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Published in IEEE Learning Technology newsletter (ISSN 1438-0625)

Vol 5, Issue 1, pp 40-42



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Report number: CID-214

ISSN number: ISSN 1403 - 0721 (print) 1403 - 073 X (Web/PDF)

Publication date: Jan 2003

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Standardized Content Archive Management – SCAM

- *Storing and Distributing Learning Resources*

Published in

IEEE Learning Technology newsletter (ISSN 1438-0625), Vol 5, Issue 1, pp 40-42, Jan 2003.

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Abstract

The use of metadata and international standards is essential for the distribution of learning material as learning objects and learning components. SCAM is an archive system for storing and distributing learning components. By using existing standards for learning related metadata and metadata in general, such as IMS metadata and RDF, an advanced metadata model is implemented. The metadata model in SCAM supports the use of multiple metadata sets on the same resources, using different vocabularies and taxonomies in a layered manner. Based on the SCAM system, different types of archives can be built, such as e.g. portfolios or general learning component archives. Archives can be connected to each other by the use of an Edutella peer. SCAM addresses some of the more common, meta data related problems of storing and distributing learning components.

Keywords

E-learning, semantic web, learning object, learning component, SCAM, interoperability, archive, metadata, RDF, learning technology standards.

Introduction

E-learning and the use of ICT in education have literally exploded during the last couple of years. Much of the e-learning today is distributed using web technology. Either via the World Wide Web, Intranet or via Extranet. Often using Virtual Learning Environments (VLE) based on web technology or a back-end that uses web technology for presentation and interaction. The rise and growth of e-learning introduces a number of new problems (and of course, many opportunities). One of the more significant problems concerns the organization and distribution of learning resources. This is the problem that this article addresses. It is also the purpose of the SCAM project, which is the focus of this article.

The KMR-group¹ at KTH is presently coordinating a collaborative effort that involves the *Swedish Educational Broadcasting Company* (UR), the *National Agency for Education* (Skolverket) and the *National Centre for Flexible Learning* (CFL). These three dominant Swedish public service e-learning players have teamed up and are now jointly contributing to a Public e-Learning Platform (PeLP) based on open source code and emerging international e learning standards. The SCAM system constitutes a vital part of this platform.

It gets more and more common to distribute learning resources as *Learning Objects* or *Learning Components*. The SCAM system uses those concepts in order to implement the basis for a general archive system. Unfortunately, the definitions of the terms “Learning Object” and “Learning Component” are not well calibrated. There are several definitions (and visions), but most of them have some characteristics in common. One such commonality is the use of international Learning Technology Standards². Another is a modular design ambition and the strive to be reasonably context-independent - and hence reusable. One of the more common visions is the LEGO™-like model where several independent Learning Objects can be assembled and contextualized in order to obtain a compilation of learning material that suits a specific pedagogical situation. This is a vision that has been criticized and accused of being too simplified and unrealistic. Other, more complex models, such as the atomic model have been suggested. [Wiley, 2002]. A more exhaustive discussion of the subtleties of the concept “Learning Object” is however outside the scope of this article. Here we give a high level description of the SCAM system, the ideas behind it and the problems it addresses.

The SCAM system was developed to constitute a general basis for constructing standardized archives for digital learning resources. This means that the use of international Learning Technology Standards (as well as other Technology Standards) is most essential. The work is based on the assumption that the use of metadata and metadata international standards are prevented by the complexity of the implementations needed. At the same time, a great part of the implementation is similar for most projects in this domain. Hence, a common basis would greatly increase the effectiveness by enhancing reuse as well as by hiding the complex implementation details and provide a higher abstraction level for the average programmer.

¹ <http://kmr.nada.kth.se> .

² I.e. standards such as IEEE/LTSC, IMS, SCORM or JTC1/SC36.

