

CEN

CWA 15903

WORKSHOP

December 2008

AGREEMENT

ICS 03.180; 35.240.99

English version

Metadata for Learning Opportunities (MLO) - Advertising

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties, the constitution of which is indicated in the foreword of this Workshop Agreement.

The formal process followed by the Workshop in the development of this Workshop Agreement has been endorsed by the National Members of CEN but neither the National Members of CEN nor the CEN Management Centre can be held accountable for the technical content of this CEN Workshop Agreement or possible conflicts with standards or legislation.

This CEN Workshop Agreement can in no way be held as being an official standard developed by CEN and its Members.

This CEN Workshop Agreement is publicly available as a reference document from the CEN Members National Standard Bodies.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

© 2008 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No.:CWA 15903:2008 E

Table of Contents

Foreword	4
1. Introduction	5
2. Scope	5
3. Conformance	6
Conforming Instances	6
Conforming Bindings	6
Conforming Applications	6
4. Normative References	7
5. Other References	7
6. Terms and Definitions	7
7. Concepts	8
Learning Opportunity (LO)	8
Learning Opportunity Provider (LOP)	9
Learning Opportunity Specification (LOS)	9
Learning Opportunity Instance (LOI)	9
8. Classes	10
Properties used to describe relationships between resources	10
Properties included from ISO 15836	11
Properties for Learning Opportunity resources	11
9. UseCases	14
9.1. Business Case: Course Advertising	14
9.2. Business Case: Mediated Application	15
9.3. Business Case: Learning Opportunities Benchmarking	15
9.4. Academic Learning Opportunities Evaluation and Control	16
9.5. Transcript of Records	17
10. Appendix	19
10.1. DCAM	19
10.2. Application Profiles and the roles and usage of	19
10.3. Extensions to properties	19
a) Inclusion of additional properties	19
b) Refinement of properties using sub-properties	19
c) Refinement of properties using vocabulary encoding schemes	19

d)	Refinement of properties using syntax encoding schemes	19
e)	Constraining the use of properties within the profile model	19
10.4.	Graceful degradation	19
10.5.	MLO properties related to other specifications	20
10.6.	Note on IEEE 1484.12.1 Learning Object Metadata	21

Foreword

The MLO work has as its background in the identified need to harmonise different specifications around Europe for describing and exchanging information about courses, elearning offerings, and learning opportunities.

This project was initiated by Norway and had its basis in the Norwegian CDM (Course Description Metadata) work. The CDM specification has been adopted by French universities with some modifications in a project co-ordinated by the French Ministry of Education. In Sweden they used EMIL (Education Information Markup Language), in Germany DIN published (December 2006) the specification PAS 1068 developed in consensus by its DIN-workshop, and the UK had developed XCRI (eXchanging Course-Related Information) into a much used service. In 2004 a project was proposed by the CEN/ISSS WS-LT for harmonisation of the existing specifications and to identify needs and use cases by other countries. As a number of experts and national interests found this a serious market demand, a group of experts in the field set out to do this work on a voluntary unpaid basis.

The group that set out to develop a set of standards on MLO consists of 21 experts from 12 countries and vendors within Europe.

This group has performed the work by regularly on line meetings and physical meetings co located with the CEN WS-LT meetings. To collaborate and develop this document a wiki hosted by Teria AS has been used.

The work has been led by Erlend Øverby from Hypatia AS, Norway. Other experts contributing to the work has been: Scott Wilson (UK, JISC-Cetis), Mark Stubbs (UK, MMU), Kristina Unverricht (Germany, User council of DIN), Marc Van Collie (France, EifEL), Christian M. Stracke (Germany, Vice-Chair CEN TC 353), Ola Berge (Norway, NSSL), Paul Bessems (Netherland, IBLC), Andy Heath (UK, Axelrod consulting), Peter Karlberg (Sweden, MSU), Leopold Kause (Switzerland, UBS AG), Simone Ravaioli (Italy, KION), Sandro Cacciamani (Italy, KION), Cleo Sgouropoulou (Greece, ELOT), Gérard Vidal (France, ENS Lyon), Geir Vangen (Norway, USIT/UiO), Are Rikardsen (Norway, Utdanning.no), Jan Pawlowski (Finland, Chair of CEN/ISSS WS-LT), Tore Hoel (Norway, Vice Chair of CEN/ISSS WS-LT), Mike Collett (UK, Chair CEN TC 353), Linda Feng (Oracle/IMS Enterprise2).

The production of this CEN Workshop Agreement (CWA) specifying the Metadata for Learning Opportunities (MLO) – Advertising, was discussed at the meeting of Workshop Learning Technologies on 13 October 2008 in Louvain and was approved following an electronic process, which finished on 7 November 2008.

A list of companies, which have supported the document's contents, is available from the CEN Management Centre on request.

