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**AGREEMENT**

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## European Learner Mobility Achievement Information (EuroLMAI)

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## Foreword

The European Learner Mobility Achievement Information Model (EuroLMAI) aspires to address the identified need for a harmonized solution to the recording and exchange of learner mobility information within the European Education Area. The results of this work will contribute to the effort towards interoperable European-wide IT systems that manage and exchange learner achievement information.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

The EuroLMAI work has its roots in the European transparency tools and especially in the Europass framework for the transparent description of qualifications and competences. Europass provides the common basis for the well-structured recording of all life-long learning opportunities taken, including European Higher Education structures and learners' private and institution-owned information. The EuroLMAI Model is expected to result in a multipart standard, however in this phase the main focus will be on the representation of formal, institution attested achievement information.

The development of the proposed model has been carried out within the context of the CEN WS-LT project on "Guidelines for a European Learner Mobility Model", funded under the 2008 ICT Standardization Work Programme. The project was initiated and led by the Hellenic Organization for Standardization (ELOT) and the Technological Educational Institute of Athens (Greece). The appointed project team also comprised experts from the following organizations: JISC-CETIS (UK), Hypatia AS (Norway) and KION (Italy). The document has been developed through the collaboration of a number of contributing partners, representing a wide mix of interests, among others the Manchester Metropolitan University (UK), University of Duisburg Essen/eLC (Germany), USIT/UiO (Norway), Digitary (Ireland), University of Vigo (Spain), ISFOL (Italy), Alan Paull Services (UK). The close collaboration and substantial support of the Rome Student Systems and Standards Group of software implementers regarding the European Learner Mobility (EuroLM) standardization efforts is highly acknowledged.

The final CEN/WS-LT internal review/endorsement of this CWA was discussed at the meeting of Learning Technologies Workshop on January 11, 2010 in Bolton and was approved following an electronic process, which finished on April 5, 2010. WS-LT members from the following organizations participated in the Bolton WS-LT meeting and approved this document:

- CESI Group
- CETIS
- ELOT; TEI of Athens
- Hypatia AS
- K-INT
- KION SPA
- Manchester Metropolitan University
- Open University of the Netherlands
- Schemata
- University of Duisburg – Essen
- University of Jyväskylä
- University of Oslo
- UNED University
- WU Vienna

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

## Introduction

The establishment of Europass as a common framework which is accepted throughout Europe demonstrates that European education has reached a maturity stage where the demand for the recording and exchange of learner mobility information needs to be efficiently supported by technical interoperability standards. At the initiation point of this project several relevant standardization efforts were identified and significant national expertise had already been accumulated. However, harmonization was deemed necessary towards a European solution, in order to provide viable support for emerging European student management information systems and dissuade service providers from developing proprietary services and platforms. The results of the current and future European Learner Mobility (EuroLM) work aspire to support the development of a new generation of technology enhanced services for learners (learning and employment opportunities exploration), higher education institutions (certification or augmentation of learner information), employers (work-place descriptions, recruiting and development of learners' competences) and other stakeholders of learning, education, and training throughout Europe, as the European Union and Commission, the Member States and their governments and ministries, etc.

The EuroLM Achievement Information Model seeks to address directly the European requirement for rapid implementation and dissemination of the institution-owned transparency information tools throughout Europe. This EuroLM Achievement Information (EuroLMAI) Model will be developed as a generic model for representing the institution attested achievements of a learner within a formal learning setting, resulting from the learner's participation in one or more learning opportunity instances and including any available associated results. The Europass institution-owned learner achievement information structures, namely the Europass Diploma Supplement and the Europass Mobility, as well as other official achievement reports (e.g. the learner's Transcript of records), will be specified as application profiles of the EuroLMAI model.

This document specifies, first, a subset (skeleton) of the generic EuroLMAI model. Other learner mobility achievement structures (e.g. that of Europass Mobility) set the requirements for the future enhancement of the skeleton model with additional information entities concerning assessment processes, intended learning outcomes, etc. New standardization projects should be launched in order to develop these entities and provide the appropriate extensions to the EuroLMAI model.

## **1. Scope**

The present document defines a model for the recording and exchange of learner achievement information among student management information systems, as well as the aggregation of information by third party suppliers.

The model proposed within this CWA is not intended to define the representation of the entire spectrum of Learner Mobility information. The scope of the standard is restricted to the definition of the electronic representation of official, institutionally attested achievement information for learners engaged in formal learning processes, in order to facilitate its recording and subsequent exchange within the European Education Area.

Achievement Information structured and presented in compliance with this standard may of course be used for other purposes - for instance, providing descriptions of achievement to enrich a learner-owned report, in terms of an e-portfolio. However, guidance on the specification and organisation of information for purposes other than the representation of formal achievement reports is outside the scope of this standard.

The EuroLMAI model has been developed as:

- a lightweight standard taking into consideration existing and emerging educational practice processes and the relevant European policies
- an easy-to-implement standard in order to ensure a rapid uptake by stakeholders of learning, education and training throughout Europe (Higher Education Institutions, learners, employers, service providers, etc.)

## **2. Normative References**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CWA 15903:2008, Metadata for Learning Opportunities (MLO) – Advertising

CWA 16077:2010, Educational Credit Information Model

CWA 16076:2010, ECTS Information Package/Course Catalogue MLO Application Profile

ISO 639, Codes for the representation of names and languages

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

### 3. Conformance

#### 3.1 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.

#### 3.2 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.

#### 3.3 Conforming Applications

A conforming application must have at least one of the following capabilities:

- Generating conforming instances and/or instances conforming to a conforming binding
- Processing conforming instances, and/or instances that conform to a conforming binding.

## 4. Terms and Definitions

### 4.1 EuroLMAI model related terms

For the purposes of this document, the following EuroLMAI model related terms and definitions apply. The notation "**Term<sub>1</sub> [Term<sub>2</sub>]**" is used to denote that Term<sub>2</sub> is a synonym of Term<sub>1</sub>. The notation "**Term** <Domain<sub>1</sub>> Definition<sub>1</sub> <Domain<sub>2</sub>> Definition<sub>2</sub>" is used for the provision of multiple, domain-specific definitions of a term.

