

Customising open source LMSs in order to meet localization and synchronous communication requirements

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Abstract: - Learning Management Systems (LMSs) are applications that facilitate the management, observation and delivery of educational material through the Internet. Nowadays several of these systems are of such high quality that despite their free distribution and open source nature they are gaining popularity among distinct academic institutions. This paper addresses the issue of installing and adopting the open source LMS Dokeos to deliver SCORM lessons in the Greek language. Additionally, the authors demonstrate the extension of the system with direct support for new services such as videoconferencing and streaming video. The proposed methodology is applicable to any LMSs and therefore can function as the basis for coping with similar localization problems in discrete e-learning platforms.

Key-Words: - Learning Management Systems, Localization, SCORM, Streaming Media.

1 Introduction

E-learning is blossoming into the most effective paradigm for conveying knowledge among distributed heterogeneous audiences. Mainly due to its worldwide acceptance and popularity, the World Wide Web is the natural vehicle for this kind of knowledge dissemination, as it can be inferred by looking at the growth of distance learning programs offered by universities and colleges all over the world. Learning Managements Systems (LMSs) stand for the applications controlling the management, observation and transmission of educational material through the Internet. So far, numerous lecturers in complex academic environments have successfully developed educational websites through the utilization of the aforementioned systems. In order to develop a LMS effortlessly and quickly while keeping costs at a low pace, many instructors tend to use off-the-shelf applications, that is freely and openly distributed software. Applications such as Moodle [1], A-tutor [2] and Dokeos [3] abide by the latest standards in e-learning, thus allowing learning content reusability and parameterization of several user interface attributes (language, appearance, services). In an effort to both address the needs of University of Macedonia's multimedia lab and experiment on learning objects and their specifications, the authors decided to install and operate a modified version of the Dokeos LMS.

This paper initially describes the theoretical framework of modern standards and specifications in e-learning. The distinct features of Dokeos that led to its selection are then highlighted, followed by an introduction to the problems that occurred after its installation. Section 5 focuses on applications for synchronous communication in learning environments and section 6 illustrates the actions carried out in order to enhance Dokeos with these functionalities.

2 E-learning standards - SCORM

The current most widely acclaimed e-Learning standards development organizations are:

- Aviation Industry Computer-Based Training Committee (AICC).
- Instructional Management System Global Learning Consortium, Inc. (IMS).
- Institute of Electrical and Electronic Engineers (IEEE).
- Advanced Distributed Learning (ADL) initiative.

Recent development of innovative specifications and standards has played a vital role in the reproduction of many drastic LMSs. Their common feature is the fragmentation of learning material into pieces called Learning Objects (LOs) [4]. LOs contribute in the production of interoperable, accessible, durable and most importantly re-usable course elements [5]. Reusability equals to portability

across diverse LMSs and discoverability among content consumers, provided that said standards are widely adopted.

The Sharable Content Object Reference Model (SCORM) is one of the most acclaimed e-learning specifications and is therefore supported by most modern LMSs. Established in 1997 by the American Department of Defense in collaboration with a number of American universities and firms, ADL [5] introduced SCORM aiming at encouraging and supporting small, reusable, sharable course content, discoverable via metadata descriptors [6]. The SCORM metadata information model is a reference to the IMS learning resource metadata information model, which itself is based on the IEEE LOM standard [4]. The SCORM metadata also adheres to the IMS learning resource metadata XML binding specification and provides an XML representation for the SCORM metadata information data model.

3 Dokeos LMS Features - Setup

Seeking an integrated e-learning solution, we decided to focus on open source software mainly because of its unique experimentation capabilities. In order to opt for an open LMS that was both user friendly and SCORM compliant with Greek language support, we evaluated a series of applications including ATutor[2], Dokeos[3], MOODLE [1] and ILIAS [8]. Dokeos was finally selected because it is a system that offers easy management and maintenance along with rich documentation. Furthermore, it is platform independent, SCORM compliant and exceptionally user friendly when it comes to authoring or viewing.