This CEN Workshop Agreement is publicly available as a reference document from the National Members of CEN : AENOR, AFNOR, ASRO, BDS, BSI, CSNI, CYS, DIN, DS, ELOT, EVS, IBN, IPQ, IST, LVS, LST, MSA, MSZT, NEN, NSAI, ON, PKN, SEE, SIS, SIST, SFS, SN, SNV, SUTN and UNI.

Comments or suggestions from the users of the CEN Workshop Agreement are welcome and should be addressed to the CEN Management Centre.

1. Introduction

MLO-Advertising (MLO-AD) is a standard addressing metadata sufficient for advertising a learning opportunity.

The goal of MLO-AD is to provide information about a learning opportunity, to enable the learner to make a decision if there is a need for more information about the learning opportunity, and where to find that information.

The group has also aimed at developing a lightweight standard that fits well with existing business processes and technologies. The MLO-AD standard is also designed to facilitate semantic technologies and web architectures to support several mechanisms for exchange of the information and aggregation of information by third party service suppliers. Finally, the goal has been to make the standard easy to implement to ensure a rapid uptake by the European countries.

At the design level, the group wanted the standard to support the ECTS descriptions and the exchange of ECTS information.

The standard only describes the datamodel for learning opportunities, and does not give any guidance on the vocabularies that are needed to ensure semantic interoperability between different educational and jurisdictional domains. The reason for not addressing vocabularies is that there is a need for frequently updating and maintaining the vocabularies, and that many vocabularies are mandated by the educational and jurisdictional domains where the standard is used. Therefore all vocabularies will be maintained as separate CEN Workshop Agreements (CWAs) by the CEN/ISSS WS-LT.

In the future the MLO set of standards will be further developed to describe Metadata for Learning Opportunities related to the Europass system used throughout Europe. Based on other needs for metadata related to Learning Opportunities new standardisation projects could also be launched.

NOTE: The *mlo:* namespaces used in this document are provisional and will be changed pending approval by CEN.

2. Scope

This standard defines the electronic representation of Learning Opportunities in order to facilitate their advertising and subsequent discovery by prospective learners.

Key users of the standard will be:

- those who provide opportunities for learning and wish to advertise them;
- those who offer electronic search services that aggregate results from multiple Learning Opportunity providers;
- those who wish to compare Learning Opportunities that have been represented electronically.

The standard presents an abstract model for representing Learning Opportunities. The model specifies three resources about which metadata can be stored to facilitate advertising of Learning Opportunities:

1. Learning Opportunity Provider;
2. Learning Opportunity Specification; and
3. Learning Opportunity Instance.

The standard specifies relations between the three resources and recommends a core set of metadata for each.

CWA 15903:2008 (E)

The model proposed within the standard is not intended to define the electronic representation of Learning Objects in general - the scope of the standard is restricted to define the electronic representations of Learning Opportunities to facilitate their advertising and subsequent discovery by learners. Metadata collected and presented for the purpose of advertising Learning Opportunities may, of course, be used for other purposes - for instance, providing detailed description of a formal learning opportunity to enrich a transcript that showed a learner's educational history. However, guidance on the specification and organisation of metadata for purposes other than advertising Learning Opportunities is outside the scope of this standard.

3. Conformance

Conforming Instances

A *strictly conforming instance* is a set of structured information constituted only of objects and statements defined by the classes and properties of this standard and *fully qualified refinements* of the properties defined in this standard.

A *fully qualified refinement* is defined for the purpose of conformance as a property that explicitly extends a property defined by this standard. A fully qualified refinement must be capable of being processed according to the semantics of the property it extends.

A *conforming instance* may contain additional objects and properties.

NOTE: As there are no cardinality restrictions on any of the properties of this standard, an instance consisting only of one or more objects conforming to classes defined in this standard but without any properties is a strictly conforming instance.

Conforming Bindings

A *strictly conforming binding* is constituted only of bindings to an exchange format of the classes and properties defined by this standard and fully qualified refinements of the properties defined in this standard.

A *conforming binding* may contain additional properties that do not necessarily extend or map to the properties defined in this standard.

Both *strictly conforming bindings* and *conforming bindings* must be capable of generating and validating instances that can be automatically converted to a strictly conforming instance of this standard.

Both *strictly conforming bindings* and *conforming bindings* may impose additional constraints upon the values of properties defined in this standard.

Both *strictly conforming bindings* and *conforming bindings* may impose cardinality constraints on properties defined in this standard.

Both *strictly conforming bindings* and *conforming bindings* may impose cardinality constraints on associations between instances of the classes defined in this standard.

NOTE: Attention is drawn to the GRRDL (Gleaning Resource Descriptions from Dialects of Languages), and XSLT (XSL Transformations), both recommendations of W3C.

Conforming Applications

A *conforming provider* must be capable of generating and sharing (1) conforming instances, and/or (2) instances that conform to a conforming binding.

A *conforming aggregator* must be capable of processing (1) conforming instances, and/or (2) instances that conform to a conforming binding.

