

What Is...

What is IEEE Learning Object Metadata / IMS Learning Resource Metadata?

by Phil Barker

In Brief

What is IEEE Learning Object Metadata / IMS Learning Resource Metadata?

The IEEE 1484.12.1 – 2002 Standard for Learning Object Metadata is an internationally recognised open standard (published by the Institute of Electrical and Electronics Engineers Standards Association) for the description of “learning objects”. The IEEE working group that developed the standard defined learning objects as being “any entity, digital or non-digital, that may be used for learning, education or training”, a definition which has struck many commentators as being rather broad in its scope. IEEE 1484.12.1 is the first part of a multipart standard, and describes the LOM data model. The LOM data model specifies which aspects of a learning object should be described and what vocabularies may be used for these descriptions; it also defines how this data model can be amended by additions or constraints. Other parts of the standard are being drafted to define bindings of the LOM data model, i.e. define how LOM records should be represented in XML and RDF (IEEE 1484.12.3 and IEEE 1484.12.4 respectively). This briefing paper focuses on the LOM data model rather than issues relating to XML or other bindings.

IMS Global Learning Consortium is an international consortium that contributed to the drafting of the IEEE Learning Object Metadata and endorsed early drafts of the data model as part of the IMS Learning Resource Meta-data specification (IMS LRM, versions 1.0 – 1.2.2). Feedback and suggestions from the implementers of IMS LRM fed into the further development of the LOM, resulting in some drift between version 1.2 of the IMS LRM specification and what was finally published at the LOM standard. Version 1.3 of the IMS LRM specification realigns the IMS LRM data model with the IEEE LOM data model and specifies that the IEEE XML binding should be used. Thus we can now use the term “LOM”

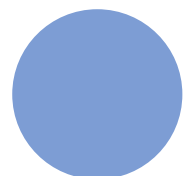
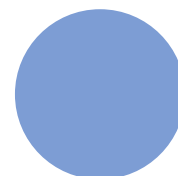
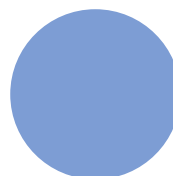
in referring to both the IEEE standard and version 1.3 of the IMS specification. The IMS LRM specification also provides an extensive Best Practice and Implementation Guide, and an XSL transform that can be used to migrate metadata instances from the older versions of the IMS LRM XML binding to the IEEE LOM XML binding.

What is the LOM for?

Some of the main things that the LOM is designed to help you achieve are:

Creation of well structured descriptions of learning resources. These descriptions should help facilitate the discovery, location, evaluation and acquisition of learning resources by students, teachers or automated software processes.

- Sharing of descriptions of learning resources between resource discovery systems. This should lead to a reduction in the cost of providing services based on high quality resource descriptions.
- Tailoring of the resource descriptions to suit the specialised needs of a community. This may include choosing suitable controlled vocabularies for classification, reducing the number of elements that are described or adding new ones from other resource description schemas.
- Creators and publishers may use the LOM along with other specifications to “tag” learning resources with a description that can be associated with the resource. This will provide information in a standard format similar to that found on the cover and fly-page of a text book.



