STUDY OF IMPLEMENTATION OF LEARNING OBJECT MANAGEMENT SYSTEM

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ABSTRACT

The vast and rapid development in the computer, communication and Internet technologies has significantly affected contemporary educational systems. This paper presents a LOMS (Learning Objects Management System) architecture based on the B/S architecture for the support to the reusability and interoperability of various learning objects. A dynamic approach in the use of the metadata and how this concept can dramatically improve the management of Learning Objects is illustrated. The work of user input during the metadata generation also has considerably been reduced by the template together with information gathered from the system. Our basic design ideas are to develop a user-friendly learning environment utilizing a simple but effective architecture, taking advantage of XML and making efficient use of available open source offering. Hence, we adopted native XML database technology instead of traditional RDBMS (Relational Database Management Systems), and Apache's open source offering, Xindice as tools to develop the LOMS.

Keywords: eLearning standards, learning object, Learning Object Metadata, LOMS, XML binding, web-based learning, XML-native database

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1. INTRODUCTION

As web-based Learning being widely used in educating and training, the amount of digital learning resources begin to accumulate. Reusability and interoperability of digital learning resources become one of the major challenges. The proposal to structure learning contents according to the model of the Learning Object (LO) has evolved out of this context. The characteristics of durability, interoperability and reusability and the related standardization process needed to achieve these goals, have played an important role in the diffusion of the Learning object model. Thus the cost of courseware development can be lowered through reusing of learning objects.

A learning object, as defined by the Institute of Electrical and Electronics Engineer's (IEEE) Learning Technology Standards Committee, "is any entity, digital or non-digital that can be used, re-used or referenced during technology supported learning" (IEEE, 2002). This definition is intended to include any form of instructional material that can be used during "technology supported learning."

The core of a learning object system is a central repository (database) containing hundreds to thousands of individual learning objects. The information stored in these repositories would be accessed by an array of applications and end users, including learners and the instructional designers. Attached to each learning object in the database is metadata. The metadata includes subject-specific information by conforming to the open standards.

The basic LMS performs two major functions: it provides instructional designers with a means of locating learning objects, and it assembles them into standard compliant learning units. Although many types of LMSs are available, the enhanced LMS will contain four essential features: an authoring application similar to the computer assisted software environment , a collection of learning objects described above, a means of sending the completed course to a delivery system (called a delivery interface), and administration tools. The LMS systems have been enhanced to include additional features, such as intelligent tutoring or adaptive learning components for learners.

In particular the standardization process has focused on two main aspects: the description of LOs to provide efficient search and retrieve mechanisms; the model of LO to guarantee the reusability and interoperability of educational resources in the hundreds of learning platforms and learning systems available worldwide.

Standard organizations such as ACM (Association for Computing Machinery), DLF (Digital Library Federation) and IEEE (Institute of Electrical and Electronics Engineers), IMS (Global Learning Consortium, Inc.) and ADL (the Advance Distributed Learning Initiative, sponsored by the OSD (Office of the Secretary of Defense of USA)) have published several well known specifications for e-learning either independently or co-operatively

XML-based specifications supporting learning technologies have been developed by the SCORM initiative and distributed through the ADL (Advanced Distributed Learning) initiative's network [5]. There are two key mechanisms in SCORM, one is the content aggregation model and the other is run-time environment. SCORM provides specifications for building a unified content model and a run-time environment, enable courseware sharing and multi-platform (cross-platform) learning.

Our basic design goal is to develop a general-purpose, user-friendly digital reference room with a simple but effective architecture. So we adopted native XML database technology and open source offering Xindice after thorough investigation. This paper describes the architecture and implementation for Learning object management system using native xml database Xindice.[7]

2. LITERATURE SURVEY

Alex Koohang in his paper "Creating Learning Objects in Collaborative E-learning Settings", provides a systematic approach to creating LOs for the purpose of reusability. There are undoubtedly other methods for creating learning objects. A critical element in creating LO is choosing a sound LO architecture that includes a set of industry standards principles that are fundamental to run time environment, metadata and content packaging. In addition instructional design models and user interface design that are critical issues in learning must be incorporated in creating learning objects.[4]

Olivier Motelet, Nelson A. Baloian ,José A. Pino in their paper on " Hybrid System for Generating Learning Object Metadata" discussed the issues of both automatic and human-based generation of LOM. LOM is used not only for packaging the learning material items, but also for characterizing them and potentially helping the design of the lesson syllabus. Their approach also attempts to integrate the results of automatic LOM generation tools in order to assist the instantiation process. In particular, the system provides suggestions and restrictions on LOM values.[6]

Albert D. Ritzhaupt in their paper " Learning Object Systems and Strategy: A Description and Discussion" have illustrated how a dynamic vision of the metadata should be integrated in the design of a LOMS in order to improve the management of Learning Objects. Currently their research is concentrated on the improvement of usability of the user interface of the FreeLOMS platform; moreover, they have been developing a set of web services that can facilitate the management and reuse of digital educational resources in efficient and effective way.[2]