4. Normative References

ISO 639, *Codes for the representation of names of languages*

ISO 8601, *Data elements and interchange formats - Information interchange - Representation of dates and times*

ISO 15836, *Information and documentation - The Dublin Core metadata element set*

[IEEE-LOM] Learning Object Metadata IEEE 1484.12.1

5. Other References

[DCMI-SF] DCMI Singapore Framework <http://dublincore.org/documents/singapore-framework/>

[W3C-DTF] W3C DateTime Format

[W3C-RDFS] W3C Resource Description Framework Schema Language 1.0 <http://www.w3.org/TR/rdf-schema/>

[IETF-RFC2396] Uniform Resource Identifier

[DCMI-TERMS] Dublin Core Metadata Initiative: Terms 1.1

DCMI-DSP] DCMI Description Set Profile <http://dublincore.org/documents/2008/03/31/dc-dsp/>

[UML] Unified Modelling Language, v2.1.2 <http://www.omg.org/spec/UML/2.1.2/>

[EN14142-1] EN 14142-1:2003 Postal Services - Address databases - Part 1: Components of postal addresses.

[UPU-S42] UPU S42 Universal Postal Union (UPU) International Postal Address Components and Templates UPS SB42-4, July 2004.

[GEO-RSS] GEORSS: Geographically Encoded Objects for RSS feeds <http://www.georss.org/>

6. Terms and Definitions

Advertising: The process of making descriptions of Learning Opportunities available to external systems. Typically this is for the purpose of encouraging applications from potential learners.

Aggregator: A system (application or service) that collates descriptions of Learning Opportunities from multiple Learning Opportunity Providers in order to offer additional functionality to users based on those descriptions, for example to search, browse, and compare Learning Opportunities.

Broker: A system (application or service) that collates descriptions of Learning Opportunities from multiple Learning Opportunity Providers in order to support one or more business processes, such as mediated application to University, or financial services such as student loans.

Provider: A party (person or organisation) that offers Learning Opportunities. Synonymous with *Learning Opportunity Provider*.

Resource: Anything that might be identified. Familiar examples include an electronic document, an image, a service. Attention is drawn to W3C\RDFS for the detailed definition of this term.

Class: A group containing members that have attributes, behaviours, relationships or semantics in common. Attention is drawn to W3C\RDFS for the detailed definition of this term.

Property: A specific aspect, characteristic, attribute, or relation used to describe resources. Attention is drawn to W3C\RDFS for the detailed definition of this term.

Range: The range of values that may be used for a property. Attention is drawn to W3C\RDFS for the detailed definition of this term.

Domain: The class of resource to which statements using a property may be made. Attention is drawn to W3C\RDFS for the detailed definition of this term.

Sub Property Of: The superclass of a property. Attention is drawn to W3C\RDFS for the detailed definition

CWA 15903:2008 (E)

of this term.

Sub Class Of: The superclass of a class. Attention is drawn to W3C\RDFS for the detailed definition of this term.

Literal: A literal value for a property defined within a statement; this may be a plain literal value (such as a string and language term) or a typed literal value (such as a value and data type specification identifier). Attention is drawn to W3C\RDFS for the detailed definition of this term.

Statement: A combination of a property and a value specified for a resource.

URI: A uniform resource identifier, as defined by IETF\RFC2396.

7. Concepts

Figure 1. illustrates the domain model of Metadata for Learning Opportunities. Attention is drawn to UML for an explanation of the underlying semantics of this diagram. Each box in the diagram relates to a Class defined in this standard (see section XXX). Each named association (line with label) in the diagram represents a Property defined in this standard (see section XXX). Arrows on named associations indicate the direction in which traversal between instances can occur. No cardinality is specified for any association. Lines with an open triangle arrowhead represent a subclass-superclass relationship between classes, and not an association between instances.

