

Open Source Software on Web-Based Education

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***Abstract.** This paper describes the experience in the ILIAS open source GPL license e-learning framework, developed by the University of Cologne, Germany. This work consists of two fundamental levels. First, we have evaluated it as on-line course teaching tool (Extranet Solution) and as a complement to the attendance courses of the University Systems Analysts career (Analista Universitario en Sistemas) - (Intranet Solution). Then, we have made a verification of portability of the environment under Intel and Sun Sparc architectures, using Linux and Solaris OS, and the analysis of the development of an automatic installation tool.*

1. Introduction

The impressive development of communications and information technologies has brought up an increasing globalization of higher education. This situation is pushing forward educational institutions to collaborate and participate in complex networks for the interchange of information and experiences, by means of Web course materials, multimedia interactive software, video conferences, virtual lectures, etc.

According to the European Community Commission briefing “Web-Based Education” [1], the e-learning initiative will allow a strong cooperation between public and private sectors, between education, formation and cultural agents on one side, and content industry agents on the other.

The student as an active entity of his own learning process plays a more relevant role on e-learning than on traditional learning.

The pedagogical principle of individualization proposed by the New School, at the end of the XIX century, can be boasted on the XXI century virtual educational environments.

It must also be considered that the extensive use of information technology has generated new pedagogical paradigms [2], and a unified criterion has not been found yet.

2. ILIAS: A Web-Based Learning Management System

ILIAS is a web-based learning management system (LMS) [3], which was originally developed in the VIRTUS project at the University of Cologne, Germany [4] and now, it has become an Open Source software under GPL.

ILIAS consists of tools for learning, authoring, information access and co-operative work, thus presenting an integrated environment for learning and teaching on the Internet. ILIAS authors can create entire courses within a team and publish them on the web. Students can conform groups to work through learning material and communicate with each other or to their tutors.

The main modules of ILIAS take into account:

- Personal desktop for each user
- Learning environment with personal annotations, tests, glossary, print function, search engine
- Communication features like news system and discussion forums
- Group system to organize group members and resources
- Authoring environment (Editor) to create courses
- Context-sensitive help system for learners and authors
- System administration interface

Besides this workplace concept, some principles determined its development process. ILIAS did not follow a unique pedagogical approach; it tried to open up the system for different approaches that learning material authors can follow and, to improve the flexibility of the system in order to make it usable for authors coming from different pedagogical schools.

The production of learning material is a cost intensive process. Usually, the content consists of several multimedia components, the portability and scalability of which often is extremely costly. In order to minimize costs ILIAS supports the idea of re-using and exchanging learning material. Therefore, it implements some features that prepare the system for future compatibility to applications developed according to international standards such as IMS, SCORM, AICC and ARIADNE [5, 6].

Within this workplace, the users play different roles such as system administrator, authors, tutors (teachers) and students (learners). The system administrator puts the actors together based upon the concept of a virtual unit course by creating groups and assigning the access rights, privileges and resources needed: mailboxes, forums, discussion groups, chat rooms, documentation repositories, helpers, etc. (See Figure 1).

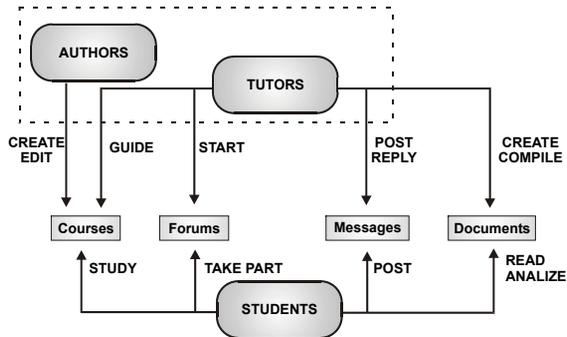


Figure 1. ILIAS environment

2.1. Technical information about ILIAS

The installation of the LMS requires a set of applications not included in the standard distribution of ILIAS, which establishes its operative framework. These applications are available under GPL license and can be obtained in source or binary formats for specific platforms in many web sites. With the source code, the portability of the LMS to different operating systems becomes possible.

The packages needed for the installation of ILIAS version 2.3.6 (stable) are:

- Web server Apache 1.3.27 - www.apache.org
- Relational database MySQL 4.0.12 - www.mysql.com
- Server-side programming language PHP 4.3.1 - www.php.net
- Graphic library GD 1.8.4 - www.boutell.com/gd/
- Compression library Zlib 1.1.4 - www.info-zip.org/pub/infozip/zlib/
- Imaging compression library IJG JPEG 6b
<ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz>
- Graphic tool ImageMagick 4.2.9 - www.imagemagick.org
- Compression utility Info-ZIP Zip 2.3 - www.info-zip.org
- Decompression utility Info-ZIP Unzip5.50 - www.info-zip.org
- PNG library libpng 1.2.5 - www.libpng.org

Since ILIAS was developed for Linux and Sun Solaris operating systems, we have focused our work on these operating systems in particular.

To install these applications we can enumerate some highlights:

a) The Sparc Solaris operating system does not provide these tools by default. However, a lot of them are available in binary form from the Web [www.sunfreeware.com].

b) In Linux operating systems depending on the distribution in particular, these applications may be present or not. The recent main Linux distributions such as RedHat, Debian, Suse and Mandrake meet these requirements.

Once all the applications above-mentioned have been obtained, the installation process can be started.

3. Our experience in e-learning

Our first experience in e-learning began four years ago. At the beginning, we adopted the LMS WebCT environment [7]. At that time, the product was freeware, but in recent versions, it became a commercial product. At that moment, we focused our attention in investigating the philosophy of the open source project and we concluded that was possible to replace the original environment by another GNU product. We were seeking for free software products at international levels, and we selected ILIAS as our standard e-learning environment [8, 12].

For two years at the *Instituto Politécnico Superior*, we posted the University Systems Analysts entrance course using this platform. The course was dictated in both modalities: attendant and on-line.

ILIAS gave us the possibility to follow the student's acquisition of new knowledge, to obtain early diagnostics by making different kind of tests, to establish fluid communication channels, in order to answer questions and therefore guide the students and, as a side effect, to foster the student's interest in the use of free software.

Statistical evaluations have probed that in both modalities (online and attendant) the ratio of approved students is near to one. Moreover, actually we use ILIAS as a complementary documentation and communication tool for the conventional student's attendant activity. That is to say, an Intranet Solution.

At the same time, the institute offer extra-curricular courses about information technology using the e-learning modality.

4. Analysis of the development of an assisted installation

The installation tasks of the applications described above in the section 2.1 implies complexity for the majority of organizations interested in the e-learning formation, driving them in many cases to adopt "Turn Key" commercial systems.

To minimize the installation problems, and to increase the participation of users, we proposed the following items: (1) to define an operative platform, (2) to provide the means needed to build a certifiable operative environment.

We denominate this certification ISRP (ILIAS System Ready Platform). Only when hardware equipment with its operating system complies the ISRP certification statements, the installation of LMS ILIAS can be started.

For this reason we focussed in the generation of packages, such as RedHat Package Manager [9], Debian Package [10], Sun Cobalt Package (BlueLinQ) [11]. And this in turn has gave us the possibility to aim a great variety of operating platforms such as Solaris (for Sparc and Intel) in versions 7, 8 and 9, Sun Cobalt Linux, and the Linux distributions Redhat, Debian, Suse and Mandrake.

5. Discussion and Conclusion

In Education, Open Source or Proprietary Systems? An answer to this is that the university teachers and researchers' responsibility on educational affairs, considering their influence on society, is to avoid that communication and information technology world may become a business and technological monopoly.