#### 4.1.1 Assessment result [Result]

The recorded result for a learner of an assessment process for a learning opportunity

#### 4.1.2 Awarding body

Organisation that awards credit or qualifications

NOTE The same organisation may also be a learning opportunity provider or an issuer

#### 4.1.3 Credit

The quantified means of expressing the volume of learning based on the workload students need in order to achieve the expected outcomes of a learning process at a specified level [ECTS Users' Guide]

#### 4.1.4 Credit scheme [Credit transfer scheme]

See framework

#### 4.1.5 Credit value

Particular amount of credit

NOTE Credit value is only meaningful within a framework or credit scheme, and the framework or scheme may require the specification of a level. The European Credit Transfer System (ECTS) is one such scheme. Credit value is an abstract amount that can be applied in several circumstances

#### 4.1.6 Diploma

Official documentary record of the awarding of a qualification

NOTE This is equivalent to the [ECTS Users' Guide] Glossary term Qualification: "Any degree, diploma or other certificate issued by a competent authority attesting the successful completion of a recognised programme of study." Here, the preferred usage of the term "qualification" (q.v.) is for the status conferred, not the documentation

#### 4.1.7 Framework [Credit scheme]

System of concepts, definitions and provisions through which educational practices are ordered, related and articulated

#### 4.1.8 Issuer

Body that issues the EuroLMAI report

NOTE The same body may also be the learning opportunity provider or the awarding body

#### 4.1.9 Learner

<European Learner Mobility>

Individual engaged in a learning process [ECTS Users' Guide]

NOTE Broad term, for the entire European Learner Mobility landscape. ECTS notes that learning processes can be formal, non-formal or informal. Thus, this term can include everyone

<Achievement Information>

Person currently or formerly enrolled in a formal learning opportunity (course, seminar, work placement, programme, etc.).

#### 4.1.10 Learning opportunity

Formally specified education or training process

NOTE This is close to the [ECTS Users' Guide] Glossary definition of Educational Component: "A self-contained and formally structured learning experience (such as: course unit, module, seminar, work placement)." There are other opportunities to learn that are less structured, but these are of less interest in the context of European learner mobility

#### **4.1.11 Learning opportunity instance**

Single presentation of a learning opportunity

NOTE "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." [CWA 15903:2008]

#### **4.1.12 Learning opportunity provider**

Organisation that validates or advertises learning opportunity specifications, or that runs learning opportunity instances

NOTE The same organization may also be an assessing body or an awarding body

#### **4.1.13 Learning opportunity specification**

Description of a learning opportunity, consisting of information that will be consistent across multiple instances of the learning opportunity [CWA 15903:2008]

#### **4.1.14 Level [Educational level]**

One of a set of terms, properly defined within a framework or scheme, applied to an entity in order to group it together with other entities relevant to the same stage of education

NOTE This is similar in intention to the definition of level in [CWA 15903:2008] which in turn refers to the Dublin Core term with name "educationLevel" and label "Audience Education Level". Level terms are typically consecutive small integers

#### **4.1.15 Module**

Course unit in a system in which each course unit carries the same number of credits or a multiple thereof [ECTS Users' Guide]

#### **4.1.16 Programme**

Set of learning opportunities for successful completion of which the learner can be awarded a specified qualification.

NOTE [ECTS Users' Guide] Glossary defines "Programme (educational)" as a "set of educational components, based on learning outcomes that are recognised for the award of a specific qualification". In a learner mobility document (including Diploma Supplement), the programme refers to the top level learning opportunity whose results are represented in the document

#### **4.1.17 Qualification**

Status awarded to or conferred on a learner by an awarding body

NOTE This is compatible with the Qualification property of [CWA 15903:2008]. A qualification is identified and represented by its name, and possibly also its subject. To be of value, a qualification must be meaningful within the system of education and within the society in which it is embedded. The EQF defines a qualification as "a formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards", which says a lot about the process, but little about the nature of the outcome

#### **4.1.18 Student**

See Learner

#### **4.1.19 Transcript**

Collection of information, represented in a learner mobility achievement report, about learning opportunity instances taken by a learner, including any available associated results for that learner

## **4.2 Informative terms**

For the purposes of this document, the following informative terms and definitions apply.

### **4.2.1 Application profile**

An assemblage of metadata elements selected from one or more metadata schemas and combined in a compound schema.

NOTE "The purpose of an application profile is to adapt or combine existing schemas into a package that is tailored to the functional requirements of a particular application, while retaining interoperability with the original base schemas". Term, definition and note from [CWA 15555:2006].

**4.2.2 Class**

A group containing members that have attributes behaviours, relationships or semantics in common.

NOTE Attention is drawn to [W3C-RDFS] for the detailed definition of this term.

**4.2.3 Domain**

The class of resource to which statements using a property may be made.

NOTE Attention is drawn to [W3C-RDFS] for the detailed definition of this term.

**4.2.4 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).

NOTE Attention is drawn to [W3C-RDFS] for the detailed definition of this term.

**4.2.5 Property**

A specific aspect, characteristic, attribute, or relation used to describe resources.

NOTE Attention is drawn to [W3C-RDFS] for the detailed definition of this term.

**4.2.6 Range**

The range of values that may be used for a property.

NOTE Attention is drawn to [W3C-RDFS] for the detailed definition of this term.

**4.2.7 Record**

An instantiation of a set of descriptions, created according to a binding specification

**4.2.8 Resource**

Anything that might be identified. Familiar examples include an electronic document, an image or a service.

NOTE Attention is drawn to [W3C-RDFS] for the detailed definition of this term.

**4.2.9 Sub Property Of**

The superclass of a property.

NOTE Attention is drawn to [W3C-RDFS] for the detailed definition of this term.

**4.2.10 Statement**

A combination of a property and a value specified for a resource

**4.2.11 URI**

Uniform Resource Identifier

NOTE Defined by [IETF-RFC2396]

## 5. European Learner Mobility Achievement Information Model

### 5.1 Introduction

This specification has been developed following the principles of the Singapore Framework for application profiles defined by the Dublin Core Metadata Initiative [DCMI-SF]. The EuroLMAI Model is defined in terms of:

- a Conceptual Model, aiming at the description of the semantics of the achievement information field through the representation of the participating entities and a series of assertions about its inherent processes, and
- a Domain Model, providing a detailed description of the DS resources and their associations

### 5.2 Conceptual Model

The draft CWA on Guidelines for a European Learner Mobility Model [EuroLM Guidelines] specifies a high-level working model of the educational practice relevant to the learner mobility domain (Figure 1), in the context of which information arises - that is, the practice that generates information, parts of which are gathered together in mobility documents and reports.