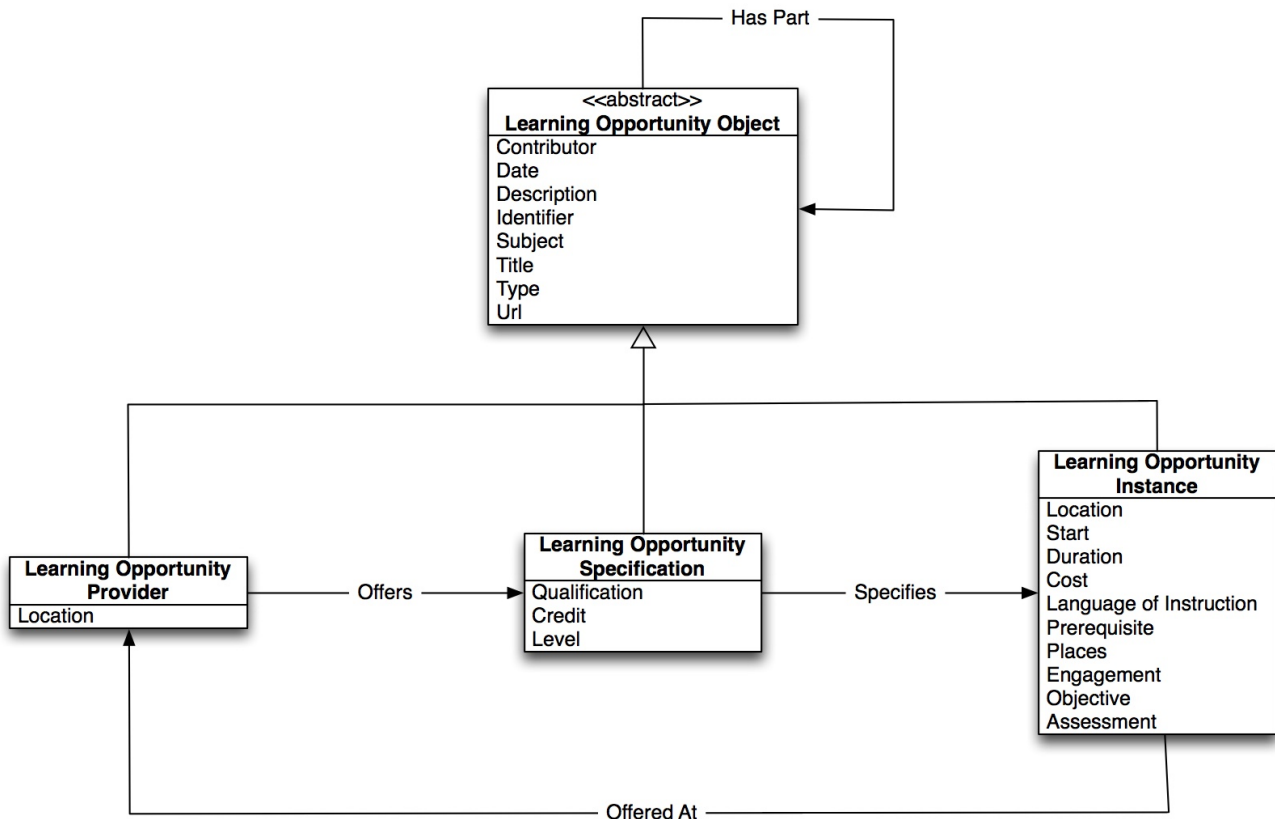


Figure 1: Concepts - Illustration of the domain model of MLO

Learning Opportunity (LO)

A chance to participate in education or training.

Learning Opportunity Provider (LOP)

An agent (person or organisation) that provides learning opportunities.

Learning Opportunity Specification (LOS)

An abstract description of a learning opportunity, consisting of information that will be consistent across multiple instances of the learning opportunity.

Learning Opportunity Instance (LOI)

A single occurrence of a learning opportunity. Unlike a Learning Opportunity Specification, a Learning Opportunity Instance is not abstract, may be bound to particular dates or locations, and may be applied for or participated in by learners.

8. Classes

The following classes represent the Resources defined for Learning Opportunities.

URI: mlo:LearningOpportunityObject

Label: Learning Opportunity Object

Domain: Resource

Range: Class

Definition: An abstract resource used within the context of learning opportunities.

Comments:

URI: mlo:LearningOpportunityProvider

Label: Learning Opportunity Provider

Domain: Resource

Sub Class Of: mlo:LearningOpportunityObject

Definition: An agent (person or organisation) that provides learning opportunities.

Comments:

URI: mlo:LearningOpportunitySpecification

Label: Learning Opportunity Specification

Domain: Resource

Sub Class Of: mlo:LearningOpportunityObject

Definition: An abstract description of a learning opportunity, consisting of information that will be consistent across multiple instances of the learning opportunity.

Comments:

URI: mlo:LearningOpportunityInstance

Label: Learning Opportunity Instance

Domain: Resource

Sub Class Of: mlo:LearningOpportunityObject

Definition: A single occurrence of a learning opportunity. Unlike a Learning Opportunity Specification, a Learning Opportunity Instance is not abstract, may be bound to particular dates or locations, and may be applied for or participated in by learners.

Comments:

Properties used to describe relationships between resources

URI: mlo:offeredAt

Label: Offered At

Domain: mlo:LearningOpportunityInstance

Range: mlo:LearningOpportunitySpecification

Sub Property Of: mlo:LearningOpportunityInstance

Definition: A relation to a Learning Opportunity Provider that offers the Learning Opportunity Instance.

Comments: This can be used to represent franchises or other circumstances when the provider that offers the instance is different to the provider that defines the specification. Content should be a URI conforming to IETF\RFC2396.

URI: mlo:offers

Label: Offers

Domain: mlo:LearningOpportunityProvider

Range: mlo:LearningOpportunitySpecification

Sub Property Of: mlo:LearningOpportunityInstance

Definition: A relation to a Learning Opportunity Specification offered by the Learning Opportunity Provider.

Comments: Content should be a URI conforming to IETF\RFC2396.

URI: mlo:specifies

Label: Specifies

Domain: mlo:LearningOpportunitySpecification

Range: mlo:LearningOpportunityInstance

Sub Property Of: mlo:LearningOpportunityInstance

Definition: A relation to a Learning Opportunity Instance that is an instance specified by the Learning Opportunity Specification.