The metadata problem

One of the most important missions of SCAM is to serve as a *metadata catalogue* for learning resources. The resources themselves may be distributed and referred to by URI:s. One of the fundamental problems and common misconceptions regarding metadata is that metadata is objective, static and has logically defined semantics [Nilsson, Palmér, Naeve, 2002]. Since this is not really true, especially not for learning resources, we need a mechanism for supporting a metadata ecosystem of dynamically evolving metadata over multiple metadata sets, using different metadata models, vocabularies and taxonomies for the same set of resources. We also need a mechanism that provides metadata semantics. In order to address those problems, we have turned to the Resource Description Framework or RDF⁴. As Bray expresses it: “*RDF is a framework for describing and interchanging metadata.*” [Bray, 2000]. The use of RDF is a good start in order to design a system that has the wanted characteristics. For this reason, the SCAM metadata implementation is based on the newly released RDF bindings for LOM/IMS Metadata.⁶ To describe the structure of learning resources, IMS Content Packaging is implemented using, an RDF-based version of the IMS Content Packaging specification. This specification was developed by Mikael Nilsson and Matthias Palmér⁷, in order to solve this problem (and others) for the SCAM project as well as for the Edutella project. Edutella is an RDF based peer-to-peer (P2P) infrastructure for metadata interchange and interoperability on the semantic web. [Nejdl et al. 2002].¹⁰

Current state of SCAM

The first version of SCAM (SCAM I) was released in March –2002 and is available at Source Forge¹¹ under a combined GPL/MPL Open Source license. This release is a working prototype with the main purpose to prove the concept.

Since SCAM is a basis for building metadata-based archives, it is more or less invisible. To visualize SCAM I a teacher/student portfolio system was built on top of it. The implementation was made by providing a simple, form-based metadata editor and a simple web-based user interface. This SCAM I portfolio can be used for organizing and storing metadata on personal as well as shared learning resources.

As of December 2002, SCAM is approaching version II. Many of the identified metadata problems have been addressed. At the same time, SCAM has gone through a major architecture revision and refactoring. The most significant architectural change is that SCAM II is based on Enterprise Java (J2EE) for reasons of performance and scalability. The release of SCAM II is planned for Q2 2003.

⁴ <http://www.w3.org/RDF/>

⁵ <http://www.w3.org/RDF/>

⁶ The RDF-bindings were developed under the coordination of Mikael Nilsson of the KMR-group at CID as part of the KMR involvement with e-learning standardization work within IMS and IEEE. See [Nilsson et al, 2001].

⁷ of the KMR group <http://kmr.nada.kth.se> .

⁸ <http://kmr.nada.kth.se/>

⁹ <http://www.kth.se/>

¹⁰ <http://edutella.jxta.sun.com/>

¹¹ <https://sourceforge.net/projects/scam/>

Unsolved problems and the future of SCAM

Despite the successful work on SCAM II, there are still many issues to investigate further in future research.

- *Use of multiple metadata models, vocabularies and taxonomies.* This is addressed by the implementation of a new, RDF based metadata model.
- *Annotation of metadata.* Functions for annotation of resources and metadata by other than the “resource owner”. This feature will be supported by the use of multiple metadata models. We expect it to be very useful in the portfolio application of SCAM.
- *Connecting several archives for distributed metadata searches and interchange.* This is partly addressed by the implementation of an Edutella interface to SCAM II.

Conclusions

One of the most important attributes in order to store and distribute learning material is a sound use of standards. However, the work with the SCAM project has shown us that we need a more flexible metadata model that supports multiple metadata layers for multiple vocabularies, taxonomies and ontologies. This is absolutely essential in order to promote efficient reuse and contextualization of learning resources. We must realise that metadata is not static and that metadata is not necessarily provided by once by a single provider. We must establish the right conditions for creating a dynamic, democratic, metadata ecosystem.¹⁴ As described by [Nilsson, 2001] as:

“ a place where metadata can flourish and cross-fertilize, where it can evolve and be reused in new and unanticipated contexts, and where everyone is allowed to participate.”

SCAM is a step in that direction, but more research is needed in this area.

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¹² <http://www.cfl.se/>

¹³ <http://www.ur.se/>

¹⁴ SCAM has recently been equipped with *SHAME* (*Standardized HyperAdaptable Metadata Editor*), which has been designed in order to support this view of metadata.

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