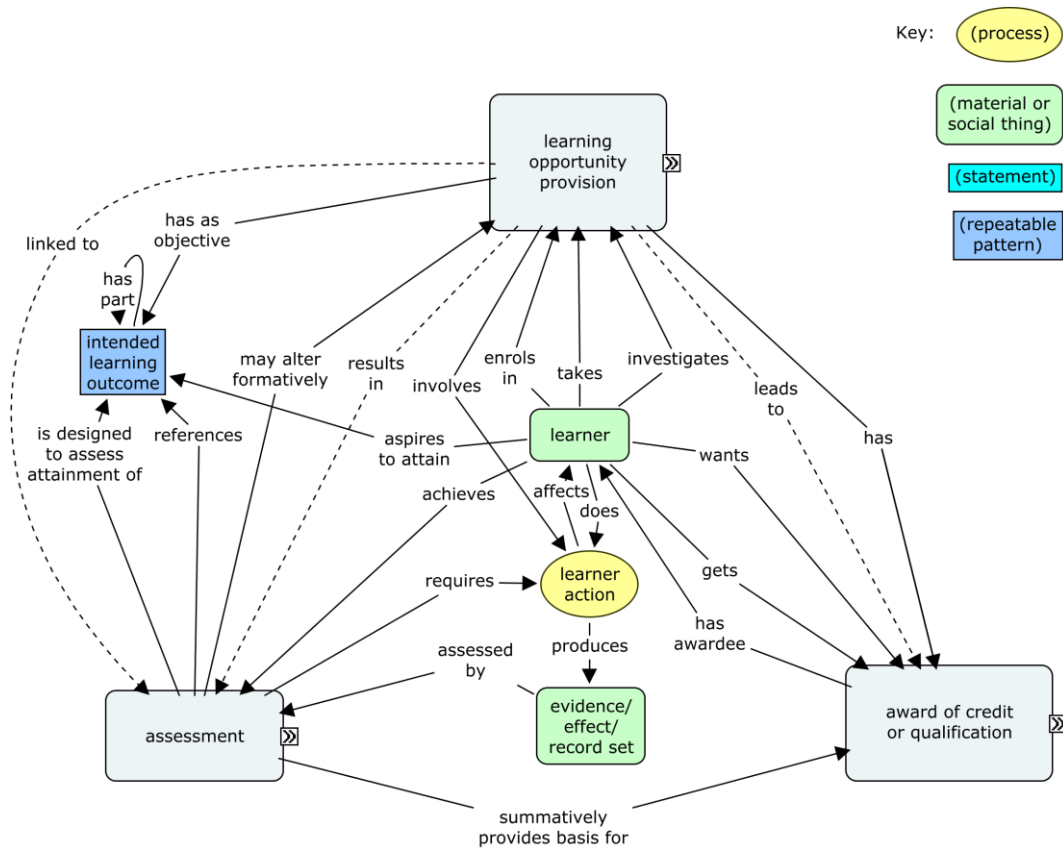


Figure 1 - Conceptual model of educational practice within EuroLM

The conceptual model illustrates the rough division of the subject matter into three distinctive parts: learning opportunity provision, award of credit or qualification, and assessment<sup>1</sup>. Between these parts sits the learner, the learner's actions, and their results as evidence, which provide the basis for the rest of the system.

<sup>1</sup> Terms not appearing in clause "4. Terms and definitions" of this document are not considered as directly related to this part of the EuroLMAI model. For these terms please refer to [EuroLM Guidelines]

Intended learning outcomes act as the proper bridge between learning opportunity provision and assessment. Without this bridge, the connections are more tenuous.

The above model provides the basis for the definition of a complete EuroLMAI model, under the condition of existence of the ingredients as standardised models, for the representation of each of the constituent components taking part into the educational practice. At the current point of maturity, standardisation advances within the learner mobility context can support modelling of practice and processes regarding the recording of the institution attested information about a learner's participation in a single or a set of learning opportunities and the associated qualifications and/or results obtained. Information representation concerning assessment processes or intended learning outcomes cannot yet be considered, given that relevant specifications are expected by future developments.

The above restrictions taken into account, a subset of the overall model is defined and illustrated in Figure 2 (marked in bold, in a detailed version of representation). This subset can be assumed as the conceptual foundation for the development of the EuroLMAI skeleton model, regarding mainly the representation of institution attested achievement information on learning opportunities taken by a learner and the possible associated awarding and/or results obtained, within a formal learning setting supporting a wide range of delivery and assessment practices [EuroLM Guidelines], such as:

- Traditional, single institution delivery and assessment in terms of a full programme of study
- Provision of lesser learning opportunities (single courses, or learning streams)
- Awarding with experience components
- Shared programmes between different institutions
- Exchange of learners with a sequential or parallel plan of delivery and assessment

