VIANET – A New Web Framework for Distance Learning
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ABSTRACT
This paper presents, VIANET, a new web framework addressing the distance learning scenario. The VIANET project aims at bringing together the most promising web technologies and standards, in order to attain a highly competitive online learning environment. Moreover, the new web framework includes a Learning Management System (LMS), a SCORM based Learning Content Management System (LCMS) and a Virtual Class System supporting the innovative solutions taken to implement reusability, portability, scalability, data warehousing, groupware and standardization.

1. INTRODUCTION
The dramatic evolution, during the last decade, on electronics, computer systems and information technologies, together with the worldwide accessibility to the internet opened a tremendous set of opportunities to implement collaborative projects among the most diverse countries and cultures. Particularly, on the educational area, the possibility to easily reach an extremely large number of web users with significantly low costs in the long run, has been the motivation factor for the increasing number of web environments being developed for learning purposes, e.g., WebCT [1], Blackboard [2], Lotus Learning Space [3], TopClass [4], applied either to a specific campus or to a virtual campus in a distance learning scenario. The VIANET project, illustrated in fig. 1 and described in this paper, aims at bringing together the specificities of the distance learning scenario, the most promising web technologies and the emerging standards, in order to attain a highly competitive online learning environment, including innovative and/or state-of-the-art features to implement reusability, portability, scalability, standardization, data warehousing and decision support mechanisms [5-7].

2. SYSTEM ARCHITECTURE
The VIANET system architecture is based on a client-server 3-Tier architecture offering an advantage over conventional visually oriented development of 2-tier applications by allowing natural improvements on features, such as, accessibility, encapsulation, reusability, scalability, heterogeneous database, security and integration. In the following subsections the system modules implementing the above features are described.

2.1 Learning Management - LMS
The Learning Management Systems (LMS) corresponds to a set of applications where each of them refers to a suite of functionalities designed to deliver, track, report and manage learning content, student progress and student, tutor and administrator interactions. Moreover, this work provides an easy web pages creation and maintenance, so that teachers without any special knowledge on HTML, XML or other web technologies, can produce useful and appealing web interfaces. Finally, the chosen configuration will be stored in the database and the corresponding XML code will be automatically generated.

2.2 Learning Content Management - LCMS
The Learning Content Management System (LCMS) provides support for creation, editing, consuming, discovery and persistence of Learning Objects (LO) in a web-based learning environment, as illustrated in fig. 2 by a Unified Model Language (UML) component diagram.
2.2.1 Content Tools and XML Generators

The Content Tools are system components, which assist authors on content creation, and include both a Content Creation Center and SCORM [5] compliant HTML/JavaScript editor. The XML Generators are system components which in turn produce XML files containing learning object meta-data, according to IEEE’s LOM specification.

2.2.2 LCMS Core and Tools

The LCMS Core implements the system’s most basic functions and capabilities, like the presentation and processing of content (SCO Reader and SCORM RTE), as well as its persistence (SCORM Repository). The LCMS tools introduce additional functionalities to the system core by including modules that offer search, editing and management capabilities. Although the LCMS has full control over the learning objects, it is possible to limit editing permissions for both document and meta-data files, in order to safeguard the content author’s legal rights.

2.3 Assessment Management – LAMS

The Learning Assessment Management System (LAMS) implements an online process supporting planning, creating, carrying out and correcting different sorts of assessments, such as, exams, tests, questionnaires and surveys allowing students to self-evaluate their skills.

2.4 Web Virtual Class

The VIANET Web Virtual Class aims at promoting the direct interaction between all players in a distance learning scenario by implementing several features for presentation, analysis, synthesis and formalization purposes, e.g., video conference, slide show, content visualization, forums, chats, shared text editor, shared whiteboard. The WebClass layered architecture is illustrated in fig. 3.

2.5 Data Management

A gap, in current E-Learning tools, is the lack of Data Warehousing (DW) [8] represented by an extensible and structured model allowing the data from different learning applications to be progressively added. The VIANET Data Management System includes a DW module from which the generated data may is used as a valuable input to data mining analysis [9] and decision support tools, where the data appear summarized, subject-oriented and under an historical form. Using data mining techniques it is possible to extract information and knowledge from the Data Warehouse leading to the creation of intelligent on-line or off-line support systems, which are used to support decisions that involve the analysis of many units of data.

3. SYSTEM IMPLEMENTATION

The VIANET E-Learning environment prototype is being developed in Microsoft Visual Studio .NET, which provides a reliable way to implement the required Web applications, Web Services and Class Libraries. The core of the project is developed in C#, the web interfaces is implemented in ASP.NET language and the supporting database management system used is MySql. The selected development platform allows a rapid prototyping and a high level of integration for the different system components.

4. CONCLUSIONS AND FUTURE WORK

The presented work proposes a new E-Learning environment VIANET devoted to the distance learning scenario. The proposed architecture aims at building an updated and competitive solution, compared to the existing E-Learning scenario, by incorporating special management facilities, appealing user interfaces and innovative and/or state-of-the-art methodologies to implement reusability, portability, scalability, warehousing, groupware and standardization. The VIANET environment is presently being developed and the first complete prototype will partially support distance learning activities at Lisbon Open University during the scholar year of 2003/04.
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6. REFERENCES