



EifFE-L meets ECLIPSE: an integrated open source e-learning environment

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Abstract

This work reports on the process of integration of the EifFE-L open source e-learning platform within the Eclipse open source development platform, with the aim to create an open framework for both distance education and knowledge management. The fusion of the two environments can lead several advantages: EifFE-L has earned in flexibility having acquired the possibility to take advantage of a powerful and easy to use development environment and has thus been able to evolve following the ever growing requirements of e-learning; Eclipse has made a further step ahead in the direction of becoming an e-learning tool for the programming languages and for the management of virtual laboratories and simulation environments.

1 Introduction

In the past few years one can observe that education is changing, resembling more and more the mass media with the risk of producing just superficial knowledge. The frontal lesson, even if supported by multimedia subsidies, is similar to a show in which the teacher plays a monologue that often leaves no trace in the mind of the students. Generally speaking, when knowledge is introduced without the demand of an effort from who must learn, students do not activate their brain and, more important, they do not activate that part of the mind dedicated to the management of the acquired knowledge.

E-learning tools and services make it possible to center the learning process around the students, moving the focus away from the teacher. Despite the fact that they cannot be considered equivalent or substitutes for the traditional forms of teaching, e-learning lessons can be an add-on oriented to different types of users:

- students attending lessons;
- students that cannot attend lessons because they are also working or they live far from the University;
- graduate people who want to find their first job or a better job than the one they already have, so that they keep on studying, to be always up to date.

In the first case, students will have the possibility of accessing e-learning facilities so that they can study more and make self-assessment; in the second case, students will have the possibility of attending courses in any University they prefer, according to their specific constraints in time and place; in the third case people will have the opportunity of keeping up to date in any specific field and realizing the model of lifelong learning.

Based on the above scenario, e-learning has to be considered in different ways:

- An amplifier for traditional didactic techniques. This is the case in which the development of specific services for the students (lessons calendar, course programs, sign up for lessons and exams, communication on events and services, bulletin board, etc.) as well as communication tools both asynchronous and synchronous, delivery of teaching materials, and more are needed. This is the case of blended learning.
- Online courses. In an online course, the only available communication means is the web and both teachers and students use an e-learning environment for their interactions and management (according to the Italian law, online learning is regulated by the “Decreto Interministeriale 17 aprile 2003, GU 29 aprile 2003, n. 98”). In this specific case, the course must show a multimedia value higher than in the previous case, since

it is the only available source. Online courses can be very different and we must distinguish if we are talking about a regular University course or a lifelong learning activity.

E-learning is not just a different way of learning for teachers too must modify their strategies. Contents can be the same of a traditional lesson but they must be treated in a different way from both the point of view of the language and the tools used.

In this work the focus will be on e-learning tools and services, with specific reference to both blended learning and online courses. The working environments must be flexible and customizable so to allow the use of a variety of didactic models, techniques, and strategies as well as web communication and knowledge sharing tools. Moreover, they must be available to a wide variety of different devices, including palmtop and mobile phones. In this scenario, this paper reports on the project of integration of an e-learning platform (specifically designed for university) and an open, integrated software development environment. The project is called EifFE-L meets Eclipse (EmE). The integration of the open source e-learning platform EifFE-L¹ (Environment for Freedom in E-Learning) and the open source development environment Eclipse², is made with the aim to create an open development environment for education and knowledge management. All the tools of the project are open source and they are integrated in the Eclipse open architecture.

The EmE project was born with the aim to create a system containing various instruments for the didactics on the web, with the idea of offering a complete service to the customer. After the first release, in which EifFE-L could be considered like a stand-alone application, now it can be installed as an Eclipse plug-in. The new synergy between the two platforms allows EifFE-L to be upgraded and extended through Eclipse, which improves interoperability with many other tools and many development or simulation environments. Another key aspect of the EmE project regards the creation of a simulation environment to be used in distance education projects. Learning by doing and learning from experience, from the real world, requires the possibility of simulating a scenario, dipping the students into a real situation.

In Section 2 we describe the architecture of the system Section 3 is about the description of the software used for the set-up of the system, with some details on the implemented architecture. Finally, in Section 4, we present our conclusions and future perspectives.

¹ <http://www.eiffe-l.org>

² <http://www.eclipse.org>

2 Architecture of the Em Ξ System

As already stated, the Em Ξ project has the aim to merge together, in a unique working environment, two separate products: EifFE-L with Eclipse. Specific issues on the integration will be detailed so that the integrated system architecture can be outlined.

2.1 EifFE-L

EifFE-L is a platform-independent LCMS (Learning Content Management System) built on the specific needs of e-learning and blended learning in medium-large Italian Universities. It was developed under the CampusOne³ project, funded by CRUI (the Italian Conference of the Chancellors), as an open source application, available on sourceforge⁴ (Adorni and Sugliano, 2005), released under the GPL license. EifFE-L is a bunch of different sub-systems, and, according to a standard client server architecture, it grounds on a web server and a database, offering a variety of e-learning services and tools in a web browser friendly interface, in addition, it can interact with external services provided by different legacy systems.