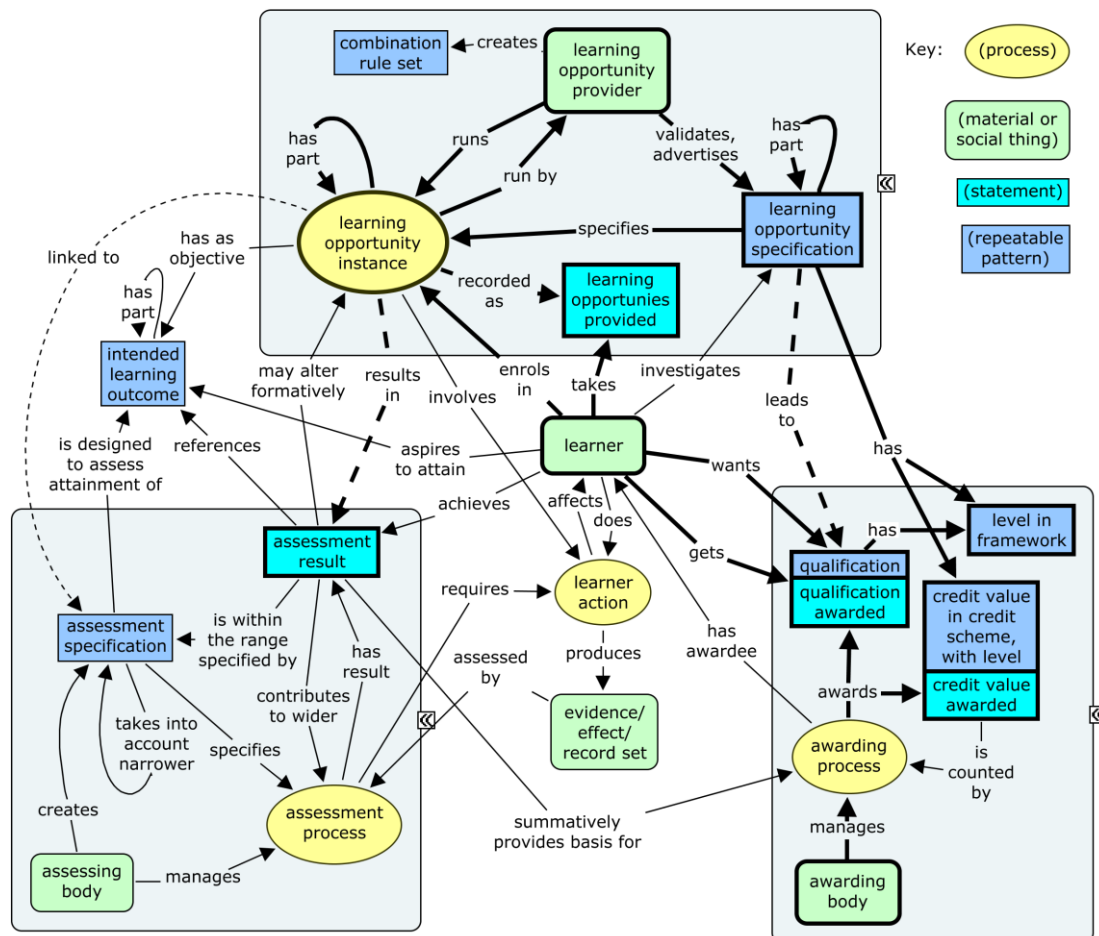


Figure 2 - Conceptual model ingredients relevant to EuroLMAI

### 5.3 Domain Model

This subclause defines the domain model of the skeleton EuroLMAI model. The EuroLMAI model is concerned with specific sets of learner achievement information arising from the different administrative processes carried out at the institutions throughout the implementation of educational practice, as well as with the associations amongst them. The EuroLMAI model builds upon information regarding learner information, description of learning opportunities, assessment of qualification for a specific learner and result information for each completed learning opportunity. The EuroLMAI model defines the assemblage pattern of such information in terms of an achievement report configuration, consisting of:

- a Learner instance, representing the individual enrolled in a formal learning opportunity (part or full programme of study, course, work experience, etc.)
- an Issuer instance, representing the authority that awards credits and/or qualifications and/or attests learner participation in the described learning opportunities including any associated results gained
- at least one Learning Opportunity object, which, depending on its function and level, may comprise any or all of the following information:
  - description of a learning opportunity or period of learning the learner currently or formerly enrolled in, and in case of successful completion, of the qualification achieved, including the actual result for the specific learner
  - description of possible component units (each of which may contain provider, credit, and result information for the specific learner)
- and optionally, a set of additional information properties.

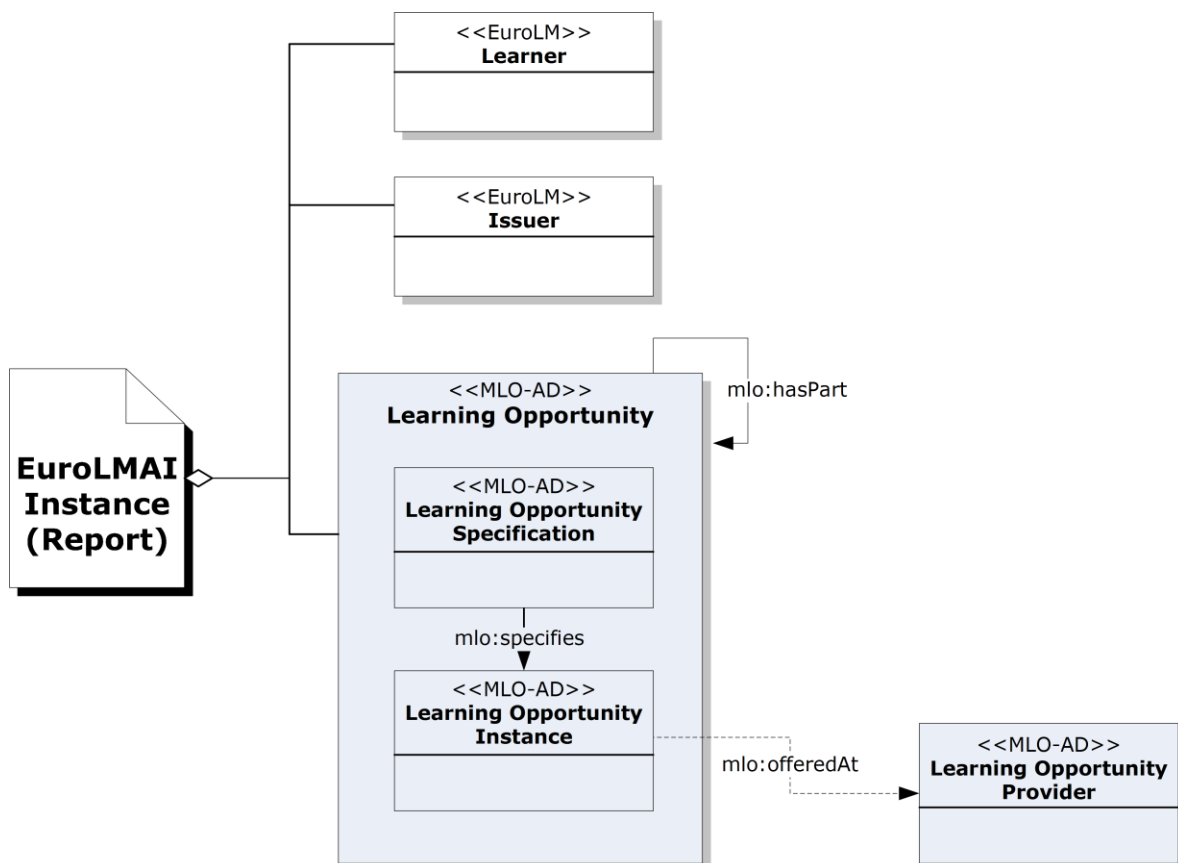


Figure 3 - Domain model of the EuroLMAI skeleton

Figure 3 illustrates the domain model in UML. Attention is drawn to UML for an explanation of the underlying semantics of this diagram. Each box in the diagram relates to a *Class*. Each named association (line with label) in the diagram represents an *Association Property*. The *Resources* of this model are either defined in this specification or in other standards referred to in the following subclauses. *Attribute Properties* from other relevant standards have also been reused. Arrows on named associations indicate the direction in which

traversal between instances can occur. No cardinality is specified for any association. Lines with an unfilled diamond shape represent an association with an aggregation relationship, indicating that one class is a part of another class.

