

---

---

**Information technology for learning,  
education, and training — Learner  
mobility achievement information  
(LMAI)**

*Technologies de l'information — Éducation, formation et  
apprentissage — Informations pour la réalisation de la mobilité des  
apprenants*

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO/IEC 19479:2019](https://standards.iteh.ai/catalog/standards/sist/e5abfba2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019)

<https://standards.iteh.ai/catalog/standards/sist/e5abfba2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019>



**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO/IEC 19479:2019

<https://standards.iteh.ai/catalog/standards/sist/e5abfba2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO/IEC 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
Foreword.....	iv
Introduction.....	v
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>1</b>
<b>3 Terms and definitions.....</b>	<b>1</b>
<b>4 Abbreviated terms.....</b>	<b>3</b>
<b>5 Conventions.....</b>	<b>4</b>
<b>6 Conformance.....</b>	<b>4</b>
6.1 Conforming instances.....	4
6.2 Conforming bindings.....	4
6.3 Conforming applications.....	5
<b>7 Learner mobility achievement information model.....</b>	<b>5</b>
7.1 General.....	5
7.2 Domain model.....	5
7.3 LMAI Resources.....	6
7.3.1 Classes.....	6
7.3.2 Association Properties.....	7
7.3.3 Attribute Properties.....	8
<b>8 The LMAI description set profile.....</b>	<b>9</b>
8.1 General.....	9
8.2 LMAI report.....	10
8.3 Learner.....	10
8.4 Issuer.....	10
8.5 Learning Opportunity Specification.....	11
8.6 Learning Opportunity Instance.....	11
8.7 Qualification.....	12
8.8 Credit.....	12
<b>Annex A (informative) Illustrative uses of the EuroLMAI Model and the Europass DS Application Profile.....</b>	<b>13</b>
<b>Annex B (informative) The LMAI conceptual model.....</b>	<b>18</b>
<b>Annex C (informative) Digital diploma supplement models.....</b>	<b>21</b>
<b>Annex D (informative) Application profiling.....</b>	<b>24</b>
<b>Annex E (informative) The relationship of LMAI to other organizations' works.....</b>	<b>26</b>
<b>Bibliography.....</b>	<b>27</b>

## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)) or the IEC list of patent declarations received (see <http://patents.iec.ch>).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

Global education has reached a level of maturity where the demand for the recording and exchange of learner mobility information needs to be efficiently supported by technical interoperability standards.

Several relevant standardization efforts relating to this work were identified and significant national expertise has been developed to date. However, harmonization was deemed necessary towards an international solution, in order to provide viable support for emerging international student management information systems and dissuade service providers from developing proprietary services and platforms.

The results of the current and future work about learner mobility 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 (workplace descriptions, recruiting and development of learners' competences) and other stakeholders of learning, education, and training internationally, the national bodies and their governments and ministries, etc. For the purposes of this document, learner mobility means the movement of learners from one region or country to another.

The learner mobility achievement information (LMAI) model directly addresses the international requirement for rapid implementation and dissemination of the institution-owned transparency information tools internationally. It has been 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.

This document specifies a framework of the generic LMAI model that supports the expression of institution-owned learner achievement information and the formation of official achievement reports (e.g. the learner's transcript of records) and transparency documents (e.g. digital diploma supplement). The framework model supports additional learner mobility achievement structures and tools. It standardizes additional information entities (e.g., intended learning outcomes, assessment processes, etc.). Related standardization activities are underway to provide other important extensions to LMAI.

The LMAI model has been developed to be:

- lightweight: taking into consideration existing and emerging educational practice processes and the relevant educational policies
- easy-to-implement: in order to ensure a rapid uptake by stakeholders of learning, education and training throughout the world (higher education institutions, learners, employers, service providers, etc.)

The accompanying proposed digital diploma supplement application profile meets the general purposes of:

- the use of academic achievements abroad: in continuing education or in seeking job opportunities;
- the admission of students or graduates in domestic institutions and educational organizations and those abroad: acknowledgment of credits or transfer of credits accumulated in domestic institutions moving from one institution/educational organization to another;
- the expression of the level, content and nature of qualifications to potential employers both nationally and at an international level;
- the enhancement of internal and international student mobility, from one educational organization to another, or from one branch of studies to another;
- the proper integration of foreign workers into a country's employment setting;
- the standardization of higher education qualifications, either in academic or non-academic paths;

- the establishment of good practices in the recognition procedures of qualifications among higher education institutions.

NOTE 2 The DDS application profile of LMAI focuses on the expression of information regarding the qualification awarded to a learner upon completion of a formal educational programme.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO/IEC 19479:2019](https://standards.iteh.ai/catalog/standards/sist/e5abfba2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019)

<https://standards.iteh.ai/catalog/standards/sist/e5abfba2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019>

# Information technology for learning, education, and training — Learner mobility achievement information (LMAI)

## 1 Scope

This document defines a model for the recording and exchange of learner achievement information among student information systems (SIS) (also known as student management information systems), as well as the aggregation of information by third party suppliers.

In addition, this document defines refinements to the learner mobility achievement award (LMAI) model for representing the digital diploma supplement (DDS).