Comments: Content should be a URI conforming to IETF\RFC2396.

URI: mlo:hasPart

Label: **Has Part**

Domain: mlo:LearningOpportunityObject

Range: mlo:LearningOpportunityObject

Sub Property Of: mlo:LearningOpportunityInstance

Definition: A relation to a Learning Opportunity Object that is logically included in the Learning Opportunity Object.

Comments: This can be used to represent part-whole relations, such as the relationship between organisations and departments, or between programmes and constituent units. Content should be a URI conforming to IETF\RFC2396. Attention is drawn to the property <http://purl.org/dc/terms/hasPart> as defined by DCMI\TERMS as an equivalent property.

Properties included from ISO 15836

The following properties defined by ISO\15836 are specified by this standard as within the domain of LearningOpportunityObject:

NOTE:: Attention is also drawn to other ISO 15836 properties that may be useful in conforming bindings, such as rights and format.

URI: <http://purl.org/dc/elements/1.1/contributor>

Label: **Contributor**

URI: <http://purl.org/dc/elements/1.1/date>

Label: **Date**

Comments: Recommended best practice is to use an encoding scheme, such as the W3C\DTF profile of ISO\8601. Attention is also drawn to the start and duration refinements defined by this standard.

URI: <http://purl.org/dc/elements/1.1/description>

Label: **Description**

URI: <http://purl.org/dc/elements/1.1/identifier>

Label: **Identifier**

Comments: The content should conform to a URI, as defined by IETF\RFC2396.

URI: <http://purl.org/dc/elements/1.1/subject>

Label: **Subject**

URI: <http://purl.org/dc/elements/1.1/title>

Label: **Title**

URI: <http://purl.org/dc/elements/1.1/typ>

Label: **Type**

Comments: The value of this property should where possible be refined using a vocabulary encoding scheme.

Properties for Learning Opportunity resources

URI: <mlo:url>

Label: **Uri**

Domain: mlo:LearningOpportunityObject

Range: <http://www.w3.org/2000/01/rdf-schema#Literal>

Definition: A link to a web resource that provides an alternate representation of the resource. The content should conform to a URI IETF\RFC2396.

Comments: Typically the web page of the provider or course.

CWA 15903:2008 (E)

URI: mlo:location

Label: **Location**

Domain: mlo:LearningOpportunityProvider,
mlo:LearningOpportunityInstance

Range: <http://www.w3.org/2000/01/rdf-schema#Resource>

Definition: The spatial location of the Learning Opportunity Provider or Learning Opportunity Instance Relations.

Comments: Typically an address and/or geographic co-ordinates. Attention is drawn to UPU\S42, EN14142\1 and GEO\RSS.

URI: mlo:qualification

Label: **Qualification**

Domain: mlo:LearningOpportunitySpecification

Range: <http://www.w3.org/2000/01/rdf-schema#Resource>

Definition: A qualification that can be obtained from completion of a Learning Opportunity.

Comments:

URI: mlo:credit

Label: **Credit**

Domain: mlo:LearningOpportunitySpecification

Range: <http://www.w3.org/2000/01/rdf-schema#Resource>

Definition: An account of the credits that can be obtained from completion of a Learning Opportunity.

Comments:

URI: mlo:languageOfInstruction

Label: **Language of Instruction**

Domain: mlo:LearningOpportunityInstance

Range: <http://www.w3.org/2000/01/rdf-schema#Literal>

Sub Property Of: <http://purl.org/dc/elements/1.1/language> as defined in ISO 15836

Definition: A language in which the Learning Opportunity Instance is available to be taught.

Comments: Attention is drawn to ISO\639.

URI: mlo:level

Label: **Level**

Domain: mlo:LearningOpportunitySpecification

Range: <http://www.w3.org/2000/01/rdf-schema#Literal>

Definition: An account of the education level of the Learning Opportunity.

Comments: Level will typically indicate the intended outcome of the Learning Opportunity in terms of progression; contrast this with the Prerequisite property. Attention is drawn to <http://purl.org/dc/terms/educationLevel> as defined in DCMI\TERMS as a similar, though not equivalent term.

URI: mlo:start

Label: **Start**

Domain: mlo:LearningOpportunityInstance

Range: <http://www.w3.org/2000/01/rdf-schema#Literal>

Sub Property Of: <http://purl.org/dc/elements/1.1/date>

Definition: A date from which the Learning Opportunity Instance commences.

Comments: Recommended best practice is to use an encoding scheme, such as the W3CDTF profile of ISO\8601.

URI: mlo:duration

Label: **Duration**

Domain: mlo:LearningOpportunityInstance

Range: <http://www.w3.org/2000/01/rdf-schema#Literal>

Sub Property Of: <http://purl.org/dc/elements/1.1/date>

Definition: A duration of the Learning Opportunity Instance.