## 5.4 EuroLMAI Resources

### 5.4.1 Classes

The following elements represent the Classes defined for European Learner Mobility Achievement Information.

**URI: elm:Learner**

*Label:* **Learner**

*Type:* Class

*Definition:* Individual currently or formerly enrolled in a formal learning opportunity (part of, or full programme of study, seminar, work experience, single course, etc.)

*Comments:*

**URI: elm:Issuer**

*Label:* **Issuer**

*Type:* Class

*Definition:* The body that issues the EuroLMAI report

*Comments:* May be the same as the provider of the top-level learning opportunity, but the role is different

### 5.4.2 Association Properties

This specification does not define any new association properties.

### 5.4.3 Attribute Properties

The following elements represent the Attribute Properties defined for European Learner Mobility Achievement Information.

**URI: elm:result**

*Label:* **Result**

*Domain:* mlo:LearningOpportunityInstance

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

*Definition:* The actual outcome for a learning opportunity for a learner as stated by a provider or issuer

*Comments:*

**URI: elm:gradingScheme**

*Label:* **Grading Scheme**

*Domain:* mlo:LearningOpportunityInstance

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

*Definition:* Information on the grading scheme used for the assessment of a learning opportunity

*Comments:*

**URI: elm:languageOfAssessment**

*Label:* **Language of Assessment**

*Domain:* mlo:LearningOpportunityInstance

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

*Definition:* The language by which a learning opportunity is assessed.

*Comments:* Attention is drawn to [ISO 639]

**URI: elm:additionalInformation**

*Label:* **Additional Information**

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

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

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*Definition:* Additional information concerning the resource

*Comments:* For example, additional information related to a EuroLMAI report

### URI: elm:issueDate

*Label:* Issue Date

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

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

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

*Definition:* The date on which the resource was formally issued

*Comments:* For example, the date of issue of a EuroLMAI report

## 5.5 Resources included from the MLO-AD specification

### 5.5.1 Classes

The following Classes are defined in the MLO-AD specification [CWA 15903:2008] and are applicable within the EuroLMAI domain.

#### URI: mlo:LearningOpportunityObject

*Label:* Learning Opportunity Object

#### URI: mlo:LearningOpportunityProvider

*Label:* Learning Opportunity Provider

#### URI: mlo:LearningOpportunitySpecification

*Label:* Learning Opportunity Specification

#### URI: mlo:LearningOpportunityInstance

*Label:* Learning Opportunity Instance

### 5.5.2 Association Properties

The following Association Properties are defined in the MLO-AD specification [CWA 15903:2008] and are applicable within the EuroLMAI domain.

#### URI: mlo:offeredAt

*Label:* Offered At

#### URI: mlo:hasPart

*Label:* Has Part

#### URI: mlo:specifies

*Label:* Specifies

### 5.5.3 Attribute Properties

The entire set of attribute properties defined by the MLO-AD specification [CWA 15903:2008] is applicable within the EuroLMAI domain.

## 5.6 Properties included from the DC Metadata Element Set

The following Properties defined in the Dublin Core Metadata Element Set [ISO 15836] are applicable within the EuroLMAI domain.

#### 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/title>

*Label:* Title

URI: <http://purl.org/dc/elements/1.1/type>  
Label: **Type**

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

## 5.7 Properties included from DCMI Terms

The following Property defined in DCMI Terms [DCMI-TERMS] is applicable within the EuroLMAI domain.

URI: <http://purl.org/dc/terms/educationLevel>  
Label: **Education Level**

## 5.8 Properties included from vCard MIME Directory Profile

The following Properties defined in the vCard MIME Directory Profile [IETF-RFC2426] are applicable within the EuroLMAI domain.

URI: <http://www.w3.org/2001/vcard-rdf/3.0#Given>  
Label: **Given**

URI: <http://www.w3.org/2001/vcard-rdf/3.0#Family>  
Label: **Family**

URI: <http://www.w3.org/2001/vcard-rdf/3.0#BDay>  
Label: **Birthday**

## 5.9 Properties included from the Educational Credit Information Model

The following Properties defined in the Educational Credit Information Model [CWA 16077:2010] are applicable within the EuroLMAI domain.

URI: <http://purl.org/net/cm/level>  
Label: **Level**

URI: <http://purl.org/net/cm/scheme>  
Label: **Scheme**

URI: <http://purl.org/net/cm/value>  
Label: **Value**

## 6 The EuroLMAI Description Set Profile

### 6.1 Introduction

The EuroLMAI model was based on the approach of developing an application profile of existing specifications including the relevant European policies. Application profiles can be defined as schemas which consist of data elements drawn from one or more namespaces, combined together by implementers, and optimised for a particular local application. A EuroLMAI report comprises the following components:

- The Achievement Information report itself
- Information about the learner currently or formerly enrolled in a formal learning opportunity
- Information about the issuer of the report (institution attesting the learner's achievements and/or awarding the learner with a qualification)
- Information about the learning opportunity the learner has taken, any associated results obtained, and the qualification possibly achieved
- Information about the components studied as well as the result and credits in those components
- Other achievement information

The following subclauses provide constraint clauses for the resources of the EuroLMAI model.

### 6.2 EuroLMAI Report

The EuroLMAI report is a record that contains achievement information for a learner within a formal educational setting.

1. A EuroLMAI Report instance *MUST* contain *exactly one* **elm:Learner** instance
2. A EuroLMAI Report instance *MUST* contain *exactly one* **elm:Issuer** instance
3. A EuroLMAI Report instance *MAY* contain *one or more* **mlo:LearningOpportunitySpecification** instance, representing the learning opportunity for which achievement information is represented within the scope of the report
4. A EuroLMAI Report instance *MAY* contain *at most one* **elm:additionalInformation** property
5. A EuroLMAI Report instance *MUST* contain *exactly one* **elm:issueDate** property

### 6.3 Learner

A EuroLMAI *Learner* instance shall adhere to the following constraint clauses.

1. An **elm:Learner** instance *MUST* contain *at least one* <http://purl.org/dc/elements/1.1/identifier> property

NOTE Identifiers may be given for a learner using a range of identifier schemes, including provider-issued student identifiers, national personal identifiers, and schemes of identifiers used by education systems in specific jurisdictions. Where multiple identifiers are used in a Learner instance, each identifier should be specified by defining a sub property of <http://purl.org/dc/elements/1.1/identifier> for the scheme in use.