Technical Details

How the IEEE LOM Works

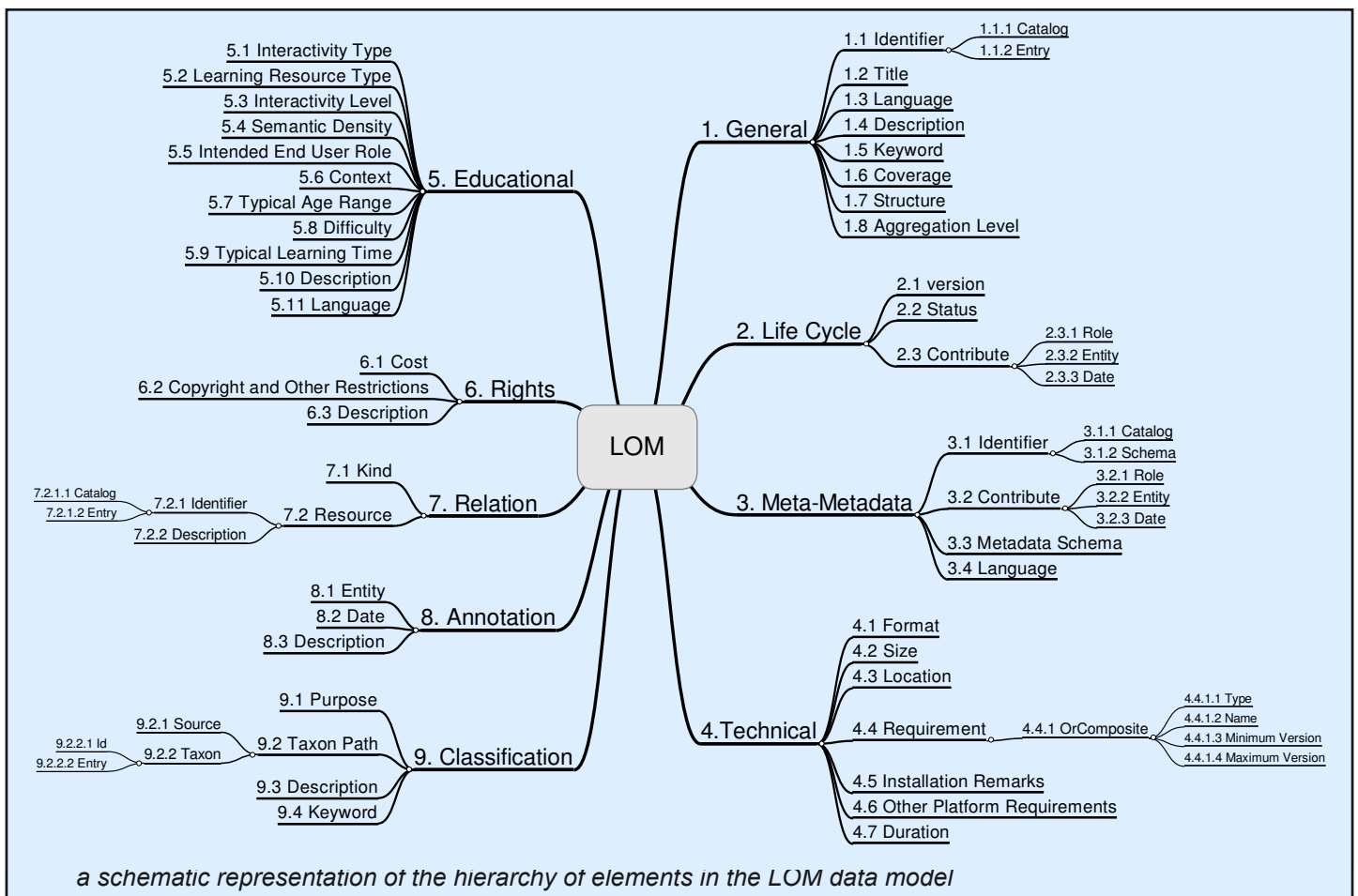
The LOM comprises a **hierarchy of elements** shown in figure 1. At the first level there are nine categories, each of which contains sub-elements; these sub-elements may be simple elements that hold data, or may themselves be aggregate elements, which contain further sub-elements. The semantics of an element are determined by its context: they are affected by the parent or container element in the hierarchy and by other elements in the same container. For example the various *Description* elements (1.4, 5.10, 6.3, 7.2.2, 8.3 and 9.3) each derive their context from their parent element. In addition, description element 9.3 also takes its context from the value of element 9.1 *Purpose* in the same instance of *Classification*.

The data model specifies that some elements may be repeated either individually or as a group: for example the elements 9.3 (*Description*) and 9.1 (*Purpose*) can only occur once within each instance of the *Classification* container element. However the *Classification* element may be repeated, thus

allowing many descriptions for different purposes.

The data model also specifies the **value space** and **datatype** for each of the simple data elements. The value space defines the restrictions, if any, on the data that can be entered for that element. For many elements the value space allows any string of Unicode character to be entered, for other elements entries must be drawn from a declared list (i.e. a controlled vocabulary) or must be in a specified format (e.g. date and language codes). Some element datatypes simply allow a string of characters to be entered, others comprise two parts as described below.

- **LangString** items contain Language and String parts, allowing the same information to be recorded in multiple languages.
- **Vocabulary** items are constrained in such a way that their entries have to be chosen from a controlled list of terms. Such elements are composed of Source-Value pairs; the Source should contain the name of the list of terms being used and the Value should contain the chosen term.



- **DateTime** and **Duration** items contain one part that allows the date or duration to be given in a machine readable format, and a second that allows a description of the date or duration (for example “mid summer, 1968”).