Dokeos is an open source LMS accompanied by Free Software Foundation's [7] [10] General Public License [9]. It is implemented in PHP and requires Apache acting as a web server and MySQL as a Database Management System. These requirements were satisfied using the open application EasyPHP which installs and sets easily both Apache and MySQL in a system running Windows 2003 Server.

An adjustment that had to be performed manually regarded the maximum size of files to be uploaded. Since the used educational material (presentations, course notes etc.) extended the default setting, we had to increase it to 100 MB through altering the "php.ini" file in the "conf_files" folder. Optionally, someone could also alter the default MySQL passwords so as to increase security.

Unfortunately, Greek characters were not displayed properly in all browsers after installation (Figure 1). In order to address this imperfection, we

had to perform the extensive substitution of the "htmlentities" function with "htmlspecialchars" within the source code of 56 files. This extra task can be readily performed with the aid of numerous text editors. Finally, the user interface had to be customised in order to correspond to the university's website layout (background, logos, headers, footers

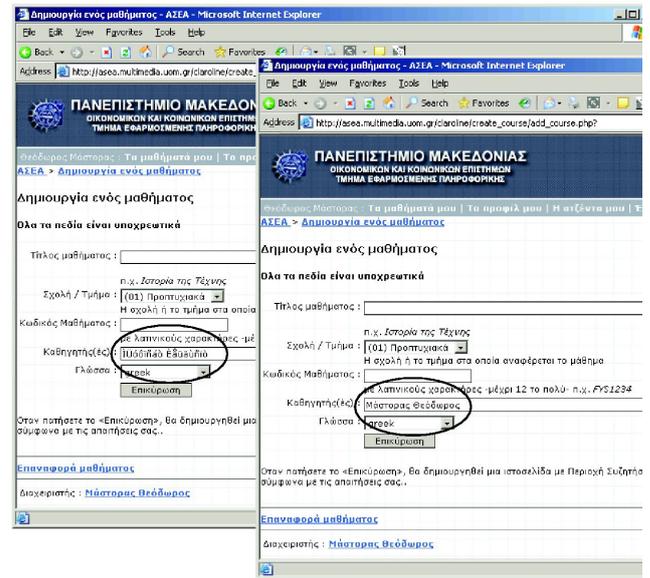


Figure 1. The problem of Greek characters in displaying

4 Addressing SCORM problems

4.1 Localization

Compared to the rest of the evaluated LMSs, Dokeos was the sole system displaying both course contents and the LOs (also called SCOs in the SCORM specification) tree structure on the same single screen. This structure acts as a user-friendly navigational tool specifying the student's learning path.

Dokeos is not fully SCORM compliant, therefore tolerant enough to courses created in different SCORM versions. At the same time it supports tracking of numerous course elements referring to the time spent in a course section, score achieved in a test and whether a section was successfully completed.

4.2 Authoring problems

The selected authoring software for the preparation of SCORM courses was Reload [11], a powerful and

open application recommended also by ADL. However, as Reload does not support the creation of self-assessment tests, a divert application had to be employed. Trivantis Lectora [12] proved to be the most eligible tool for this purpose. Lectora allowed the generation of tests in the form of small autonomous SCORM courses that were included into the main course by Reload.

Nevertheless, these courses still failed to display Greek characters due to declaration of UTF-8 as the codepage encoding (Figure 2). The solution to this problem requires two separate steps following course authoring:

- The available answers in Lectora multiple choice tests should contain only their corresponding number (e.g. “1”, “2”, “3” etc.). Greek characters should either be avoided or placed in separate floating text boxes.
- The “imsmanifest.xml” file created by Reload is UTF-8 encoded and therefore has to be converted to ANSI. This can be achieved through replacing the tag `<?xml version="1.0" encoding="UTF-8"?>` found in the file’s first line with `<?xml version="1.0" ?>`. Finally the file must be saved with the encoding attribute set to ANSI.