Comments: Recommended best practice is to use an encoding scheme, such as the W3CDTF profile of ISO\8601.

URI: mlo:cost

Label: **Cost**

Domain: mlo:LearningOpportunityInstance

Range: <http://www.w3.org/2000/01/rdf-schema#Literal>

Definition: A cost associated with obtaining access to the Learning Opportunity Instance.

Comments:

URI: mlo:prerequisite

Label: **Prerequisite**

Domain: [mlo:LearningOpportunityInstance](http://www.w3.org/2000/01/rdf-schema#LearningOpportunityInstance)

Range: <http://www.w3.org/2000/01/rdf-schema#Resource>

Definition: A prerequisite or entry requirement for accessing the Learning Opportunity Instance.

Comments:

URI: mlo:places

Label: **Places**

Domain: [mlo:LearningOpportunityInstance](http://www.w3.org/2000/01/rdf-schema#LearningOpportunityInstance)

Range: <http://www.w3.org/2000/01/rdf-schema#Resource>

Definition: Number of places available for participants in the Learning Opportunity Instance

Comments:

URI: mlo:engagement

Label: **Engagement**

Domain: [mlo:LearningOpportunityInstance](http://www.w3.org/2000/01/rdf-schema#LearningOpportunityInstance)

Range: <http://www.w3.org/2000/01/rdf-schema#Literal>

Definition: The logistical means by which individuals engage in a Learning Opportunity Instance, encompassing temporal, modal and spatial patterns of engagement and attendance.

Comments: Examples include overall attendance (full-time, part-time), modes of study (distance, campus-based, workplace-based, online), and patterns of attendance hours (evenings, daytime, weekend). Attention is drawn to <http://purl.org/dc/elements/1.1/coverage> as a similar, though not equivalent, property.

URI: mlo:objective

Label: **Objective**

Domain: [mlo:LearningOpportunityInstance](http://www.w3.org/2000/01/rdf-schema#LearningOpportunityInstance)

Range: <http://www.w3.org/2000/01/rdf-schema#Resource>

Definition: An aim or learning objective for the Learning Opportunity Instance.

Comments:

URI: mlo:assessment

Label: **Assessment**

Domain: [mlo:LearningOpportunityInstance](http://www.w3.org/2000/01/rdf-schema#LearningOpportunityInstance)

Range: <http://www.w3.org/2000/01/rdf-schema#Resource>

Definition: assessment strategy: a description of the broad approach to assessment used in the learning opportunity.

Comments: Examples include types of assessments and evaluations of learning and competency development such as exams, mostly by coursework etc.

9. UseCases

9.1. Business Case: Course Advertising

Stakeholders:

1. Providers of learning opportunities include universities, colleges, schools and training organisations.
2. Aggregators of learning opportunities provide search and browse services across multiple providers; e.g. Ploteus, HotCourses, FastTomato.
3. Brokers provide added-value services such as application management, pre-assessment, advice and guidance; e.g. UCAS and VHS Admission, Skolverket, Graduate Prospects.

There is an opportunity for a standard because:

1. Providers need to advertise widely their learning opportunities.
2. Currently providers need to use a separate format and process for each market they operate it - at local, regional, national, european sectoral level, as well as vertically where services advertise learning opportunities for specific industries.
3. Different brokers and aggregators also require in some cases specialized vocabularies or encoding schemes (e.g. for identifiers).
4. Currently many aggregators and brokers do not offer standard formats, instead requiring manual data entry on web forms, or batch uploads using specialized tools.
5. Aggregators and brokers need reliable data with as wide and deep a spread as possible. However, the cost of data collection puts off many potential providers, and makes it more difficult for new, innovative services to enter the market.

The intervention of a standard for descriptions of learning opportunities should:

1. Commodify information on courses and other learning opportunities, levelling the playing field and enabling new entrants to the market, e.g. Web 2.0 services.
2. Support transparency and learner mobility in Europe.
3. Reduce costs for providers.
4. Enable better consistency of information about learning opportunities across multiple services.
5. Support aggregator functionality such as rich browsing and targeted searches.
6. Support the provision of additional information required by brokers without adding complexity.
7. Support the emergence of new business cases.

To enable this to take place, a standard must:

1. Be lightweight and simple to implement with a very low technical threshold (i.e. not create a technology tax).
2. Either fit existing business processes or enable business process improvement (i.e. not create a process tax).
3. Support extensibility in a modular fashion to support specialized requirements.
4. Support multiple encoding schemes for elements at the instance level: from a single simple string as a base requirement, to multiple parallel schemes representing encodings requirements for different sectors and regulatory bodies.
5. Support extremely simple architectures, e.g. RSS-style simple aggregation.

6. Support the core browse and search requirements of aggregators (Cost, Start time, Duration, Minimum entry requirements, Physical location and distance from applicant's home or workplace, Qualification target, Subject).
7. Support internationalization for use across the EU and beyond.

