

Platform of e-learning management: “Aula Virtual”. Universitat de València development based in open source and collaborative software

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This paper presents “Aula Virtual”, the implementation of the LMS .LRN at the Universitat de València (Spain), result of the collaboration in a worldwide open source community. “Aula Virtual” represents one of the largest .LRN implementation. In addition, a free database (PostgreSQL) is used. The system has different authentication authorities, interface in different languages and the necessary applications to support blended learning in actual lectures. In order to carry out integration with previously existing University information systems, several OpenACS packages and new .LRN portlets were created. Development of functionalities required by the users, such as the incorporation of the OpenACS Chat package in the .LRN course portlets, the creation of personal files for each student-course, or the possibility of using LATEX mathematical formulae are the main UV contributions. Evaluation results of a 2-year period using “Aula Virtual”, conclusions and future work are also included in the document.

Keywords learning management systems; open code software; evaluation of educative software

1. Introduction

The “Universitat de València” (UV) (www.uv.es) one of the largest and most varied in Spain, offers classroom and laboratory learning to 50,000 students in 18 centers. Among them, 6,000 courses from 1,500 subjects are developed. Interested in enhancing the learning process with the use of Information and Communication Technologies, a learning management system has been selected, implemented and developed to improve the learning and communication process for the whole University.

This paper first describes the selection process of a learning management system according to the needs of a University with these characteristics [1]. Implementation, integration and development process [2] are explained, for the largest implementation of the .LRN platform fully open-source (.LRN and OpenACS software, AOLServer as webserver, PostgreSQL database and Linux Debian for the server). Evaluation and conclusions are presented based on a two year experience of actual and campuswide use.

2. LMS selection process

The University Computer Services (SIUV) were required, by the academicians of the university, to report on the implantation of an e-learning management system to support all the courses in the University. First, needed functionalities and minimum requirements to be accomplished by the evaluated platforms were identified. The following were the demanded minimum requirements:

- a) Scalability: the mean system efficiency should not be affected by the number of courses and users that concur at the same time.
- b) Integration: The platform must allow integration with the existing information systems (i.e. LDAP Authentication, database systems, other academic applications, etc.). In this way, some advantages, commonly present in open source software, were considered. Moreover, the Universitat de València resides in a bilingual region, so the platform interface should be visualized in different languages.

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- c) Reliability: use of the platform by others and communication with leading universities guarantee their reliability (UNED-Spain, MIT-USA, U.Galileo-Guatemala, U. Heidelberg-Germany and more) [3], [4].
- d) Standards: catalog, reusability and migration of the courses between different platforms will be guaranteed using standards in the creation of learning contents (SCORM, IMS).

In order to gather characteristics of each platform, their official sites were visited and their developers were contacted. Later on, specific bibliography search was done considering experiences with similar platforms in other universities of similar size and characteristics than Universitat de València. Focusing on open-source platforms, Atutor, .LRN, Ilias and Moodle were evaluated. Proprietary WebCT platform, used by the UV until academic course 2003-2004, was also evaluated, and their main weakness were integration and adaptation possibilities, and mainly the cost of licenses which is proportional to the number of students.

The analysis and report [1], conducted on February 2004, recommended the development of a practical case of implementation of the .LRN platform in the University of Valencia. Then, University of València joined the .LRN project [5] because .LRN better meets UV requirements for the learning process and also as information and communication tool for research communities.

3. Installation

“Aula Virtual” is the denomination used for the UV installation and personalization of .LRN. As for the installation, applications available in the Aula Virtual are: documents, calendar, news, forum, email and notifications, evaluation-assessment, chat, Learning Object repository system, Wimpy Point (Web presentations), weblogs, photoalbum and FAQ’s.

The implantation of the “Aula Virtual” has been developed progressively, in the following phases:

- a) Analysis: October 2003 – February 2004
- b) Implementation (and translation): February-June 2004
- c) Start-up: academic year 2004-2005
- d) Development and maintenance: since February 2004
- e) Users instruction: courses, user’s manual, on-line attention and FAQ: since February 2004
- f) Users support: since February 2004

During analysis phase, workload tests were guided with all UV courses and users, advising of other experienced members of the OpenACS community was asked for, specifically those who had systems similar to ours. The OpenACS and .LRN version that was initially installed corresponds to the branch oacs-5-1 of the CVS. The changes of the branch oacs-5-1 are tested with a weekly regularity in a development platform.

Users are authenticated by three different authentication authorities: LDAP, LOCAL and EXTERNAL:

- a) LDAP authority is verified in the UV LDAP server allowing the use of the accounts that users have created for all e-services in the university. LDAP Authority replaces the .LRN user management used in the rest of authorities.
- b) LOCAL authority is used to create local accounts by the professors and allow them to access their courses with a student role in order to carry out tests when needed.
- c) EXTERNAL authority is used to create accounts for external users who need to join communities supported by Universitat de València research projects.

As it was mentioned before, the platform interface must be available in three languages: Spanish, Valencian-Catalan and English. To accomplish this objective the UV has been participating in the internationalization project of .LRN. The interface also offers the possibility of renaming pages and moving portlets in the new classes, and in addition, user can personalize the following pages: class home, calendar, resources, communication, activities, and information.

