

CLAYNET 2.0 – PORTLET BASED LEARNING PLATFORM

Miguel Á. Conde, Jorge Carabias, Rosa M^a Martín, Inmaculada González
*I+D+i Department CLAY Formación Internacional
C/Hoces del Duratón nº 57, 37008, Salamanca, Spain*

Francisco J. García
*Computer Science Department – University of Salamanca
Faculty of Sciences, Plaza de los Caídos S/N, 37008, Salamanca, Spain*

ABSTRACT

Any system of e-learning requires the use of the technologies, that is to say, e-learning's platforms. ClayNet is a platform that contributes the desirable functionalities for the e-learning process, is integrated in a portal and constituted by assembled components with independent structure called portlets.

KEYWORDS

Portlet, e-learning, forum, platform, ClayNet, portability.

1. INTRODUCTION

The e-learning is defined for three elements: communication, knowledge and technology. It is an indispensable tool in order to establish processes for the continuous formation or long life learning (LLL). This new form of learning establishes a new relation student/teacher that eliminates the existing hierarchy among them. The e-learning is defined as the utilization of Internet to develop formative projects. It permits access to a network of dynamic knowledge that facilitates a personalized and flexible learning.

The use of e-learning requires technological adaptation, with such objective platforms are born. A learning platform is a space which has adapted an ICT (Information and Communication Technologies) application that links the processes of teaching-learning to a pedagogical model through a virtual environment.

ClayNet 1.0, was developed trying to provide certain basic services that gives users all potentialities of eLearning and enough support to all of its varieties. But it was only a web application, dependent on the technology and without the desirable portability.

Second version of ClayNet was born to be a point of reference in the formation area. It has been developed based on portlet technology (Abdelnur and Hepper, 1993) and integrated in a portal, thinking on it as an entry point to a large variety of specialized services (Arnedo, 1999) related to eLearning. The platform can be integrated in a portal but is independent; this supposes that it can run alone and integrated with other platforms.

ClayNet 2.0 is developed using portlets. They are web components managed by a container that, after the request of a user, generate and present dynamic contents. These contents are shown to users as components of content. The portlet allows personalization, presentation, and management of the security.

The content generated by the portlets is called "fragment". It is XHTML code (*eXtensible Hypertext Markup Language*), HTML (*Hypertext Markup Language*), WML (*Wireless Markup Language*), and so on. The aggregate fragments of different portlets form a document that is the portal interface.

Portlets created to CLAYNET 2.0 provide functionalities of eLearning platform and they permit their export and adaptation to other environments or to the needs of the users.

2. CLAYNET 2.0 ARCHITECTURE

ClayNet 2.0 is a web application based on the portal idea that uses the Java Portlet Technology. A portlet is a small web application that interacts and communicates with other portlets to build a portal. These portlets are independently web applications. Some advantages of the portlet based developing are:

- Independently developing: Portlet independency allows a separate and parallel developing process.
- Configurable user interface: The final aspect depends on the portlet set because these can be rearranged easily.
- Fail safe: If a portlet fails, this fail is not propagated to the rest of the platform. Only the portlet which fails stops from working correctly and can be reloaded.

In Figure 1 the ClayNet user interface is showed. It shows how the use of portlets gives a modular aspect. Each component is managed independently and it can be maximized and minimized. Portlets can be inserted and removed to change the aspect. ClayNet manages portlets for administration tasks, content visualization, forums, etc.

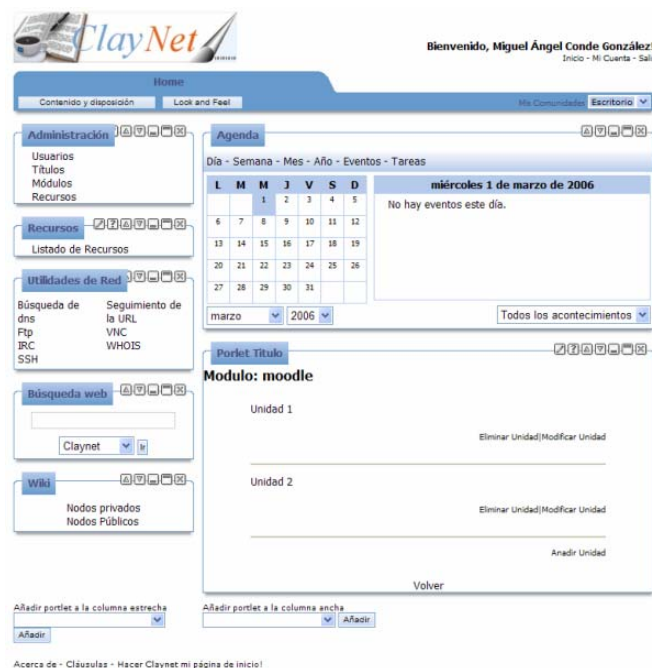


Figure 1. ClayNet 2.0 View

The use of portlets technology needs a core that supports its storage and management. Among tools that implement portlet containers compliant with JSR 168 (Arnedo, 1999) specification, Liferay (<http://www.liferay.com>) is the chosen option. Liferay is an open source tool that allows portal developing.