When implementing the LOM as a data or service provider, it is not necessary to support all the elements in the data model, nor need the LOM data model limit the information which may be provided. The creation of an **application profile** allows a community of users to specify which elements and vocabularies they will use. Elements from the LOM may be dropped and elements from other metadata schemas may be brought in; likewise, the vocabularies in the LOM may be supplemented with values appropriate to that community.

Requirements

The key requirements for exploiting the LOM as a data- or service provider are:

- to understand user/community needs and to express these as an application profile;
- to have a strategy for creating high quality metadata,
- to store this metadata in a form which can be exported as LOM records,
- to agree a binding for LOM instances when they are exchanged,
- to be able exchange records with other systems either as single instances or *en masse*.

Related Specifications

There are many metadata specifications, of particular interest is the Dublin Core Metadata Element Set (commonly known as Simple Dublin Core, standardised as ANSI/NISO Z39.85 – 2001), which provides a simpler more loosely defined set of elements with some overlap with the LOM, and which is useful for sharing metadata across a wide range of disparate services. The Dublin Core Metadata Initiative is also working on a set of terms which allow the Dublin Core Element Set to be used with greater semantic precision (Qualified Dublin Core). The Dublin Education Working Group aims to provide refinements of Dublin Core for the specific needs of the education community. Details of Dublin Core can be found at <http://dublincore.org/>.

Many other education-related specifications allow for LOM metadata to be embedded within XML instances, for example describing the resources in an IMS Content Package or Resource List, describing the vocabularies and terms in an IMS VDEX (Vocabulary Definition and Exchange) file, and describing the question items in an IMS QTI (Question and Test Interoperability) file. Details of these can be found at <http://imsglobal.org/>.

The IMS Vocabulary Definition and Exchange (VDEX) specification has a double relation with the LOM, since not only can the LOM provide metadata on the vocabularies in a VDEX instance, but VDEX can be used to describe the controlled vocabularies which are the value space for many LOM elements.

LOM records can be transported between systems using a variety of protocols, perhaps the most widely used being OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting, see <http://openarchives.org/>).

Application Profiles

For UK Further and Higher Education the most relevant family of application profiles are those based around the UK LOM Core. See <http://www.cetis.ac.uk/profiles/uklomcore>

Other important application profiles are those developed by the Celebrate project. See http://www.eun.org/ww/en/pub/celebrate_help/application_profile.htm

and the metadata profile that is part of the SCORM reference model. See <http://www.adlnet.org/index.cfm?fuseaction=scormabt>



Resources

People, products and services

The CETIS Metadata and Digital Repository special interest group <http://metadata.cetis.ac.uk/> has two email lists, the SIG list <http://www.jiscmail.ac.uk/cetis-metadata> will keep you up to date on all SIG activities and spec development related to metadata and digital repositories; the LOM-cataloguing list, <http://www.jiscmail.ac.uk/lom-cataloguing> is for queries relating to the creation and management of LOM descriptions.

The following tools allow the creation and/or storage of LOM or IMS LRM 1.2.1 instances (it is still important to check the version of the data model and XML binding are being used):

Metadata Editors

- Reload, includes an open-source editor for IMS LRM <http://www.reload.ac.uk/>
- Curriculum Online Tagging Tool is used for creating metadata for online resource made available to schools in England. <http://www.curriculumonline.gov.uk/SupplierCentre/taggingtooldownload.htm>

Repositories / Catalogues

- IntraLibrary (<http://www.intralibrary.com/>) and
- Xtensis (<http://www.xtensis.co.uk/>) are both commercial learning object repository systems. They were both tested by the Jorum project (<http://www.jorum.ac.uk>).
- HarvestRoad Hive is a commercial federated digital repository system, i.e. it is designed share content across multiple repositories. http://www2.harvestroad.com.au/cgi-bin/hr/loadframes_tmp.cgi?lcms
- Splash is open source software which allows educators to build personal repositories. <http://www.edusplash.net/>

Resources on the Internet

CanCore is simply the most thorough element-by-element guide to the LOM in existence. <http://www.cancore.ca/>

IMS Global Learning Consortium Learning resource meta-data specification. <http://www.imsglobal.org/metadata/>

About this guide

This guide was produced by CETIS, the Centre For Educational Technology Interoperability Standards. For more information on CETIS, visit <http://www.cetis.ac.uk>.

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About CETIS

CETIS is the JISC's Centre For Educational Technology Interoperability Standards. For more information visit the CETIS website at <http://www.cetis.ac.uk/>