2. An **elm:Learner** instance *MAY* contain *one or more* <http://www.w3.org/2001/vcard-rdf/3.0#Given> property
3. An **elm:Learner** instance *MAY* contain *at most one* <http://www.w3.org/2001/vcard-rdf/3.0#Family> property
4. An **elm:Learner** instance *MAY* contain *at most one* <http://www.w3.org/2001/vcard-rdf/3.0#BDay> property

NOTE Some known weaknesses of the vCard MIME Directory Profile specification [IETF-RFC2426], such as the handling of composite names are under consideration for resolution by W3C. Attention is drawn to [Portable Contacts] and the UK [MIAP CDD] Common Data Definitions 2.0 specification.

## 6.4 Issuer

A EuroLMAI *Issuer* instance shall adhere to the following constraint clauses.

1. The **elm:Issuer** instance *MUST* contain at least one <http://purl.org/dc/elements/1.1/identifier> property
2. The **elm:Issuer** instance *MAY* contain *one or more* <http://purl.org/dc/elements/1.1/title> properties (recommendation: *at most one* for any given language)
3. The **elm:Issuer** instance *MAY* contain *one or more* <http://purl.org/dc/elements/1.1/description> properties (recommendation: *at most one* for any given language)
4. The **elm:Issuer** instance *MAY* contain *any* other properties allowed as defined in the MLO-AD standard for Learning Opportunity Provider [CWA 15903:2008]

## 6.5 Learning Opportunity

A EuroLMAI *Learning Opportunity* consists of an **mlo:LearningOpportunitySpecification** instance and an **mlo:LearningOpportunityInstance** instance associated with the **mlo:LearningOpportunitySpecification** instance through the **mlo:specifies** association property.

## 6.6 Learning Opportunity Specification

A EuroLMAI *Learning Opportunity Specification* instance shall adhere to the following constraint clauses.

1. An **mlo:LearningOpportunitySpecification** instance *MAY* be associated with *one or more* child **mlo:LearningOpportunitySpecification** instances through the **mlo:hasPart** association, representing modules or sub-components of the parent learning opportunity specification.
2. Each **mlo:LearningOpportunitySpecification** instance *MUST* be associated with *at least one* **mlo:LearningOpportunityInstance** instance through the **mlo:specifies** association.
3. Depending on the function of the described learning opportunity, the corresponding **mlo:LearningOpportunitySpecification** instance *MAY* contain EITHER *at most one* **mlo:qualification** property OR *any number* of **mlo:credit** properties, , but not both.

NOTE The **mlo:credit** property *MUST NOT* be used to provide a calculated credit value, such as may be obtained by summing the credit values of sub-components of the instance, but only a source credit value.

4. Attention is drawn to the optional, though recommended use of the following properties:
  - An **mlo:LearningOpportunitySpecification** instance *SHOULD* contain *at least one* <http://purl.org/dc/elements/1.1/identifier> property
  - An **mlo:LearningOpportunitySpecification** instance *SHOULD* contain *at least one* <http://purl.org/dc/elements/1.1/title> property
  - An **mlo:LearningOpportunitySpecification** instance *SHOULD* contain *at least one* <http://purl.org/dc/elements/1.1/description> property (if applicable)
  - An **mlo:LearningOpportunitySpecification** instance *SHOULD* contain *at least one* <http://purl.org/dc/elements/1.1/type> property (if applicable)

NOTE In some models adopted by particular educational systems, there is an identified need of expressing grouping information for specific sets of learning opportunities. To address this need, apart from the representation of the individual opportunities, a parent learning opportunity can be defined, acting as a module-level component or a grouping component (e.g. semester, programme year, level or subject of a collection of courses). The <http://purl.org/dc/elements/1.1/type> property should be used to indicate the type of such components.

5. Each **mlo:LearningOpportunitySpecification** instance *MAY* contain *any* other properties allowed as defined in the MLO-AD standard [CWA 15903:2008] or the ECTS profile of MLO-AD [CWA 16076:2010]

## 6.7 Learning Opportunity Instance

A EuroLMAI *Learning Opportunity Specification* instance shall adhere to the following constraint clauses.

1. Each **mlo:LearningOpportunityInstance** instance *MAY* be associated with *at most one* **mlo:LearningOpportunityProvider** instance through the **mlo:offeredAt** association

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2. Each **mlo:LearningOpportunityInstance** instance *MAY* contain *at most one* **elm:result** property
3. Each **mlo:LearningOpportunityInstance** instance *MAY* contain *at most one* **elm:gradingScheme** property
4. Each **mlo:LearningOpportunityInstance** instance *MAY* contain *one or more* **elm:languageOfAssessment** properties
5. Each **mlo:LearningOpportunityInstance** instance *MAY* contain *any* other properties allowed as defined in the MLO-AD standard [CWA 15903:2008] or the ECTS profile of MLO-AD [CWA16076:2010]

### 6.8 Qualification

The use of the *Qualification* property within the EuroLMAI model is constrained as follows:

1. Each **mlo:qualification** property *MAY* contain *one or more* <http://purl.org/dc/elements/1.1/identifier> property
2. Each **mlo:qualification** property *MUST* contain *at least one* <http://purl.org/dc/elements/1.1/title> property
3. Each **mlo:qualification** property *MAY* contain *one or more* <http://purl.org/dc/terms/educationLevel> properties

NOTE Levels of qualifications are usually expressed in the context of a qualification framework, for example the European Qualifications Framework [EQF]. Rather than use a single integer or text for the EducationLevel property, implementers are encouraged to make use of Uniform Resource Identifiers [IETF-RFC2396] to identify both the level of the qualification and the framework from which the level is derived. For example, [CWA 16077:2010] defines EQF levels using the form <http://purl.org/net/cm/terms/EQF#n>, where n is the number of the EQF level.

Other frameworks for which a standard URI is not defined may be represented using a similar convention, whereby the URL of the framework precedes the level value separated using a URI fragment identifier. For example, the following would represent level 5 of the Scottish Credit and Qualifications Framework: <http://www.scqf.org.uk/#5>.