Among relevant features of Liferay, it can be mentioned the following:

- JSR 168 compliant. This API is used in the ClayNet components developing.
- WSRP (*Web Services for Remote Portal*) (Kropp et al., 2003) is a web services standard that allows portlet publishing in remote platforms and vice versa. This feature allows buying and selling portlet functionality as a service.
- Themes support for changing the look of the user interface.
- It is server agnostic. Liferay can be used with Jetty+Tomcat or in J2EE (Java 2 Platform Enterprise Edition) application servers like Borland ES, JBoss+Jetty/Tomcat, JOnAS+Jetty/Tomcat, JRun, OracleAS, Orion, Pramati, RexIP, Sun JSAS, WebLogic and webSphere.
- Multiplatform. Liferay is developed in Java programming language which makes it easy portable to many operating systems as BSD (FreeBSD, NetBSD, OpenBSD, etc.), Linux (Fedora, Novell, Gentoo, etc.), Solaris, Mac OS X and MS Windows.

- Database independency. Liferay uses Hibernate (<http://www.hibernate.org/>) as the ORM (*Object Relational Mapping*) tool for the persistence layer which enables pluggable databases (DB2, Firebird, Hypersonic, InterBase, JDataStore, MySQL, Oracle, PostgreSQL, SAP, SQL Server).
- Internacionalization. Liferay can display and receive input in multiple languages.

Once the core of ClayNet has been described, the integration with ClayNet will be commented. ClayNet platform is based in a set of portlets which communicates between them and have different functionality. Figure 2 shows the main architecture of the platform. In this figure it can be observed how the set of developed portlets are included at the top of the Liferay architecture. The Liferay architecture elements are showed in blue. These portlets are composed by a set of classes, which are JSR 168 compliant, and a set of JSP (Java Server Pages) pages (<http://java.sun.com/products/jsp/>). All of these elements are managed by the portlet container. ClayNet portlets also use an external database for data persistence. The database management system is MySQL (<http://www.mysql.com/>) and for the task of communicating among portlets and database it has been developed a set of classes that acts as wrapper of the database. These classes hide database management to the rest of the application and give it an API that automates the management as much as possible.

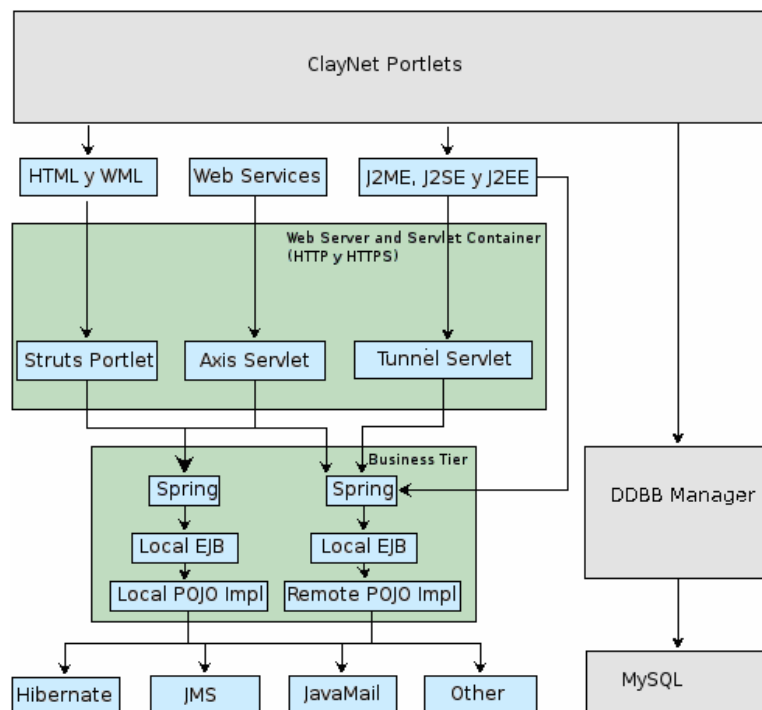


Figure 2. ClayNet 2.0 Architecture

3. EXAMPLE: PORTLET CLAYNETFORUM

Among the numerous portlets that integrate ClayNet, ClayNetForum is developed as a component for asynchronous communication available in every moment for the users. This portlet has been selected as an example because it is a very useful and well considered tool in eLearning environments and shows clearly how portlets work.

In this section, a brief description of this component is presented, talking about the development motivation, the objectives pursued and the most prominent points of portlet design.

3.1 Motivation

It must be considered the fact that a forum is one of the most useful tools of communication in eLearning environments, so that was evident the requirement to include in ClayNet a component that provided this functionality. This reason led to the design of a portlet which integrates all functionalities of a forum. That is to say, a forum that allows asynchronous communication among users using debate threads.

3.2 ClayNetForum Objectives

Since the beginning, there was the idea of developing a meta forum, that is to say, create a component that manages all forums created in ClayNet and all debates started in each them.