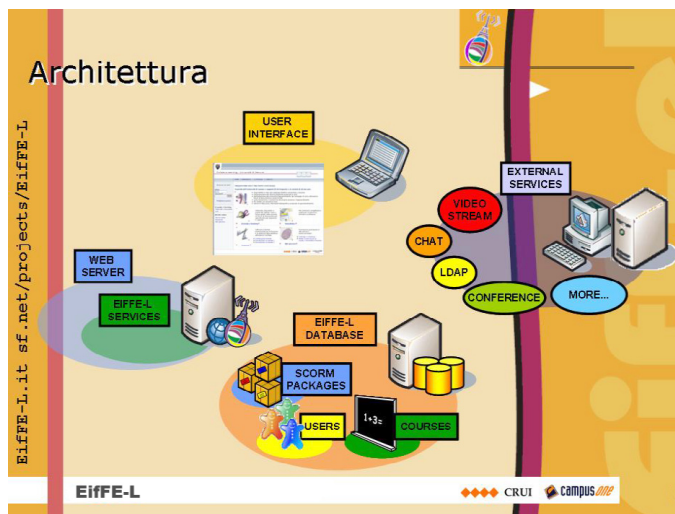


Fig. 1: The EifFE-L system architecture

Generally speaking, it is a standard LCMS (Learning Content Management System) acting like a VLE (Virtual Learning Environment) and it is currently

³ <http://www.campusone.unige.it/azione-1d>

⁴ <http://sourceforge.net/projects/eiffe-l>

used at the University of Genoa and in a number of EC funded projects. The architecture is depicted in Figure 1 (Adorni and Premuda, 2004). More in detail, EiffE-L is written in Free Pascal, it uses an Apache web server and a Firebird SQL database.

2.2 Eclipse

Eclipse is full-featured development environment, continuously growing in functionality and support. It is an open source system and an official community exists, supporting the project, with the objective of developing an open and extensible development platform for the management of complex software systems. This community is involved in the research in the field of e-learning, in international projects such as Ecsis⁵, Gild⁶, and Penumbra⁷ for teaching the C++ and Java language, and for the management of complex didactic solutions (Maresca 2008; Maresca and Savino 2008a; 2008b).

2.3 Integration

Given the specific situation with reference to the tools and languages used for building EiffE-L, a specific release of Eclipse has been necessary, with a Free Pascal compiler. Also, the compliancy with the Firebird SQL database server has been verified.

The chosen version has been developed within the Eclipse community and is available as a specific release of the platform, under the code name Eclipse-Gavab.

First, the development environment was duly set-up and configured so that the integration activity could begin. The wrapping technique was used, very common for the re-use of enclosed software system, so that external access was possible to the functionality and data inside the EiffE-L system, which can be fully exploited and further, developed (Figure 2). New functionalities can be added, after making the system available by means of new interfaces (API - Application Programming Interfaces).

⁵ <http://dev.eclipse.org/viewcvcs/indextech.cgi/ecesis-home/downloads>

⁶ <http://gild.cs.uvic.ca>

⁷ <http://sourceforge.net/projects/purdue-penumbra>

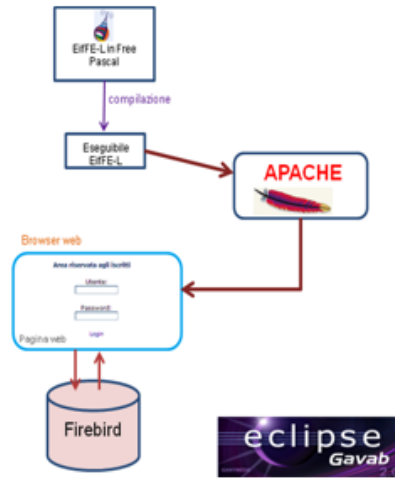


Fig. 2: EiffE-L integrated in Eclipse-Gavab

The role of the wrapper is that of driving the integration of the inherited system inside a new implementation, which makes it available as a set of reusable services (an Apache module in this case) so that EmE acts like a web service (Figure 3).

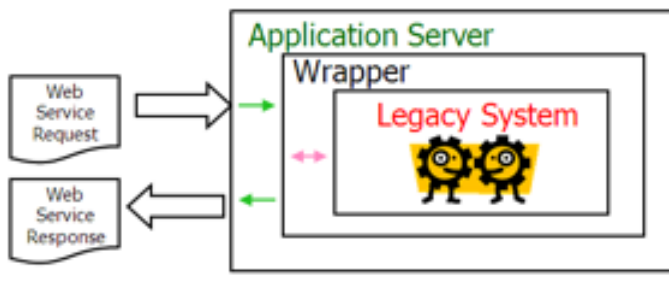


Fig. 3: EiffE-L used like a web service

3 Working environment

For the realization of the sketch in Figure 3, a variety of software has been used. This is briefly described in here.

