Enhancing the SCORM Metadata Model

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ABSTRACT

Nowadays, the leading e-learning platforms are converging towards standardization. This paper presents an extension to the SCORM, today's most well acclaimed e-learning standard, enabling the modelling of course related entities that surround learning objects and content aggregations, therefore increasing the standard's modelling scope and allowing for gains in efficiency in knowledge dissemination. A prototype is being implemented and tested on VIANET, an original e-learning platform with extensible support for the SCORM.

Categories and Subject Descriptors

K.3.1 [**Computers and Education**]: Computer Uses in Education - Distance learning

General Terms

Standardization, Documentation, Design.

Keywords

E-Learning. Metadata, Modelling, Standards, SCORM.

1. INTRODUCTION

Nowadays, e-learning is becoming the most effective paradigm for spreading knowledge among distributed heterogeneous audiences [1]. The World Wide Web, largely due to its worldwide acceptance and popularity, is the natural vehicle for this kind of knowledge dissemination, as it can be inferred by looking at top-leading e-learning solutions such as WebCT [2] and others. In order to facilitate communication and knowledge sharing among e-learning platforms, standards have been proposed for describing content metadata, course structure and navigation, and online interactions. The Sharable Content Object Reference Model (SCORM) [4] is the most prominent of those standards, enabling learning content reusability and portability across diverse Learning Management Systems (LMS), and discoverability among content consumers. The SCORM's metadata model provides means for describing learning content from its most basic form – atomic resources such as text files, videos or presentations, to complex content aggregations, like lessons or entire courses. However, it is not practical for the SCORM to specifically model essential course materials such as bibliography, evaluation rules, or the course programme. This paper aims at addressing this shortcoming, and proposes a new extension to SCORM's information model for, increasing its ability to support accessibility and interoperability of learning content aggregations.

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2. EXTENDING THE DATA MODEL

Due to the nature of the extension, whose application is intended to be as broad as possible, one major concern in defining the data model is to make it as flexible as possible, in order to maximize its modelling power or applicability. A new first level category is proposed, "Environmental", which is a direct child of the top level node "Lom" (from LOM, Learning Object Metadata [5]). This new category is parallel or has the same abstraction level as the nine main categories of the LOM metadata model, in which the SCORM is based on. Similarly to those main categories, "Environmental" is also a container, which consists of a set of nodes whose type is "Item". As illustrated in Table 1, a recursive hierarchy is proposed, in which data fields can be chained to describe arbitrarily complex structures that represent the modelled entities. The "Item" element is comprised of four child nodes. The "Type" node stipulates the kind of the item being described, and can be used by learning management systems to give semantic meaning to the item, therefore being able to behave in a customized manner towards them. As this node is meant to provide taxonomy for items, its possible values are restricted; hence, its data type is Vocabulary. The currently defined type values are Programme, Bibliography, FAQ, Assessment, EvaluationRules, and TextElement. The "Value" field holds the identification or content of the item. As an example, when

Table 1. Extension Category

Nr	Name	Description	Multiplicity	Type
10	Environmental	This category models the environment where the content aggregation is inserted in. It describes the course entities that are related with the learning contents	0 or 1	Container
10.1	Item	Entity in the content aggregation environment.	1 or More	Container
10.1.1	Type	Entity type	1	Vocabulary
10.1.2	Value	Entity content or value	0 or 1	LangString
10.1.3	Metadata	Metadata describing this entity	0 or 1	Container
10.1.4	Item	Sub-entity. The structure of this element is represented the same as 10.1 Item	0 or More	Container

modelling a course FAQ, the first step is to define an "Environmental" node in the course metadata file. The course FAQ is enclosed within one item node, whose type is FAQ; the value field of this item is used to provide a title for LMS presentation. This node's data type is, therefore, Langstring, a LOM data type for describing strings of text. The "Metadata" field, a container node that can cover an entire LOM hierarchy, may be used to specify additional information about the item. In our example, this element would contain additional metadata information about the FAQ, referenced by a link to an external metadata file or placed inline with the FAQ item. Finally, the "Item" child node, a container whose structure is the same as its parent node, enables the recursive modelling of an item, as it is represented in Figure 1.

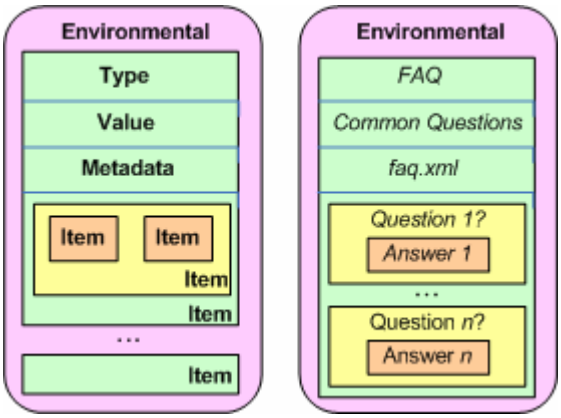

Figure 1. Item recursive structure and example application

As shown in the figure, this allows for the enclosing of the Q&A pairs in an arbitrary number of child nodes to the FAQ item. Figure 2 illustrates the definition of one of such pairs in XML. The child item, whose type is *TextElement*, contains the question. Metadata is added to characterize the question, and improve classification and search efficiency. The answer is defined as a child node to the question item, as illustrated in the figure.

3. CASE STUDY

The proposed extension is being implemented and tested on the VIANET e-learning platform [6, 7]. As the platform supports multiple standards with online model configuration, the extension is applied to the SCORM data model by simply editing it in the platform's administration portal. Once this task is complete, the system is able to parse and properly import extended metadata. It is then possible to add support for the import and export of the course entities presented earlier in this paper. For instance, when importing a SCORM course, the *Environmental* node is parsed, and FAQ items are imported. This effectively increases course portability, as new course elements can be migrated across diverse platforms, and improves search efficiency, as more course materials are described by metadata.

4. CONCLUSION

This paper proposes an extension to the SCORM standard, based on identified shortcomings that limit its modelling scope in complex learning environments. Specifically, the proposed extension provides direct support for course entities other than traditional learning contents, namely the course programme, bibliography, frequently asked questions, assessments, and evaluation rules. While only few entities are defined in this extension, concern was taken to conceive a data model with generality in mind, enabling the support for other entities if needing to. The proposed extension thus effectively enhances the SCORM modelling scope, allowing for greater flexibility and effectiveness in the design of future learning management systems. The extension is tested in a real system, revealing clear gains in course portability and search efficiency.

```
<environmental>
 <item> […] [FAQ Item]
  <item>
   <type>
    <vocabulary>[…]
     <langstring>TextElement</langstring>
    </vocabulary>
   </type>
   <value>
    <langstring>When was Rome founded?
    </langstring>
   </value>
   <metadata>
<adlcp:location>course/metadata/rome1.xml
</adlcp:location></metadata>
   <item>
    <type>
     <vocabulary>
      <langstring>TextElement</langstring>
     </vocabulary>
    </type>
    <value>
     <langstring>753 BC</langstring>
    </value>
   </item>
  </item>
 </item>
</environmental>
```

Figure 2. Item recursive structure XML representation

5. ACKNOWLEDGMENTS

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6. REFERENCES

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