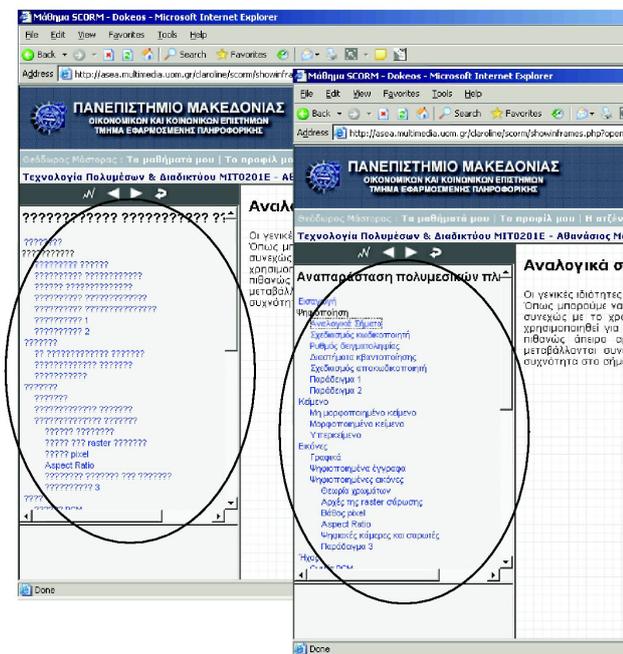


Figure 2. Greek characters displaying in SCORM

5 Synchronous communication in e-learning

E-learning systems are mostly based on asynchronous communication granting students and teachers with time and space independence.

However, this type of communication can sometimes become a burden for services such as e-fora, e-mail etc. due to possible long time intervals. These communication interruptions can lead to poor learning experiences. On the other hand, synchronous communication can overcome this problem, enhancing the learning process. The most obvious advantage of 'real-time' communication is that students are able to pose questions and receive feedback in real time. They do not have to wait for long periods and as a result the learning process is not constantly interrupted.

The use of audio and video streaming, although demanding in terms of bandwidth, is the best vehicle towards delivering a lecture through the web in an effective way. Streaming media minimize the client’s waiting time since the transmitted material does not have to be downloaded completely for viewing.

6 Integrating synchronous communication services in Dokeos

6.1 Data streaming

Windows Media [13], Real Media [14] and QuickTime [15] are the most widely accepted streaming technologies. The proposed system utilizes Microsoft Windows Media platform mainly because it was included in the Microsoft Internet Information Server (IIS) which was already in use.

The key features [16] of Windows Media Technologies can be summarized as follows:

- Wide bandwidth range and multiple bit rate encoding. A different bit rate can be encoded according to the individual need.
- Intelligent streaming. Media server can monitor and automatically adjust the bit rate of each client stream according to current bandwidth so that end users receive the highest quality stream.
- Built-in multicast service.
- Wide availability for end user due to their support of both Internet Explorer and Media Player.
- On-demand / Live Presentation.

6.2 Previous services

Dokeos facilitates synchronous communication through the “conference” and “chat” services. However, both services present several limitations. For example, instant messaging through “chat” is rather slow as it requires the continuous and rather annoying refresh of screen information. Additionally, “chat” supports only text messages. As for video streaming, it is up to the instructor to define a link to some streaming server without any further assistance or link to the available on-line video lectures. Finally, transmitted video appears in a new window which overlaps the system’s user interface, thus causing frustration among users.

6.3 Extending Dokeos

In order to cope with the aforementioned problems, we had to modify the source code of the “conference” section. In particular, the files located in the “claroline\online” folder were altered so as to support the following functionalities:

- Video-conference. After installing the video-conference server CUseeMe [17] in a separate computer, we appended an additional link responsible for the automatic launch of a video-conference to the “conference” section. Each learning module has its own virtual conversation room for the students to choose from (Figure 3) provided that they have the CUseeMe client already installed in their computers.