- Lazarus - Open source software project that allows programming in Free Pascal (ver. 0.9.26 Beta).
- Eclipse Gavab - A specific version of the Eclipse multi-platform distri-

bution, released by the GAVAB⁸ research group (Universidad Rey Juan Carlos, Madrid). It allows compiling Free Pascal source code (ver. 2.0). It is the main development environment for both compiling the project files and producing the Apache module outcome of the work done.

- Apache - The open source modular web server project (ver. 2.2.3).
- Firebird - A full-featured, reliable, high performance open source SQL DataBase Management System (ver. 1.5.3).

3.1 Development

The development of the project started from the database. It was necessary to have full control from inside Eclipse, then it was possible to start importing the Free Pascal project files. The Firebird database can be accessed and used in the local installation as well as in a remote connection with the working installation in Genoa. Once investigated the use of Firebird in Eclipse, the Eclipse Gavab was used for compiling the original source code.

3.2 Configuration

Some special configuration also has to be done so that the Apache web server can work as needed by the application. The outcome of compilation of the EiffE-L project in the Eclipse Gavab environment is an Apache module that needs to be integrated in its core so that the service can have better performance with respect to any other application written in script language. A slight modification in the Apache configuration file is needed, so that EiffE-L can be recognized and used as a module from inside the web server. Also an initialization file is needed for EiffE-L module to behave correctly. Apache is very flexible and it can be configured according to specific instructions in different configuration files. All of the files needed for the configuration, initialization, and execution of EiffE-L are inside the Eclipse Gavab workspace and the integration is done when Apache also is running in the same workspace. Another key point for the successful release of the Apache module is the choice of the operating system for the server to run on. In the case of Linux systems, a “.so” file has to be generated while in the MS Windows operating system, a “.dll” file library is needed. This can be easily achieved by means of the correct configuration of the compilation options in Eclipse Gavab.

3.3 Apache as an external tool

To use Apache as an external tool, two different instructions are needed: one for executing the web server (called Apache_Start) and another one for

⁸ <http://www.gavab.es/wiki/eclipsegavab>

stopping it (called Apache_Stop). The last step is to run the Apache server and to use the application.

3.4 Application testing

After making Apache work, the application functionality can be tested using the Eclipse internal web browser. To access the application, the domain address has to be typed in the address bar and the login screen appears. Once the user has logged-in, the welcome page of the EifFE-L system is shown and contents in the database can be accessed according to the user's needs, profile, and rights. To end the session, users have to leave the system logging out, and then terminate the execution of the Apache server.

Conclusions

In this paper, the process of integration between different open source technologies and tools has been described, with the aim of creating an open, multi-platform e-learning environment, interoperable with other systems and services. Moreover, the system is compliant with the Italian law for e-learning and University.

Integrating EifFE-L within the Eclipse Gavab, can give some advantages to the EifFE-L users, for they can access an internal instance of the system through the web browser, extend the functionality and easily install it.

Moreover, thanks to this project, EifFE-L meets Eclipse as the open source community of Free Pascal meets the Eclipse open source community. Another key point is the possibility of re-using the large amount of data that was already available thanks to the previous EifFE-L experience in distance education.

The wrapping has been done on the whole system, on both the application and the data so to obtain an Eclipse higher level of integration, right under the API level, between the application invocation and the data integration. One can invoke the application from inside the Eclipse platform, using a remote connection to a remote database. In such a novel architecture, the EifFE-L system has been revamped and the dead-point has been moved far ahead since further development is possible thanks to the use of Eclipse plug-in.

Future work is related to the realization of web services so that users can have custom access to EifFE-L, depending on the specific needs of both the users themselves and the related education projects.

In the actual situation, EmE is available on Linux Linux, Windows XP, and Vista 32 bit. Extensions will be soon available for Mac and Windows Vista 64 bit.

BIBLIOGRAPHY

- Adorni G., Premuda G., (2004), *The e-learning environment of the University of Genoa: An open source SCORM and W3C compliant platform*, in Atti della Conferenza Didattica 2004 Informatica per la Didattica, Ferrara.
- Adorni G., Sugliano A.M., (2005), *Buone pratiche per l'E-Learning all'Università: Insegnamenti blended e corsi on line*, 191-226, Fondazione CRUI, Roma.
- Maresca P., (2008), *Projects and goals for the eclipse italian community*, in Proceedings of Fourteenth International Conference on Distributed Multimedia Systems - Workshop on Distance Education, 112-117, Boston – USA.
- Maresca P., Savino N., (2008), *An Eclipse based environment for the first level universities courses*, Journal of e-Learning and Knowledge Society (Je-LKS), 3, 21-30.
- Maresca P., Savino N., (2008), *Un ambiente per la didattica dei corsi universitari di primo livello basato sulla tecnologia Eclipse*, in Colazzo L., Molinari A., Pegoraro M., Villa N., Atti del 5° congresso annuale della società italiana di e-learning, SIe-L, 1-8, Trento.