9.2. Business Case: Mediated Application

Stakeholders:

1. Providers of learning opportunities include universities, colleges, schools and training organisations.
2. Applicants include potential learners both within the EU and beyond.
3. Application Brokers provide application management services, e.g. UCAS, VHS Admission.

There is an opportunity for a standard because:

1. Currently application brokers do not offer standard formats, instead requiring manual data entry on web forms, or batch uploads using specialized tools.

The intervention of a standard for descriptions of learning opportunities should:

1. Support the wider availability of application brokerage services across the EU.
2. Commodify information on courses and other learning opportunities, levelling the playing field and enabling new entrants to the market, e.g. Web 2.0 services.
3. Support transparency and learner mobility in Europe by removing the barrier to entry of different application processes.
4. Reduce costs for providers.

To enable this to take place, a standard must:

1. Be lightweight and simple to implement with a very low technical threshold (i.e. not create a technology tax).
2. Either fit existing business processes or enable business process improvement (i.e. not create a process tax).
3. Support extensibility in a modular fashion to support specialized requirements. This is especially important in this business case as application processing has very specific data requirements that may in some cases be region- or nation-specific.
4. Support multiple encoding schemes for elements at the instance level: from a single simple string as a base requirement, to multiple parallel schemes representing encodings requirements for different sectors and regulatory bodies.
5. Support extremely simple architectures, e.g. RSS-style simple aggregation.
6. Support the collection of entry requirement information and application processing information needed by brokers, or not preclude such information being included as extensions.
7. Support internationalization for use across the EU and beyond.

9.3. Business Case: Learning Opportunities Benchmarking

Stakeholders:

1. Providers of learning opportunities include universities, colleges, and training organisations.

There is an opportunity for a standard because:

1. Providers need to provide information about their learning opportunities for agencies that perform benchmarking or other quality management functions upon those learning opportunities.
2. Currently providers need to use a separate format and process for each agency in their sector .
3. Currently many agencies do not offer standard formats, instead requiring manual data entry on web forms, or batch uploads using specialized tools.

The intervention of a standard for descriptions of learning opportunities should:

1. Reduce costs for providers.
2. Enable better consistency of information about learning opportunities provided for benchmarking.

To enable this to take place, a standard must:

1. Be lightweight and simple to implement with a very low technical threshold (i.e. not create a technology tax).
2. Either fit existing business processes or enable business process improvement (i.e. not create a process tax).
3. Support extensibility in a modular fashion to support specialized requirements.
4. Support multiple encoding schemes for elements at the instance level: from a single simple string as a base requirement, to multiple parallel schemes representing encodings requirements for different sectors and regulatory bodies.
5. Support extremely simple architectures, e.g. RSS-style simple aggregation.
6. Support i18n for use across the EU and beyond.

9.4. Academic Learning Opportunities Evaluation and Control

Stakeholders

1. Ministry of University and Research (Ministries of Education at large).
2. Government and or Institutional bodies supervising the learning processes.
3. Quality Assurance bodies and Institutions.
4. Higher Education Institutions' administrations and faculties.
5. Providers of learning opportunities at large (schools, training institutions).
6. Learners' community.
7. European Community commission.

There is an opportunity for a standard because:

1. Higher Education Institutions need to program their learning opportunities offering every academic year.
2. Ministries of Education need to evaluate each HEI's learning opportunities offering proposal for the next academic year before it can be published (advertised) to the learners community.
3. There need to be a standard evaluation to ensure quality and adherence to the Bologna Process requirements in the learning opportunities offered.
4. The learning opportunities governing bodies (Ministries, QA bodies) need to control and monitor the aggregated domestic learning opportunities distribution and offering, to report to European Community and assess the comprehensiveness and validity of the learning opportunities offered.

5. Standard technical specifications need to support the processes and data flows of this scenario.
6. the same process could be escalated and adapted to European Community level, whereby all European providers of learning opportunities need to report their learning opportunities to the EU commission.

The intervention of a standard for descriptions of learning opportunities should:

1. Enable the technical mapping of course and other learning opportunities related information, accommodated into the ECTS and Europass transparency documents, to an interoperability specification.
2. Contribute to the domestic adoption of a proactive quality evaluation and monitoring process for learning opportunities offered.
3. Support the development of monitoring systems for the implementation of the Bologna process, at institutional, national and European levels.
4. Support domestic and European education requirements.
5. Support the analysis of the learning opportunities offered throughout the years.
6. Enable control over the long term learning opportunities offered.

To enable this to take place, a standard must:

1. Be lightweight and easy to implement.
2. Be able to accommodate and support domestic and European learning systems structures.
3. Be multilingual.

9.5. *Transcript of Records*

Stakeholders

1. Higher Education Institutions' administrations and International Relationship Offices (Home Institution and Host Institution).
2. Providers of learning opportunities at large (schools, training institutions ...).
3. Business community.
4. Government and or Institutional bodies supervising the learning processes.