- Delivery of video lectures through streaming. Showing a streamed lecture within the Dokeos window (Figure 4) requires the employment of a computer running Microsoft Windows Media Services. We inserted an additional link to the “conference” section’s configuration panel, leading to the administration page of the Media Server’s repository. Instructors can then add a publishing point, i.e. a reference to a camera or a video file stored in a shared folder. There is a corresponding shared folder for any created lesson in the Dokeos environment. Following the previous steps, the assignment of a specific publishing point to a lesson, becomes an effortless task.

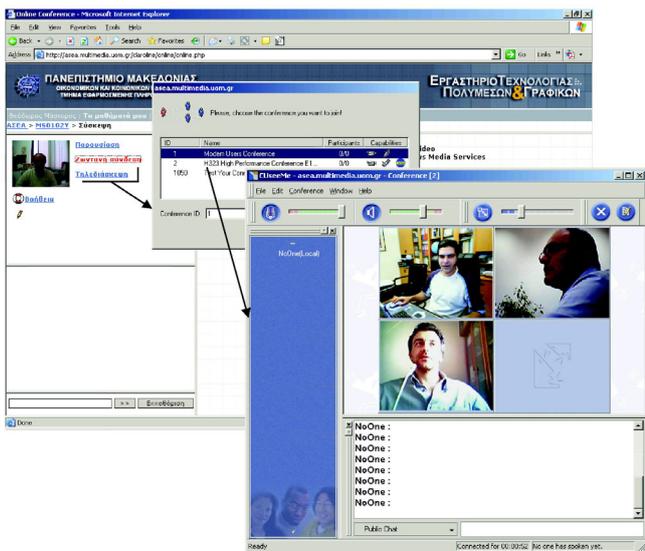


Figure 3. Video-conference under the Dokeos environment

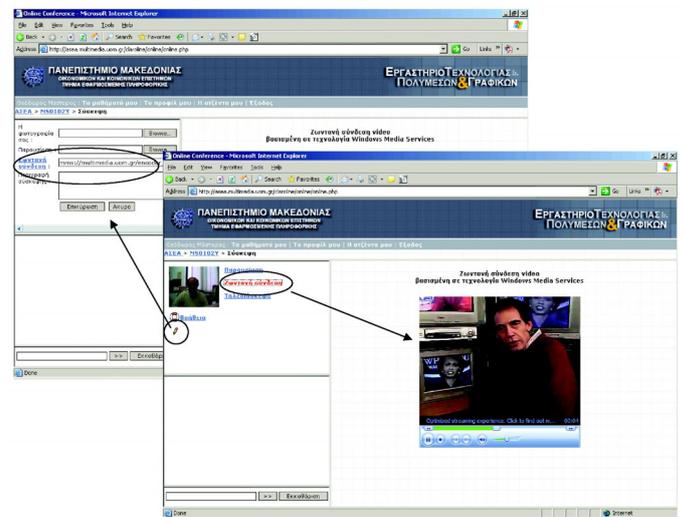


Figure 4. Showing streaming video inside the Dokeos window

7 Conclusion – Future work

This paper proposes an extension to the Dokeos LMS, based on identified shortcomings that limit its functionality. Specifically, the proposed extension provides direct support for synchronous communication services, namely video-conference and delivery of video lectures through streaming.

Additionally we presented a way to address the issues of system customization and localization by modifying the application’s source code and SCORM courses “imsmanifest.xml” file in order to display Greek characters correctly.

Dokeos has been serving the needs of two academic courses, “Introduction to Multimedia Systems” and “Introduction to Computer Graphics” respectively for over a year, receiving satisfactory feedback from both instructors and students. This positive response has led to the developing of more

advanced SCORM lessons which are expected to become available in the next academic semester.

Future plans include further extension of Dokeos through the addition of more functions, followed by the conduction of an evaluation of the proposed system.

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