It should be allowed to create different forum types: forums that allow create new debates that only allow answering debates already created by a super user, exam forums (with time limit, and qualifications), etc. It should be kept in mind the possibility of enlargement of possible forums types.

ClayNetForum should include also the possibility of private communication among users. In this way the goal is the possibility of use private and direct communication among users, without using external communication tools. Therefore a new kind of forum is the private forum, where debates are only visible to users that take part in them.

The portlet should include all common forum functionalities like, creation of new forums and debates, opening and closing debates, answering forum messages, searching, marking and qualifying messages, etc.

In the same way, the portlet should allow some kinds of interface personalization like different debate views, label messages set, colours, messages order, etc.

Due to all these reasons begins the construction of a forum portlet that covers a great number of functionalities and user interfaces. The portlet forum would be a container of all platform forums and give the user a set of forum templates, each one with a particular functionality and configurable characteristics.

Finally, it is necessary to consider that the user control over forum portlet depends on user role.

3.3 Design

The ClayNetForum portlet design, and the rest of components design, has been done following the Model/View/Controller pattern (MVC) (Buschmann et al. 1996). With this method, it is possible differentiating and separating information elements and functionalities of components (model), from data showed to users.

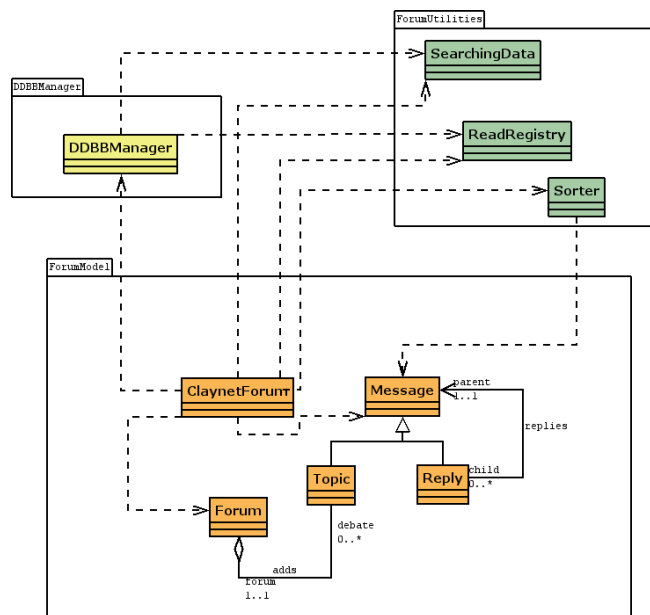


Figure 3. Portlet ClayNetForum class diagram

The *Java* class package, that implements forum functionality, is considered so much a part of **Model** as a part of **Controller**, due to they model information of problem context (concepts relatives to forum), and at the same time they run as a manager between database and the **View**.

Classes from package *ForumModel* model data from forum, while package *DDBBManager* interacts with DDBB. Package *ForumUtilities*, includes utility classes that implements well defined functionalities. Figure 3 shows *ClayNetForum* packages diagram.

Finally, view includes a set of JSP pages and *Javascript* files that makes portlet *ClayNetForum* user interface.

The objective of *ClayNetForum* is to provide a component that offers different forum templates, depending on the kind of forum, and at the same time, allows users configure same appearance characteristics. Also must be considered user interface changes depending on the user role, like controls availability, news, private forums and debates, labels availability, etc.

3. CONCLUSIONS

As conclusions, it should be considered that an e-learning platform version has been built. It allows users to use different facilities oriented to this kind of learning. The platform is embedded in a portal and is based on portlets as can be seen in the example. This provides some advantages like independent development, personal component configuration and security. These advantages provide to ClayNet characteristics like portability, scalability, fail-safe, reliability, and so on.

Other platforms like *EducaMadrid* (<http://www.educa.madrid.org/portal/web/educamadrid>) use the same technology, although developers do not have access to its source code, they have used reports about this platform to improve some functionalities and interaction with users.

In the future, it will be considered the possibility of building a virtual campus. It will allow users to develop different studies, being certified following European eLearning laws and storing them in a personal portfolio. Also interfaces and functionalities will be improved using users' feedback.

ACKNOWLEDGEMENTS

This work is partially subsidized by Education and Science Ministry and by FEDER funds through KEOPS Project (TSI2005-00960).

REFERENCES

- Abdelnur, A. and Hepper, S., 1993. Java™ Portlet Specification Version 1.0. Sun Microsystems, Inc. <http://www.jcp.org/en/jsr/detail?id=168>.
- Arnedo, T., 1999 De Portales a Plazas; Presente y Futuro de los Portales en Internet. *Internet '99*. Asociación de Usuarios de Internet. <http://www.aui.es/biblio/libros/mi99/3portales.htm>.
- Buschmann, F., Meunier, R., Rohnert, H., Sommerlad, P. and Stal, M., 1996. *Pattern Oriented Software Architecture: A System of Patterns*. John Wiley & Sons.
- Kropp, A., Leue, C., Thompson, R. (Eds.), 2003. Web Services for Remote Portlets Specification. OASIS Standard. <http://www.oasis-open.org/committees/download.php/3343>.