Towards Open Standards:
The Evolution of a Collaborative Courseware Generating System

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ABSTRACT

In this paper we present the evolution of a collaborative courseware generating system that is featured by XML-based course structure representation, JSP-based dynamic courseware presentation, and WebDAV-based collaborative courseware authoring. While the first system implementation employs a proprietary design using a self-defined XML DTD to represent the course structure, the second and the third system implementation take an open-standard-oriented approach, which are respectively SCORM 1.1 and SCORM 1.2 conformant. In the latter two implementations, all learning resources contained in an existing Java course are re-designed according to the SCORM 1.1 and SCORM 1.2 Content Model and further annotated with corresponding SCORM metadata. In addition, the course structure is re-constructed utilizing SCORM 1.1 Content Structure Format and SCORM 1.2 Content Packaging Specification. The evolution of the collaborative courseware generating system is motivated by our efforts to improve the reusability and interoperability of learning resources.

Keywords: eXtensible markup language, Web-based Distributed Authoring and Versioning, Java Server Pages, Sharable Content Object Reference Model

INTRODUCTION

Since the summer semester 1999, the joint CS1 course “Introduction to Java Programming” (Info1 for short) has been shared among three German universities and one university in Italy. During the past three years, we have been successively working on three system implementations of Info1 with the purpose of exploring efficient approaches to improving the reusability and interoperability of learning resources. While the first system implementation employs a proprietary design using a self-defined XML (eXtensible Markup Language) DTD (Document Type Definition) to represent the course structure, the second and the third system implementation take an open-standard-oriented approach, which are respectively SCORM (Sharable Content Object Reference Model) 1.1 (ADL Technical Team, 2001)
and SCORM 1.2 (ADL Technical Team, 2001a) conformant. In the latter two implementations, all learning resources contained in Info1 are re-designed according to the SCORM 1.1 and SCORM 1.2 Content Model and further annotated with corresponding SCORM metadata. Also the course structure is re-constructed utilizing SCORM 1.1 CSF (Content Structure Format) and SCORM 1.2 CP (Content Packaging) Specification. In the following we will present these three system implementations of Info1, showing its evolution towards open standards.

GENERAL DESIGN

In Figure 1 we illustrate the general infrastructure of the collaborative courseware generating system.

In general, the system is constructed from a WebDAV (Web-based Distributed Authoring and Versioning) based courseware authoring module and a JSP (Java Server Pages) based courseware publishing engine. The standard data interface between both is XML.

Although the general infrastructure is commonly shared by all three system implementations, there are several essential differences between them. First of all, the three system implementations are different in how they represent the course structure using XML. This essential difference clearly marks the system’s evolution towards open standards. Moreover, the different representations of the course structure also determine the reusability of the JSP-based courseware publishing engine that is responsible for dynamically presenting the XML-based course structure on the Web. In Figure 2 we firstly illustrate a common module of all three system implementations: the WebDAV-based courseware authoring module. It is used to support collaborative courseware authoring in three system implementations.

The courseware authoring module comprises a WebDAV-based courseware repository used to store course script files, and an XML file used to represent the course structure. The latter also serves as the standard data interface between the courseware authoring module and the courseware publishing engine in order to cleanly separate course content from the courseware presentation. The WebDAV-based courseware authoring module is shared by all three system implementations of Info1, which can enable geographically dispersed authors to collaboratively accomplish the courseware authoring process.

WebDAV (Goland, Whitehead, Faizi, Carter, & Jensen, 1999) is an IETF speci-
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