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Article abstract

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Technical Evaluation Report

11. International E-learning Specifications

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Abstract

A previous report in this series discussed the classification of online course delivery systems according to the Advanced Distributed Learning Partnerships (ADL), and the international standards accepted by the ADL. The standardisation of courseware in this manner is necessary for the development of inter-institutional course sharing and quality control. The present report gives further definitions of the criteria applied by international standards organisations, and lists the principal specifications/ standards bodies now in operation.

Definitions

The following definitions have been adapted from Webopedia (<http://webopedia.internet.com>).

Specifications are less evolved than standards and attempt to capture a rough consensus in the user or implementer community. Specifications enable people to get on with the job of system and content development. It can take a long time before specifications are finally approved as standards.

Standards are definitions or formats that have been approved by a recognised standards organisation, or are accepted as *de facto* standards by the industry. Standards serve a regulatory function and have been created for programming languages, operating systems, data formats, communications protocols, and electrical interfaces.

Application Profile is a simplified and interpreted version of a standard or specification that is created to serve the needs of a particular community of users or implementers. Application profiles can combine elements from more than one specification or standard into a single profile, but should not modify these in such a way that would impact interoperability negatively.

Metadata is data “about data.” Like a card or record in a library catalogue, metadata describes a resource (e.g., a book, document, video clip, application), but unlike a library record, metadata can either be embedded in the resource it describes, or be located separately from it. Metadata can be generated either manually or automatically, but is most often structured according to semantically understood elements – access points such as author, title and location.

Interoperability is the ability of systems or components to work together, without unnecessary human intervention. In the case of metadata, interoperability refers specifically to the ability to exchange information and to process information that has been exchanged. True interoperability would allow users to search and otherwise make use of systems in a seamless manner – despite their location, origin, or internal operation.

XML is the acronym for *Extensible Markup Language*, a specification defining syntax for tagging that often looks similar to HTML. But unlike HTML, XML allows developers to create their own custom tags. This makes it possible to label the purpose of particular elements in a document – instead of simply specifying the way these elements might appear in a Web browser, as is the case with HTML. A set of tags or elements created in XML that specify the kind and format of permitted data is known as a DTD (Document Type Definition) or Schema. XML documents that actually contain this data are known as XML records.

Specifications

Dublin Core (<http://purl.oclc.org/dc/>) is named for Dublin, Ohio, not Dublin, Ireland, and has been described as the most broadly based metadata specification. It coexists comfortably with the other metadata sets and is intended to facilitate interoperability between the semantics of metadata specifications. *Dublin Core* metadata is syntax-independent, and can be encoded in a number of ways – in metatags in the header of an HTML document, in XML documents or in RDF/XML markup. *Dublin Core* consists of only fifteen optional elements such as Title, Description, Creator, Subject, etc.

IMS (<http://imsproject.com>), the acronym for Instructional Management Systems, was established by *EduCom* (now *EduCause*) in 1994. The mandate of IMS is to serve as a catalyst for the development of instructional software, the creation of an online management infrastructure for learning, the facilitation of collaborative learning activities and certification. Its members include *Apple, Cisco, IBM, Industry Canada, Microsoft, Oracle, Sun*, and the US Defence Department. The *IMS* has been developing a number of specifications for the community of e-learning developers: i.e., content packaging, digital repository interoperability, and learning design. Included with these is a metadata specification that both incorporates and extends the *Dublin Core*. Bindings or encodings are available for *IMS* metadata in both XML and RDF/XML. Although the *IMS* metadata schema represents an important activity, the *IMS* is *not* just a metadata schema. The *IMS* is involved in the development of other learning application specifications.

ARIADNE (<http://ariadne.unil.ch/>), the acronym for The Alliance of Remote Instructional Authoring and Distribution Networks for Europe, has fostered the sharing and reuse of electronic pedagogical material by universities and corporations. It attempted to create a European-wide repository for pedagogical documents called the Knowledge Pool System. It has also acted as a co-author of the *IMS* metadata structure.

ADL SCORM (<http://www.adlnet.org/Scorm/>) is the Advanced Distributed Learning Network Sharable Courseware Object Reference Model, supported by the US Department of Defence and the US government. It combines and interprets a number of interrelated technical specifications built upon the work of the *AICC, IMS* and *IEEE* to create a unified content model. This model specifies the behaviour and aggregation of modular, interactive learning components, and makes extensive use of XML. Like *IMS*, *SCORM* is *not* simply concerned with metadata, but combines metadata with a number of other specifications that deal with a variety of aspects of learning content and management.