**NOTE** The proposed model proposed is not intended to define the representation of the entire spectrum of learner mobility information but to define the formally structured representation of official, institutionally attested achievement information for learners engaged in formal learning processes, in order to facilitate its recording and subsequent exchange within any international area within which learner mobility is possible. Achievement information structured and presented in compliance with this document could, of course, be used for other purposes, for instance, to provide descriptions of achievement to enrich a learner-owned report in an e-portfolio. However, guidance on the document and the organisation of information for purposes other than the representation of formal achievement reports is outside the scope of this document.

## 2 Normative references

There are no normative references in this document.

ISO/IEC 19479:2019  
<https://standards.iteh.ai/catalog/standards/sist/e5ab1fa2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019>

## 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>.

### 3.1

#### assessment result

recorded outcome of a process used to evaluate, measure and document the progress of a learner

### 3.2

#### awarding body

organization that gives *credit* (3.3) or *qualifications* (3.19)

Note 1 to entry: The same organization may also be a *learning opportunity provider* (3.14) or an *issuer* (3.10).

### 3.3

#### credit

unit of learning or study that counts towards a *qualification* (3.19), such as a degree or *diploma* (3.6)

### 3.4

#### credit scheme

*framework* (3.6) that defines units of learning or study that can be accumulated by learners and transferred from an educational organization or programme of study to another

3.5

**credit value**

particular amount of credit

3.6

**diploma**

official documentary record of the awarding of a qualification

3.7

**diploma supplement**

*LMAI report* (3.8) that contains digital diploma supplement information

3.8

**LMAI report**

**learning mobility achievement information report**

document that contains achievement information for a single learner within a formal educational setting

3.9

**framework**

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

Note 1 to entry: A *credit scheme* (3.4) is a specific example of a framework.

3.10

**issuer**

body that creates and distributes the *LMAI report* (3.8)

Note 1 to entry: The same body may also be a learning opportunity provider or an awarding body.

3.11

**learner**

**student**

entity that learns

ISO/IEC 19479:2019  
<https://standards.iteh.ai/catalog/standards/sist/e5abfba2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019>

Note 1 to entry: A learner for the purposes of this document can be more specifically defined as an individual currently or formerly enrolled in a formal learning opportunity, where the learning opportunity (3.12) may be a part or whole programme of study, a seminar, work experience, a single course, etc.

3.12

**learning opportunity**

formally specified education or training process

3.13

**learning opportunity instance**

single presentation of a *learning opportunity* (3.12)

3.14

**learning opportunity provider**

organization that validates or advertises learning opportunity specifications, or that runs *learning opportunity instances* (3.13)

Note 1 to entry: A learning opportunity provider is a kind of LET institution or a type of learning service provider. LET institution is defined in ISO/IEC/TR 24763:2011, E.7.

Note 2 to entry: The same organization may also be an issuer (3.10) or an awarding body.

3.15

**learning opportunity specification**

description of a *learning opportunity* (3.12), consisting of information that will be consistent across multiple instances of the learning opportunity



**3.16****level****educational level**

one of a set of terms, properly defined within a *framework* (3.9) or a *credit scheme* (3.4), applied to an entity in order to group it together with other entities relevant to the same stage of education

**3.17****module**

course unit in a system in which each course unit carries the same number of *credits* (3.3) or a multiple thereof

**3.18****programme**

set of *learning opportunities* (3.12) for successful completion of which the *learner* (3.11) can be awarded a specified *qualification* (3.19)

**3.19****qualification**

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

**3.20****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

## iTech STANDARD PREVIEW (standards.iteh.ai)

**4 Abbreviated terms**

AP	application profile
DCAM	Dublin Core Abstract Model <small><a href="https://standards.iteh.ai/catalog/standards/sist/e5abfba2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019">https://standards.iteh.ai/catalog/standards/sist/e5abfba2-37fe-4506-a753-07e68d0f0131/iso-iec-19479-2019</a></small>
DCMI	Dublin Core Metadata Initiative
DDS	digital diploma supplement
DS	diploma supplement
DSP	description set profile
LM	learner mobility
LMAI	learner mobility achievement information
MLO-AD	metadata for learning opportunities - advertising
PURL	persistent uniform resource locator
QF	qualifications framework
RDF	resource description framework
SF	Singapore Framework
SIS	student information system
SMIS	student management information system
UML	unified modelling language

URI	uniform resource identifier
URL	uniform resource locator
W3C	world wide web consortium

### 5 Conventions

Base URIs for classes and properties defined in this document are introduced with the “**lm:**”. Base URIs for classes and properties that are used to describe learning opportunities are introduced with the “**mlo:**” prefix.

NOTE 1 The URN Identifier will neither take into account the edition number of the document nor the language, and thus will designate the current edition in English. The general format, conformant to RFC 5141 will be the following:

**PURL:** <https://purl.iso.org/iso-iec/19479/Element> which has its resolution as PURL Resolver Target: <http://standards.iso.org/iso-iec/19479/Element.html>

NOTE 2 The namespaces for classes and properties defined in this document are currently <https://purl.iso.org/iso-iec/19479/lm> (prefix “**lm:**”).