There is an opportunity for a standard because:

1. Higher Education Institutions need to automate and secure the Transcript of Records (ToR) workflow between partner institutions.
2. Higher Education Institutions need to guarantee the authenticity and completeness of the ToR.
3. Higher Education Institutions need to reduce unnecessary paperwork.
4. Higher Education Institutions need to prevent repeated data entry and reuse data at each stage of the process.
5. Business community need to receive ToR for evaluation and recruitment purposes.

The intervention of a standard for descriptions of learning opportunities should:

1. Digitize Learning Agreements and ToR which are currently handwritten to make it easily transferable.
2. Ensure the completeness of all required fields (ECTS/Grades).

CWA 15903:2008 (E)

3. Enable direct transmission of ToR from home to host institution without going through student.
4. Enable import of course followed abroad directly into Student Management Systems.
5. Support ToR authenticity verification.

To enable this to take place, a standard must:

1. Be lightweight and easy to implement.
2. Be able to accommodate and support domestic and European learning systems structures.
3. Be multilingual.

10. Appendix

10.1. DCAM

Attention is drawn to the DCMI Abstract Model (DCAM); this standard is inspired by, and conforms to, DCAM.

10.2. Application Profiles and the roles and usage of

Communities are encouraged to develop application profiles of this standard.

Attention is drawn to the Singapore Framework for application profiles developed by the Dublin Core Metadata Initiative DCMI-SF.

10.3. Extensions to properties

Application profiles may extend the specification in the following ways:

a) Inclusion of additional properties

A compliant application profile may define additional properties in the domain of Learning Opportunity classes.

b) Refinement of properties using sub-properties

A compliant application profile may refine a property defined within this specification by defining a new sub property. Refinements must be defined as semantically contained within the original property definition, such that the statement ":LearningOpportunityObject subPropertyURI value" can also be expressed as ":LearningOpportunityObject parentPropertyURI value".

c) Refinement of properties using vocabulary encoding schemes

A compliant application profile may refine a property defined within this specification by defining a vocabulary encoding type that restricts the values of statements that use the property.

d) Refinement of properties using syntax encoding schemes

A compliant application profile may refine a property defined within this specification by defining a syntax encoding type that restricts the values of statements that use the property.

e) Constraining the use of properties within the profile model

A compliant application profile may constrain the use of properties defined within this specification, such as defining the minimum and maximum occurrence of statements using the specified property for a resource. Attention is drawn to the DCMI Description Set Profile DCMI-DSP.

10.4. Graceful degradation

Where refinements of properties are used, it should be possible for implementations to be able to identify and use their supertypes.

For example, if "foo" refines "bar" then an XML serialization may use XML Schema Instance refinement of the form:

```
<bar xsi:type="foo">value</bar>
```

In this way both the refined type and original type are available for the processing system, enabling graceful

CWA 15903:2008 (E)

degradation from subtype to supertype.

Where RDF serialization is used, the use of RDF Schema and/or OWL should enable such dynamic supertype substitution to occur.

10.5. MLO properties related to other specifications

MLO-AD	PAS 1068	ECTS IP/CC	ISO 15836: DC 1.1	IMS LIS v2
Contributor		CourseUnitNameOfLecturer	Contributor	
Date	1.2.2: Year /date of publishing	CourseUnitYearOfStudy	Date	
Description	1.1.3: Description	CourseUnitCourseContents	Description	Description
Identifier	1.1.2: Identifier/Unique reference (URI)	CourseUnitCourseCode	Identifier	SourceID
Subject	1.1.10: Classification of the topic		Subject	ListofTopics ?
Title	1.1.1: Name; 2.1.1: Name of the LO provider	CourseUnitCourseTitle; InstitutionName	Title	Title
Type	1.1.6: Kind of learning opportunity	CourseUnitCourseType	Type	
Url	1.2.5: URL of alternate representation and Information online			
Location	3.1.7: Location for realizing the learning opportunity	InstitutionAddresses		
Qualification	1.4.3: Formal qualification			
Credit		CourseUnitNumberOfCredits		defaultCredits
Language of	1.1.9: Language of the learning	CourseUnitLanguageOfInstruction	Language	

MLO-AD	PAS 1068	ECTS IP/CC	ISO 15836: DC 1.1	IMS LIS v2
instruction	opportunity	n		
Level		CourseUnitCourseLevel		
Start	3.1.6.1: Starting time			SectionClass->StartTime
Duration	3.1.1: Expected learning time in total			TimeFrame
Cost	2.2.1: Costs of the learning opportunity			
Prerequisite	1.5.2: Prerequisites and precognition	CourseUnitPrerequisites		listofPrerequisites
Places	1.2.3: Number of participants			
Engagement	1.1.7: Workflow and programme of the LO	CourseUnitSemesterTrimester		
Objective	1.4.1: Description of the objectives	CourseUnitObjectives		

10.6. Note on IEEE 1484.12.1 Learning Object Metadata

Attention is drawn to the IEEE 1484.12.1 Learning Object Metadata standard for comparison with this standard. There are some similarities, and some areas where similar concepts can be expressed in LOM and MLO-AD.