Standards

IEEE LTSC LOM (<http://ltsc.ieee.org>) is the acronym for The Institute for Electrical and Electronics Engineers Learning Technologies Standards Committee, which creates and supports standards and best practices related to the technical aspects of e-learning. The *IEEE LTSC* is releasing the Learning Object Metadata, referred to as IEEE LTSC LOM P1484.12, as an approved standard. This standard is almost identical to the *IMS* metadata specification, and is compatible with *Dublin Core* metadata.

ISO (http://jtc1sc36.org/#terms_of_reference) is the acronym for the International Standards Organization, a network of the national standards institutes of some 130 countries responsible for coordinating the development of international standards of all sorts. The Information Technology for Learning, Education, and Training Committee of the *ISO* supports the standardisation of information and communications technologies for learning. This sub-group liaises closely with the *IEEE LTSC*. The standard number being used for educational metadata is *IECJTC1 SC36*.

Application Profile

There are other organizations working on metadata that conforms to international metadata specifications. Because the purpose of metadata is to enable interoperability between systems, organisations involved want to conform to emerging metadata standards. For example, the Canadian Core Metadata Application Profile, or *CanCore*, is an attempt to interpret and simplify the elements of the *IMS* model.

CanCore (<http://www.cancore.ca>) is the acronym for The Canadian Core Learning Resource Metadata Application Profile, and is primarily concerned with the vocabularies and semantics associated with *IMS* metadata elements. Users of the *CanCore* protocol know that their data will conform to the emerging international standard for educational metadata based on and fully compatible with the *IMS* Learning Resource Metadata Information Model. *CanCore* has defined a sub-set of data elements from this *IMS* model for the purposes of the efficient and uniform description of digital educational resources. It is intended to facilitate the interchange of records describing educational resources and the discovery of these resources. *CanCore* is at the leading edge in providing both semantic and syntactic guidance to the implementation of the *IMS* and *IEEE* Learning Object Metadata specifications.

Related Organisations

AICC (<http://aicc.org/>). The Aviation Industry Computer-Based Training Committee created early guidelines and recommendations for online learning systems. It provides guidelines for interoperability using metadata and protocols.

ALIC (<http://www.alic.gr.jp/>). The Advanced Learning Infrastructure Committee, Japan, works with other international standards bodies for metadata. It facilitates interoperability within Japan and outside.

CEN/ ISSS (<http://www.cenorm.be/iss/>). The European Committee for Standardization Information Society Standardization System provides for both formal and informal standardisation. This includes guides to best practice as well as full standards. It works by consensus among industry and consumer groups. It covers a broad constituency and is flexible in its methods.

CSystems RLO/ RIO (<http://www.cisco.com/>). Re-usable Learning Objects/ Re-usable Information Objects are based on chunked reusable objects that form a complete lesson. The objects incorporate metadata that conforms to the IMS/SCORM specifications.

CLEO (<http://www.cleolab.org/>) is the acronym for Customized Learning Experiences Online, and is a one year long research collaboration between corporations including *Cisco Systems*, *Click2Learn*, *IBM Mindspan Solutions*, *Microsoft*, and *NETg*. Using the *ADL SCORM* specification, *CLEO* focuses on applied research on technical and pedagogical issues.

MARBI (<http://www.ala.org/alcts/organization/div/marbi/marbi.html>), the acronym for The Machine-Readable Bibliographic Information Committee, is the body within the American Library Association responsible for developing official *ALA* positions on standards for the representation in machine-readable form of bibliographic information. *MARBI* focuses its attention on the development of the *MARC* format.

MARC 21 (<http://lcweb.loc.gov/marc/>). The Machine-Readable Cataloguing record is a library standard for the representation and communication of bibliographic and related information in a machine-readable form. It is comprised three elements: (1) record structure, (2) content designation, and (3) data content of the record. Supported by the Library of Congress Network Development and *MARC* Standards Office, *MARC* consists of dozens of metadata elements, yet is generally not considered flexible enough for the cataloguing of Internet resources. *Dublin Core* is perceived by many as a substitute for *MARC* in this area of distributed digital resources.