NOTE 3 The namespaces for classes and properties defined in this document are currently <https://purl.iso.org/iso-iec/19479/mlo> (prefix “**mlo:**”).

## iTeh STANDARD PREVIEW (standards.iteh.ai)

### 6 Conformance

#### 6.1 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 document and fully qualified refinements of the properties defined in this document.

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

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

#### 6.2 Conforming bindings

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

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

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

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

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

### 6.3 Conforming applications

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

- generating instances that conform to a conforming binding;
- processing instances that conform to a conforming binding.

## 7 Learner mobility achievement information model

### 7.1 General

This document has been developed following the principles of the Singapore Framework (SF) methodology for application profiles defined by the Dublin Core Metadata Initiative (DCMI)<sup>[13][14]</sup> The LMAI model is defined in terms of:

- a conceptual model (see [Annex B](#)), 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 (see [7.2](#)), providing a detailed description of the LMAI instance (report) resources and their associations.

### 7.2 Domain model

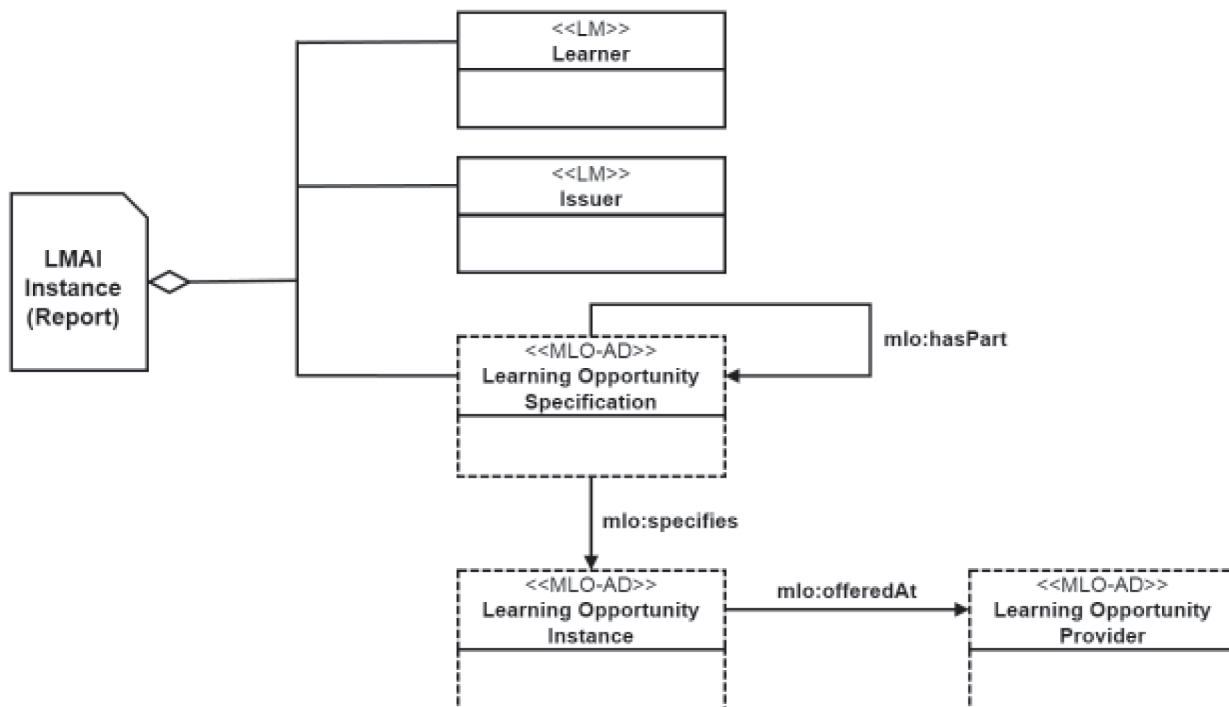
The LMAI model is concerned with specific sets of learner achievement information arising from the different administrative processes carried out at the institutions throughout the implementation of educational practice, as well as with the associations amongst them. It builds upon:

- 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; and
- other achievement information.

This subclause defines the domain model of the framework LMAI model. More specifically, it defines a LMAI instance (report) as an assemblage pattern of such information, namely:

- 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 Specification* instance, 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 (with reference to provider and – if specified – to related credit information), 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 1 — Domain model of the LMAI framework**  
 (standards.iteh.ai)

Figure 1 illustrates the domain model in UML [18]. Attention is drawn to the UML class diagram specification 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.

The LMAI model follows an application profile approach. Application profiles can be defined as schemas which consist of elements drawn from one or more namespaces, combined together and optimised for particular applications.

### 7.3 LMAI Resources

#### 7.3.1 Classes

The following classes are defined for LMAI. They require permanent URLs (see NOTE 1 in Clause 5).

**URI: lm:Learner**

**PURL: <https://purl.iso.org/iso-iec/19479/lm:Learner>**

**Label: Learner**

**Type: Class**

**Definition:** Individual currently or formerly enrolled in a formal learning opportunity

**Comments:** For example, part of or full programme of study, seminar, work experience, single course, etc.