Wang Xuan, Zheng Li, and Yang Fang in their paper" An Implementation of Learning Objects Management System states that for the reusability and interoperability of learning objects, the development of a LOMS should be based on the concept of metadata and compatible to various metadata standards. The XML technology makes the multi-standards support feasible. By putting the standards in different classes, the XSLT makes the support of a class of standards simple and extensible.[5]

3. SYSTEM ARCHITECTURE

The architecture is based on the B/S (Browser/Server) architecture. Contrast to other Client/Server architectures, B/S is convenient for user, for only a browser is required. In addition, the change of the system doesn't affect the user either. The LOMS consists of two sub-systems: application server and the database servers. The system is distributed on three layers: the presentation layer, the function/control layer and the data layer. The browser on the presentation layer is the entry to the system. Application server focuses on the implementing of the functions of the system, such as the metadata's generating. It is the function/control layer. All the data, including the metadata and the learning objects themselves are stored in different databases, which form the data layer. The metadata is stored in Xindice and the learning objects in file systems. Three components reside in the application server: Learning Objects Upload Module allows a user upload his/her learning resources to the system and stores them into the learning objects database. Metadata Generate Module generates the metadata for a learning object. Learning Objects Search/Retrieve Module accepts the user's request, finds the appropriate objects and then returns them.[5]

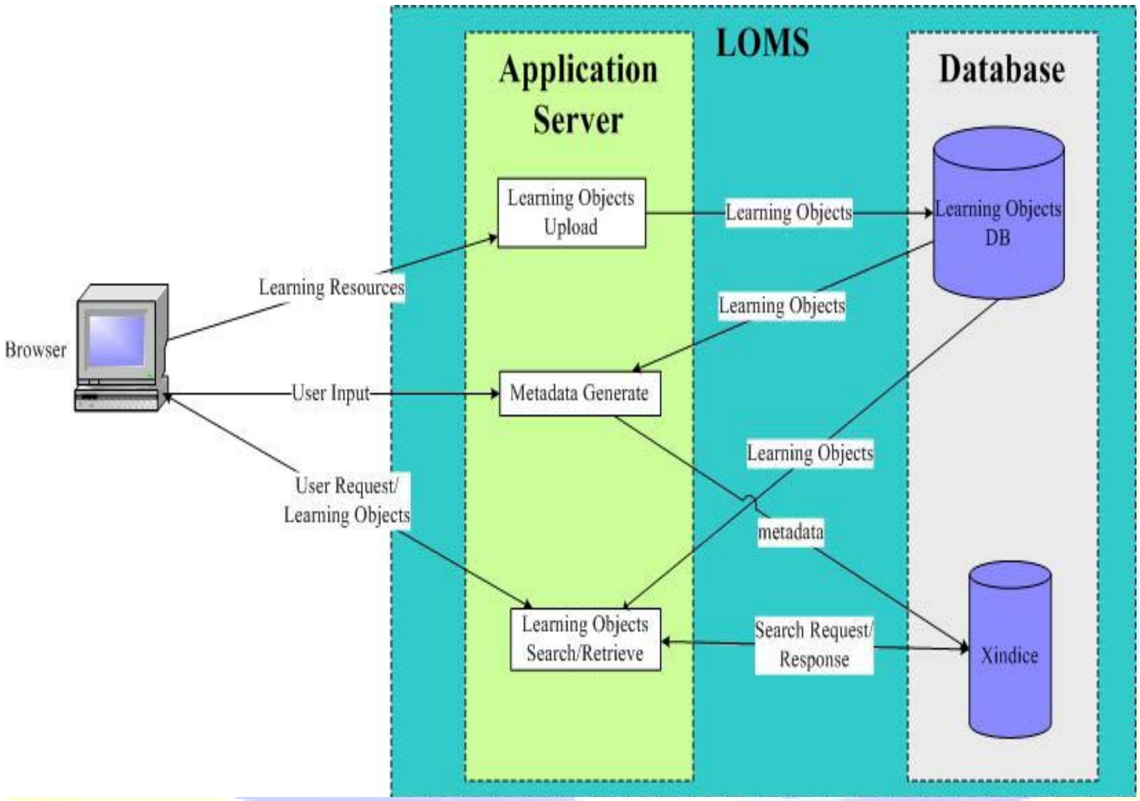

Fig.The overview of the LOMS

4. CONCLUSION

For the reusability and interoperability of learning objects, the development of a LOMS should be based on the concept of metadata and compatible to various metadata standards. The XML technology makes the multi-standards support feasible. By putting the standards in different classes, the XSLT makes the support of a class of standards simple and extensible. The other effort made in our system is to make use of the templates in LOMS to reduce the user's work during the process of metadata generation. Next, the user-defined extension of the standards may be supported in our LOMS, and what is more interesting may be the creation of templates library for different users and objects. We have presented our basic design ideas for our ongoing project on LOMS for e-learning. We adopted native XML database and Xindice to implement the three layers architecture of LOMS so that it is cross-platform enabled and multi-OS interoperable.

Future works include further personalization of user database to enable high efficient e-learning and full test and evaluation of the under-developing learning object management system.

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