4. An **mlo:qualification** property *MAY* contain *one or more* <http://purl.org/dc/terms/1.1/description> properties

### 6.9 Credit

The use of the *Credit* property within the EuroLMAI model is constrained by the rules expressed in the Educational Credit Information Model [CWA 16077:2010]

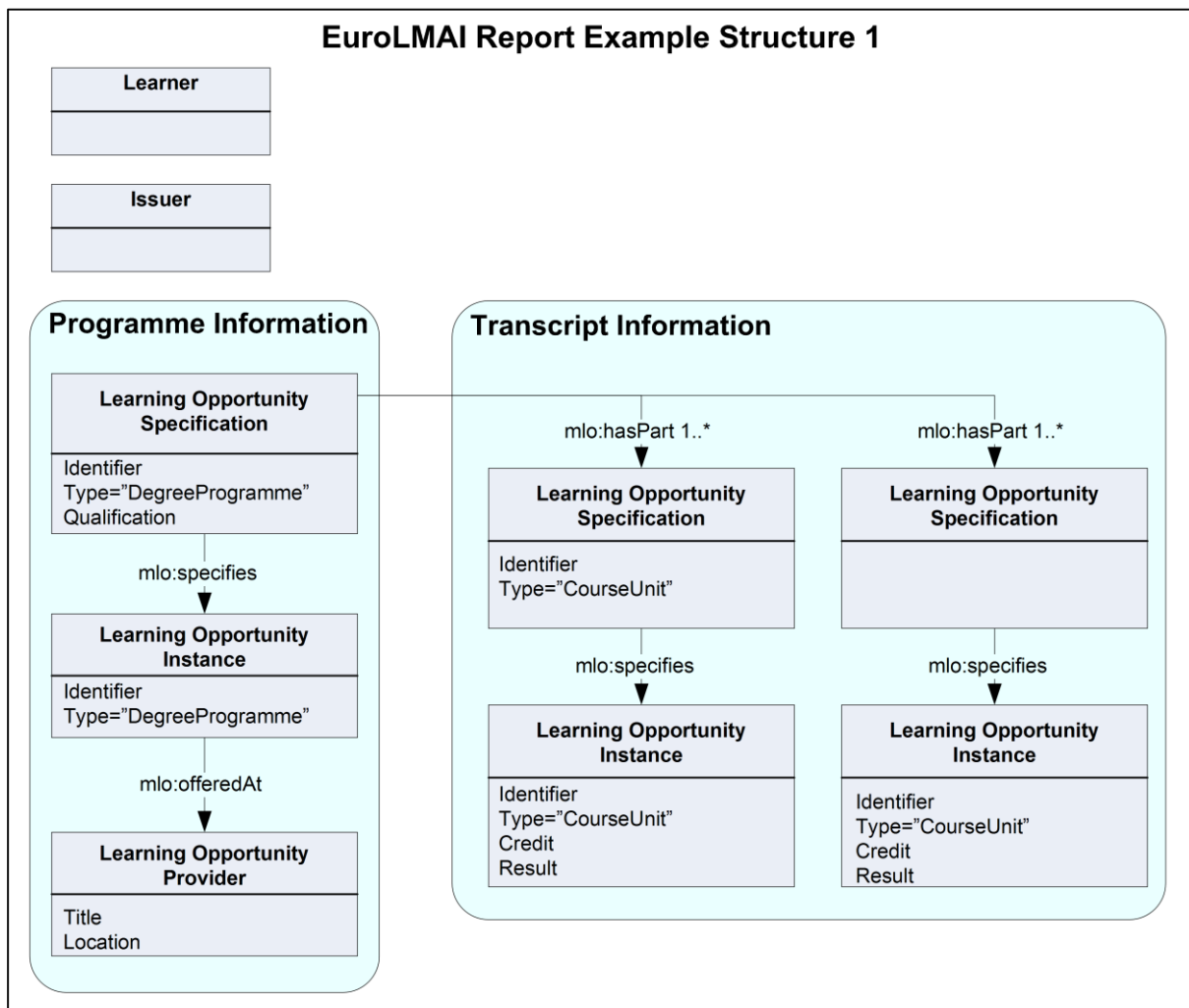
## 7. Recommended uses of the EuroLMAI Model

### 7.1 Introduction

This clause includes diagrammatic representations of recommended uses of the EuroLMAI skeleton model, for facilitating a number of processes in the context of educational practice involving different levels of achievement information reporting (interim study reports, qualification achievement reports, transcripts, courses taught at other institutions, etc.).

### 7.2 Report on completed part of programme of study

This case represents achievement information about a learner who has enrolled in an official programme of study and has completed part of the programme offered by a single or multiple providers (interim report). The learner has not yet obtained the corresponding qualification.



**Figure 4 - EuroLMAI report instance for completed part of programme of study**

The EuroLMAI instance for this case includes the descriptions of:

- a Learning Opportunity at the programme level, containing information on the programme the learner has enrolled in, without including any result information, since the qualification has not yet been obtained by the learner
- Learning Opportunities as component units of the described programme (transcript level), which the learner has taken and achieved specific credits and results

- Where a unit of the programme is offered by another institution, the corresponding learning opportunity must make reference to the Provider that offered the unit (course, work experience, etc.) To represent this, the Learning Opportunity Instance of the component MUST contain the basic details of the other institution such as the institution name.

Figure 4 provides an example structure of a EuroLMAI report for a learner that has completed two course units, both at the institution offering the programme the learner has enrolled in.

### 7.3 Transcript information for a period of learning

This case represents achievement information about a learner who has enrolled in an official programme of study and has completed a specific period of learning, like a semester or year.

