TECHNICAL REPORT

ISO/IEC TR 20821

First edition
2018-08

Information technology — Learning, education and training — Learning environment components for automated contents adaptation

Technologies·de·l'information· — ·Apprentissage,·éducation·et·formation·--·Composantes d'un milieu propice à l'apprentissage pour l'adaptation des contenus automatisée

Reference number
ISO/IEC TR 20821:2018(E)

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
Website: www.iso.org

Published in Switzerland

Contents

Page

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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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).

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).

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.

This document was prepared by 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.

Introduction

Mobile learning is a term used to describe education conducted via digital learning environments where mobile devices are used. It is an evolved form of education that exploits the functionality and convenience provided via computers and the Internet. Mobile learning allows students to participate in classes via various devices regardless of the student's location, free from traditional time constraints while engaged in daily life. Providing content optimized for the student is the most important element of mobile learning, however, there is an exponentially increasing amount of customized educational content, often with the same context available. This content is increasingly created and shared in mobile learning environments that need to support many different device types. Content providers should be aware of various characteristics of user devices and learning environments so that they can provide optimized content. In order to select content meeting the requirements of both the end users' devices and the learning environment, profile data and metadata that describes the characteristics of those devices and learning environments is used.

This document describes a learning environment profile to support the establishment of mobile learning environments and defines a standard set of terms used to express device information and learning environments for mobile learning. It aims to energize a mobile learning market that is tailored to meet individual student's needs by allowing them to receive recommendations on, and use suitable content for, both their devices and learning environments.

This document contains two methods:

— The profile expression method is a technical method of displaying device information language that includes definitions of schema and vocabulary.

— The profile grouping method is a technical method of grouping and displaying terminal information language that includes a group profile example.

The standards herein express basic information needed to function successfully across different devices and environments. These standards will help establish a foundation for successful delivery of mobile learning.

Information technology — Learning, education and training — Learning environment components for automated contents adaptation

1 Scope

This document specifies two methods for adaptive content automation. Firstly, a learning environment profile for the expression of device and learning environment information required for mobile learning providers of both content and services, and for effective use of such services. Secondly, a grouping method is specified so that similar learning environment profiles can be bound into one and expressed collectively.

2 Normative references

There are no normative references in this document.

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
attribute
item that describes data elements that a resource description framework (RDF) contains

Note 1 to entry: Each attribute is related to a value or resource.

3.2
component
element that classifies *CPI* (3.3) at a high level

EXAMPLE UAProf, HardwarePlatform, SoftwarePlatform, NetworkCharacteristics, WAPCharacteristics, and BrowserUA, CommonCharacteristics, HardwarePlatform, SoftwarePlatform, NetworkCharacteristics, UserAgent and UsageEnvironment.

3.3
CPI
capabilities and preference information
item that contains the function of device, operation and network environments, student information, etc.

3.4
profile
instance by *schema* (3.8) that has all *attributes* (3.1) of a device, network and learning environment

Note 1 to entry: This profile will have all vocabularies available in the *schema* (3.1).

3.5
profile repository
repository where the *profiles* (3.4) are collected and stored

Note 1 to entry: A profile is usually saved in a resource description framework (RDF) file.

3.6
property
characteristic expressing the capability of the resource

Note 1 to entry: Resources may have many properties.

3.7
resource
objective or element expressed in RDF format

Note 1 to entry: Resource description framework (RDF) resource is usually expressed in uniform resource identifier (URI).

3.8
schema
RDF format *vocabulary* (3.11) created to express the *resource* (3.7)

Note 1 to entry: Schema contains only meaning (structural) information of REF data model, and does not have any values.

3.9
user
individual (student or teacher) or a group that acts as an individual

Note 1 to entry: A user will authenticate his or her identity in order to access resources or content from the server.

3.10
user agent
browser or program that operates in *users'* (3.9) devices

Note 1 to entry: In the mobile learning environment, user may express *CPI* (3.3) anywhere, anytime, by using various user agents.

3.11
vocabulary
set of terms used to express *CPI* (3.3)

Note 1 to entry: Vocabulary is related to *schema* (3.8).

Note 2 to entry: Profile vocabulary for mobile learning devices include device functions and network characteristics.

4 Learning environment profile

4.1 Components

4.1.1 Common characteristics (CommonCharacteristics)

A set of common attributes related to users' devices. Each device has, common attributes (the attributes commonly needed to select a content), such as character set, language, local time, supported content type, etc.

4.1.2 Hardware platform (HardwarePlatform)

A set of hardware attributes related to the users' devices. Devices use various hardware and support various functions. To accommodate such variety, Hardware will describe functions that can be supported according to the characteristics of hardware unique to the device. Hardware platform includes type of device, kind of model, etc.

4.1.3 Software platform (SoftwarePlatform)

Software platform describes the software components supported by the device. Software platform includes functions the installed operating system supports and other characteristics such as supported video and audio formats, etc.

4.1.4 Network characteristics (NetworkCharacteristics)

A set of attributes related to network a user uses. A user using a device may use various networks, and depending on the characteristics of network, availability of functions may be limited. Network characteristics include mobile phone number, information on the network connected to and communication protocol.

4.1.5 User agent (UserAgent)

A set of attributes related to HTML (Hyper-Text Markup Language) browser application. There are many browsers, such as Internet Explorer, Firefox, Google Chrome, etc. Each browser may support different functions. User agent includes type of browser and whether ActiveX, Java applet and Java script are supported.

4.1.6 Usage environment (UsageEnvironment)

A set of attributes related to current circumstances of users. A user's circumstances may change at any time. Usage environment includes location, prior knowledge level, education target, schedule, etc. of a user.

4.2 Attribute

An attribute can be included in only one schema and will be defined using a format where a name is paired with a value. Description of RDF attribute will be unique to a meaning and a value, and will never be ambiguous.

Attribute description within RDF component description block will be a vocabulary or RDF resource included to express a value in advance. The RDF resource uses indirect remote reference or remote reference, such as URI.

In case of an attribute with complex or multiple values, attribute will be described by the RDF resource. For example, basic attribute points at attribute collection. Thus, it will be described as URI resource. Similarly, RDF container (Bag or Sequence) will be used to describe aligned or unaligned lists of values connected to a given attribute.

4.3 Resolution rule

An attribute value may have multiple descriptions. In such cases, the following applies:

— First, apply the attribute description associated with the default tag.

— Thereafter, apply any supplied attribute descriptions. The default attribute description will be overridden. However, where there are multiple attribute descriptions outside default description block, the following will apply: The final attribute value is determined by resolution rule of applicable attribute. There are three types of resolution rules – Append, Locked and Override:

  — Append: a list of all attributes forms the final value.