Microsoft LRN (<http://www.microsoft.com/elearn/support.asp>). The Microsoft Learning Resource Interchange is a specific implementation of the *IMS* content packaging specification, . 1.0. *Microsoft LRN* incorporates the *IMS* metadata and provides a toolkit.

OAI (<http://www.openarchives.org/>) is the acronym for the Open Archives Initiative, which advances interoperability standards that facilitate the propagation of content, and increases accessibility to intellectual content. Among the most important of the *OAI* initiatives is the metadata harvesting protocol, a means of systematically sharing metadata records across distributed databases or repositories. The *OAI* is supported by the Digital Library Federation and the Coalition for Networked Information.

Warwick Framework (<http://www.dlib.org/dlib/july96/lagoze/07lagoze.html>) has not been widely accepted, but remains significant for metadata generally. Warwick Framework provides a higher-level context for *Dublin Core*, nesting components or packages of information in containers, thus facilitating interoperability. It allows for the selective manipulation of data.

Z39.50 (<http://www.loc.gov/z3950/agency/>). The International Standards Maintenance Agency and the Library of Congress Network Development and *MARC* Standards Office support this information retrieval protocol that facilitates communication among different information systems. *Z39.50* allows users to search multiple, heterogeneous databases from a single interface or point of access in real time. It is widely used in libraries and it supports *MARC* records and other types of metadata.

Learning Object Repositories

The metadata employed by these repositories may not conform fully to the international standards. They are given here as working examples of learning object repositories.

CAREO (<http://www.careo.org>) is the acronym for the Campus Alberta Repository of Educational Objects, and has as its primary goal the creation of a searchable Web-based collection of multidisciplinary teaching materials for educators across Alberta and beyond.

CAREO is a project undertaken jointly by the University of Alberta and the University of Calgary in cooperation with Broadband Enabled Lifelong Learning Environment (*BELLE*), Canadian Network for the Advancement of Research in Industry and Education (*CANARIE*), and the University of Calgary Health Education Cluster project.

GEM (<http://www.thegateway.org/>). The Gateway to Educational Materials is learning object repository housing un-catalogued educational materials. It is supported by a consortium of more than 200 organizations and individuals under the aegis of the US Department of Education and *ERIC*.

JA-SIG (<http://www.mis2.udel.edu/ja-sig/>) is the acronym for the Java in Administration Special Interest Group, a collection of interactive online learning materials written in the Java computer language. It was created before the emergence of international specifications in the area of educational metadata.

MERLOT (<http://www.merlot.org>) is the acronym for the Multimedia Educational Resource for Learning and Online Teaching, a project of the California state university system under the Distributed Learning and Teaching, and Multimedia Repository initiatives. *MERLOT* houses a collection of high quality interactive online learning materials, many of which have been evaluated by professionals.

TeleCampus Online Course Directory (<http://telecampus.edu>). The *TeleCampus* metadata repository has a data structure that conforms to international specifications. It consists of Web links to more than 55,000 courses, modules, and lessons in over 30 countries. Note that it houses only the metadata and not the actual lessons, modules, and courses. It links to the institutions that own them.

Edutella (<http://edutella.jxta.org/servlets/ProjectHome>) is a peer-to-peer exchange network for metadata. *Edutella* is based on the well-known *GNUtella* open source application, and its development is supported by the Wallenberg Global Learning Network, a partnership of organisations in Sweden and Germany.

EML (<http://eml.ou.nl/introduction/>) is the acronym for the Educational Modelling Language, a system for codifying pedagogical experiences created by the Open University of the Netherlands in partnership with *CISCO*. It defines a document type in XML that allows for the modelling of units of study in terms of roles, relations, interactions, and activities.

PALO (<http://sensei.lsi.uned.es/palo/>) is a Spanish initiative similar to EML. It is expressed in XML and has different levels for content, activities, structure, sequencing and management.

This series of software evaluation reports will continue with reviews of other online collaborative tools.

N.B. Owing to the speed with which Web addresses are changed, the online references cited in this report may be outdated. They can be checked at the Athabasca University software evaluation site: <http://cde.athabascau.ca/softeval/>. Italicised product names in this report are assumed to be registered trademarks.

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