocabulary terms are given in order of importance	<”all”,”video”>

5.5	Intended End User Role	Role of principal user(s) for which the learning objects in this collection were designed, most dominant first..	0..7	Ordered	author counsellor learner manager parent teacher other	Scoped VocabularyTerm	Vocabulary terms are given in order of importance	<”all”,“teacher”>
5.6	Context	The principal environment within which the learning and use of the learning objects in this collection is intended to take place.	0..12	Unordered	pre-school compulsory education special education vocational education higher education distance education continuing education professional development library educational administration policy making other	Scoped VocabularyTerm		<”some”,“higher education> ”
5.7	Typical Age Range	Age of the typical intended user.	0..1	Unspecified	Typical Age Range is expressed as a range Minimum-Maximum age in years	Scoped LangString		<”all”,“10-12”>
5.8	Involved Party	Those entities (i.e., people, organizations) that have affected the state of the learning objects in this collection (e.g., creation, validation).	0..* (10)	Ordered	-	Scoped	This data element is concerned with contributions to the learning objects in this collection	-
5.8.1	Role	Kind of contribution.	1	Unspecified	creator owner provider validator technical contact	VocabularyTerm	With the value ‘owner’ one refers to the rights owner of the learning objects in this collection	-
5.8.2	Entity	The identification of and information about entities (i.e., people, organizations) contributing to this metadata. The entities shall be ordered as most relevant first.	1..* (10)	Ordered	vCard, as defined by IMC vCard 3.0 (RFC 2425, RFC 2426).	CharacterString (smallest permitted maximum: 1000 char)	-	-

5.8.3	Date	The date of the contribution.	0..1	Unspecified	-	DateTime	-	“2003-03-13”
5.9	QA Procedures	The quality assurance procedures used for the learning objects in this collection	0..1	Unspecified	-	Scoped LangString (smallest permitted maximum: 1000 char)		
5.10	Rights	Descriptions of the conditions of use of the learning objects in this collection	0..* (10)	Unordered	-	Scoped LangString (smallest permitted maximum: 1000 char)		
5.11	Example	Examples from this collection	0..* (10)	Unordered	-	MediaDescriptor		
6	SubCollection identifier	This category describes possible sub-collections	0..* (100)	Unordered	-	-		-
6.1	Catalog	The name or designator of the identification or cataloging scheme for this entry. A namespace scheme.	1	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	It is recommended to use the registry URI if it exists	“registry.ariadne.org”
6.2	Entry	The value of the identifier within the identification or cataloging scheme that designates or identifies this collection. A namespace specific string.	1	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"MACE"
7	Annotation	This category allows other parties than the ones of 3.2 to annotate this collection.	0..* (100)	Unordered	-	-		-
7.1	Contributor	The identification of and information about entities (i.e., people, organizations) contributing to this metadata. The entities shall be ordered as most relevant first.	1	Unspecified	vCard, as defined by IMC vCard 3.0 (RFC 2425, RFC 2426).	CharacterString (smallest permitted maximum: 1000 char)	-	-
7.2	Date	The date of the contribution.	0..1	Unspecified	-	DateTime	-	“2003-03-13”
7.3	Keyword	A keyword or phrase	0..* (100)	Unordered		Langstring	This metadata element can	<“en”,”biology”>

		describing the topic of the learning objects in this collection					be used for social tagging	
7.4	Description	A textual description of the content of this collection.	0..* (10)	Unordered		Langstring		<“en”,”Wow, this is a cool collection”
7.5	Rating	This category indicates the value of this collection for the contributor given in 7.1	0..1	Unspecified		Number	The rating applies to the collection as a whole. It is recommended that higher numeric values signify higher appreciation of the collection	“5”
7.6	Selection	This category allows the contributor of 7.1 to specify whether this collection should be taken into account when processing this collection	0..1	Unspecified	yes no	VocabularyTerm	This metadata element can for example be used by a broker to limit the search for the contributor given in 7.1	“yes”
7.7	Visibility	This category indicates whether this annotation can be shared with other parties	0..1	Unspecified	private public	VocabularyTerm	An application profile can specify which of the metadata element from 7.1 to 7.6 will be exposed or shared with other parties	“public”