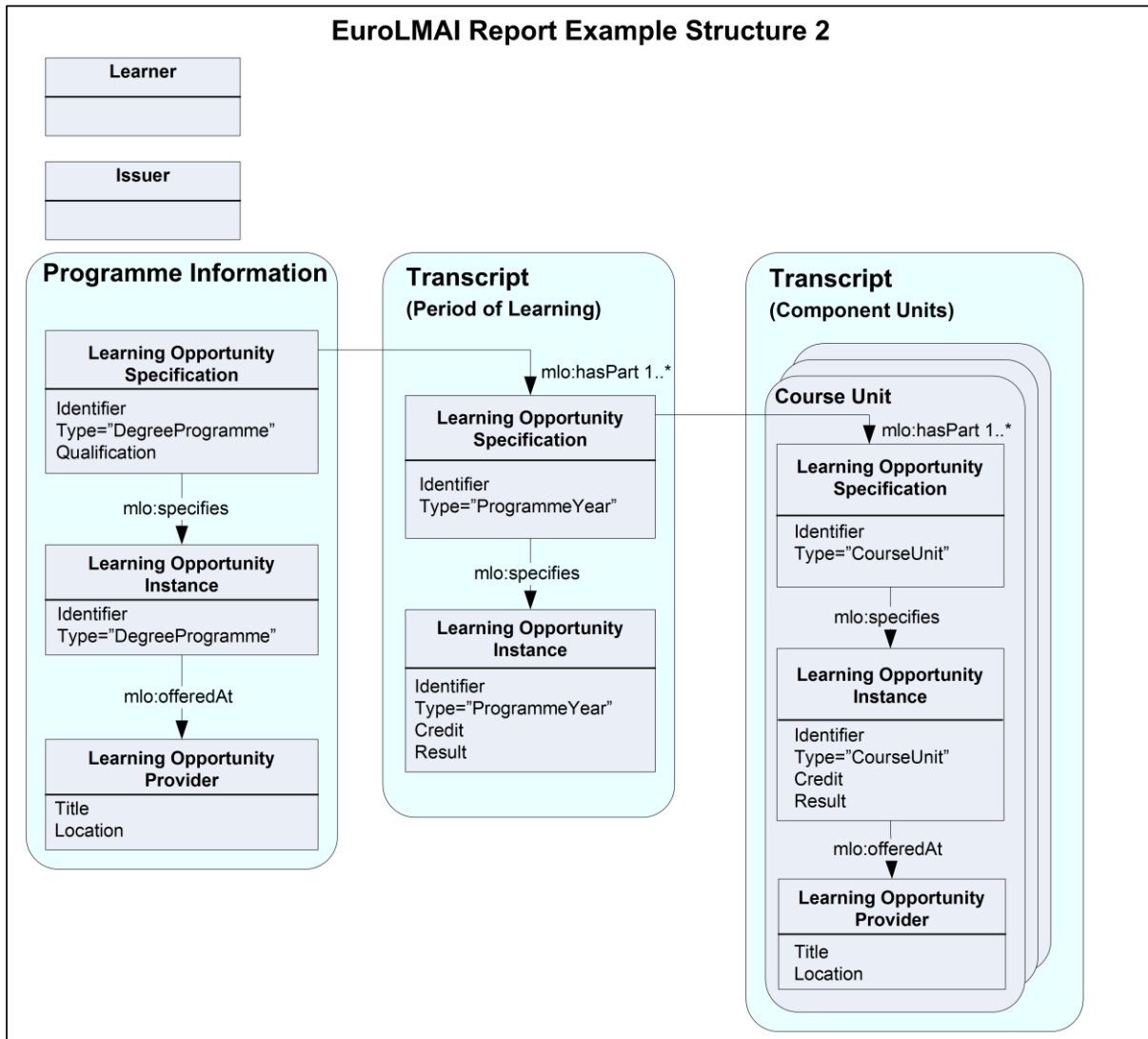


Figure 5 - EuroLMAI report instance with transcript information for a period of learning

A EuroLMAI report of this nature could be structured as follows:

- including three levels of learning opportunities, the topmost representing the programme of study, the next offering a grouping placeholder for the components units that relate to the specific period of learning, while the third comprising detailed information about each of the component units
- including, at the top level, a learning opportunity which represents the period of learning of the programme of study and at a second level, the associated component units.

The Learning Opportunity Instance representing the period of learning MAY have associated overall credit or result information, as required by the specific educational system.

Figure 5 illustrates a EuroLMAI report instance for a learner that has completed all the course units of a programme year and has obtained an overall result and credit for this period of learning.

#### **7.4 Report on qualification obtained for a completed programme of study**

In the case of an achieved qualification obtained by the learner upon successful completion of a programme of study, the EuroLMAI report can be structured in any of the following ways:

- comprise the information sections illustrated in subclause 7.2. Learning opportunities and associated credits and results gained by the learner MUST be represented for each component unit of the programme.
- represent only the information concerning the learning opportunity corresponding to the programme of study with explicit reference to the qualification and the overall result obtained

The Learning Opportunity Instance at the programme level MUST make reference to the Provider that offered the programme.

#### **7.5 Conformant integration and full support of Europass DS by EuroLMAI**

Within the context of the European Higher Education Area, Higher Education Institutions need to issue achievement reports on qualifications adhering to the Europass Diploma Supplement Information structure. The Europass DS is fully supported by the EuroLMAI through a concrete Application Profile of the generic model, which defines specific refinements and constraints, as these are imposed by the DS information recording requirements [EuroLMAI-DS-AP].

## Annex A (informative)

### Application Profiling

#### A.1 DCAM

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

#### A.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].

#### A.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 EuroLMAI 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 "elm:additionalInformation subPropertyURI value" can also be expressed as "elm:additionalInformation 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:

- **Literal** - Any literal value such as a string or a number
- **Description Encoding Type** - A description encoding type contains either
  - Plain unescaped text with an optional language qualifier attribute
  - Valid XHTML markup with an optional language qualifier attribute
  - Empty, with a href attribute containing a URL for remote content.
- **Date Encoding Type** - A Date or DateTime literal conforming to [ISO 8601]
- **Label Encoding Type** - A String literal with an optional language qualifier attribute

##### 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].

## A.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 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.

## Annex B (informative)

### Informative References

CWA 15555:2006, Guidelines and support for building application profiles in e-learning

DCMI-SF, DCMI Singapore Framework,

Available at <http://dublincore.org/documents/singapore-framework/>

DCMI-TERMS, Dublin Core Metadata Initiative: Terms 1.1

DCMI-DSP, DCMI Description Set Profile,

Available at <http://dublincore.org/documents/2008/03/31/dc-dsp/>

ECTS Users' Guide, ECTS Users' Guide,

Available at [http://ec.europa.eu/education/lifelong-learning-policy/doc/ects/guide\\_en.pdf](http://ec.europa.eu/education/lifelong-learning-policy/doc/ects/guide_en.pdf)

EQF, European Qualifications Framework

IETF-RFC2396, Uniform Resource Identifier

IETF-RFC2426, vCard MIME Directory Profile

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

MIAP CDD, MIAP Common Data Definitions,

Available at <http://www.miap.gov.uk/products/cdds/>

Portable Contacts, The Portable Contacts project,

Available at <http://portablecontacts.net/>

UML, Unified Modelling Language, v2.1.2,

Available at <http://www.omg.org/spec/UML/2.1.2/>

W3C-RDFS, W3C Resource Description Framework Schema Language 1.0,

Available at <http://www.w3.org/TR/rdf-schema/>

OJ L 390, 31.12.2004 DECISION No 2241/2004/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 on a single Community framework for the transparency of qualifications and competences (Europass)

CWA 16131, Europass Diploma Supplement Application Profile of the EuroLMAI (EuroLMAI-DS-AP)

CWA 16133, EuroLM Guidelines, Guidelines on a European Learner Mobility Model

EuroLM Authentication, Guidelines on European Learner Mobility: Electronic Document Authentication - A supplement to "Guidelines on a European Learner Mobility model" <sup>2</sup>

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<sup>2</sup> To be published