4. Integration

Integration with other university applications that show public and private information on the academic courses has been developed using OpenACS packages and .LRN portlets for integration in the courses. Also, batch programs were made, written in Perl, for the insertion of courses, groups and users, when professors requested it. These batch programs return, via “HTTP”, the classes taught by a professor and the students registered in their courses, obtaining the information from the academic database. After collecting these data, a package made in OpenACS, named siuadmin, is invoked. This package uses the creation of courses and users API. Figure 1 shows the created courses and groups such they are visualized from the professor personal portal.



Fig. 1 courses and groups.

Figure 2 shows an example of the *Asiginfo* package that connects the platform subjects' public part with the UV *Oferta de Curso académico (OCA)* application.

INFORMACION									
Curso: 2005-06									
Módulo: 27871 Computación científica de altas prestaciones., 3 Créditos (3 C.Teo. 0 C.Pra.)									
Titulaciones									
Titulación	Nombre			Ciclo	Objetivo	Curso	Caracter	Ficha técnica	
518	240 E INFORMATICA Y MATEMATICA COMPUTACIONAL			3	1		Fundamental	Ficha técnica	
Grupo: SG									
Plazas titulación			Plazas libre opc.			Fechas		Exámenes	
Cap.	Num.Mat.	Lib.	Cap.	Num.Mat.	Lib.	Desde	Hasta	Conv.1	Conv.2
10	0	10	5	0	5	01/03/2006	30/06/2006		
Subgrupos									
Tipo aula	Subgrupo	Capacidad	Num.mat.	Plazas libres	Idioma	Horario			
T	0	999	0	999	Valenciano	Tarde			
Profesores									
Tipo aula	Subgrupo	Nombre y apellidos							
T	0	PEP MULET MESTRE							
		VICENTE CERVERON LLEO							
		WLADIMIRO DIAZ VILLANUEVA							

Fig. 2 OpenACS Asiginfo package.

Figure 3 shows an example of a .LRN portlet in the private area of a course.

BRIEF INFORMATION					
Curso: 2005-06					
Module: 12997 Parallel Algorithms 6 Créditos (3 C.Teo. 3 C.Pra.)					
Group: A					
Plazas Tit.			Plazas L. Opc.		
Cap.	Num.Mat.	Lib.	Cap.	Num.Mat.	Lib.
22	22	0	0	0	0
Fechas			Exámenes		

Fig. 3 Brief Information Portlet.

5. Own developements

The users demanded new functionalities and tools, and this fact motivated their development. Among them, we can emphasize the following ones:

- Implementation of the interface translation to the Catalan-Valencian and Spanish languages.
- Technical support for teachers and students (Technical reference manuals and on-line help)
- Development of a space within the .LRN courses where each student has a personal file, replacing classical student cards that professors traditionally asked [7], which was developed from the education Equipment portlet. In this personal file professors can access student data, including his/her photography. The file also allows professors to include commentaries, private or public, referred to the student. Figure 4 shows the way to access to the student file information.

Fig. 4 personal file.

- OpenACS Chat package integration in the .LRN courses. Figure 5 shows a course portlet, where a Chat room has been created by the professor where only members of the group are admitted.

Fig. 5 chat portlet.

- Possibility of mathematical formulation insertion, introducing symbols, in LaTeX or in ASCIIMath (based in MathML). Figure 6 shows a formula insertion using ASCIIMath.

Fig. 6 LaTeX formulae.

6. Evaluation results

The following analysis has been carried out by evaluating two academic years. In the 2004/2005 academic period, blended learning courses were activated on requests (after explicit expression of interest from the involved professors and lecturers). 600 requests were received which generated the creation of 2,662 courses with 1,890 groups and 35,400 users with a student role. Beside 18 communities (colaborative groups) associated to research projects were opened. Simultaneously connected users' average between 8:00 and 24:00 hours was 40 with peak values of 80 users. Response time problems and disturbing application bugs were the most important difficulties found in that period, mainly related with the database throughput. This problem was solved updating the hardware of the database server to a four-processor Opteron with 12 GB of RAM and Debian 64 bits kernel 2.6.9 operating system. For the 2005/2006 academic year all courses in the Universitat de València were opened for blended and technology enhanced learning, giving a personal account to all students and professors and lecturers. In addition, an utility to import the previous course contents was implemented. Figures from this academic period were: 50,000 students involved, 3,500 professors and lecturers, 6,300 courses, 23 communities (research groups sharing information and communication resources). Activity results show an utilization of 25% basic users and 12% habitual users. The use of "Aula virtual" is not obligatory but improves traditional teaching [8], and by then averaged 200 simultaneously connected users.

7. Conclusions and further work

The Universitat de València is the largest in Spain adopting an open source platform linked to educative innovation for blended learning, and the world largest .LRN implementation fully open source (.LRN on top of PostgreSQL). Recent analysis shows more than 300 simultaneoous users, and increasing. Future technical work includes tuning Aolserver and PostgreSQL, solving small application errors and bugs, improving synchronization with academic databases, creating new datamanager package (in collaboration with E-LANE project), and copying, moving and deleting objects (forums, FAQs, assessment, etc.) among different courses, automatically importing class schedules into the calendar, as well a lot of pedagogical work to get the maximum from the technological oportunities.

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