Implementing a Digital Workspace based on Model Composition Architecture

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Abstract: In the era of covid-19 and with the policy of confinement in order to overcome the pandemic of the coronavirus, telework is a mode of work organization, which has obvious virtues. It notably makes it possible to avoid tiredness and lost time in transport, to contribute to the fight against climate change by reducing pollution, to reduce fuel consumption and therefore to increase the purchasing power of households, and also to better organize his working time by staying at home. However, the use of Information and Communication Technologies (ICT) is a necessity, in this context digital workspaces are presented as a strong and powerful platform which implements several ready-to-use modules and also the possibility of adding blocks or what is called in digital workspace jargon a portlet. We will study in this article the architecture of Liferay digital workspace and its ability to present us reusable portlets, so we will refer to the composition of the models in the context of Model Driven Architecture in order to propose a complete and global prototype that meets the expected needs.

1   INTRODUCTION

A digital work space designates a set of online tools that allow remote access to digital resources. This term is commonly used in colleges, high schools and universities to designate an internet portal. We also talk about the digital work environment, virtual office, online binder and collaborative work platform.

Initially, the digital workspace aims to modernize teaching and pedagogy, but with the pandemic coronavirus, digital workspace also allow to enter and make available to students and their parents, teachers, administrative staff and more generally to all members of the educational community of school education or higher education, depending the authorizations of each user, educational and pedagogical content, administrative information relating to school life, the teachings and operation of the establishment as well as online documentation.(Jacobs, 1963) (Bailey, 2017).

A digital workspace allows users to register online for activities offered by the establishment, to subscribe to mailing lists, to participate in community spaces.

The objectives are therefore to promote the sharing and communication of resources and practices by providing to each user a workspace and storage whose resources are accessible at any time from any place with an Internet connection. Secondly, the objective is to diversify educational resources and supports (audio resources, video supports, etc.) but allow the organization of school life through an increase in the use of information and communication technologies in the establishment, allow the reduction of assistance and maintenance costs.

In the context of MDA (Model driven architecture) a digital workspace is generally used to designate this integrated set of digital services from the point of view of users. A digital workspace can be seen as a project or a solution.

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The "digital workspace solution" designates the application components and implementation services offered by publishers / integrators and other service providers (operators, hosts) linked to project leaders by service commitments. It respects the digital workspace reference architecture.

The reference architecture presents an organized view of the various services offered by the digital workspace, services which must be adapted to the needs and uses of the educational community. It should be noted that the client part of digital workspace is today intended to be multi-channel, multi-support and that it goes beyond the simple web browser client by presenting mobile clients, the other digital workspace part that it understands materializing the needs of increasing exchange and collaboration between users. In this article, we will study a powerful digital workspace, which is Liferay. Liferay (Genevois, 2011) is an excellent solution for a corporate portal. Our contribution is to identify the behaviour of this digital workspace in the context of model composition based on model driven architecture, in order to propose a global prototype using the prerequisite modules presented by Liferay.

The remainder of this paper is structured as follows: section 2 presents the global architecture of a digital workspace. Section 3 presents Liferay portal as a solution for digital workspace. A model composition solution based on Liferay portal will be presented in section 4. In section 5, we conclude the paper with a summary of our future research.

2 DIGITAL WORKSPACE

2.1 Digital Workspace Offering

The Digital workspace, also called "single portal" or "virtual office", brings together services for staff and users.

The Digital workspace extends the use of digital technology in general, a vector of success for all students, and good communication between the different actors in this success.

Management staff must both master and support the development of digital educational tools.

This requires a marked involvement of the management team, a quick handling of the tool (user-friendliness, ergonomics) and an internal work as a team.

Information, training, support and conditions for developing the tool are essential so that all users can appropriate it.

Concretely, the digital workspace allows us to steer the establishment and open it up to its environment by (Miller, 2016) (Leclercq, 2007) (Poyet, 2009):

- Facilitating discussion with teams and partners, communicate and inform in real time all users;
- Facilitating exchange and sharing resources and practices;
- Providing to each user a workspace and storage space accessible at any time and regardless of the location (home, classrooms, computer rooms, etc.);
- Diversifying the educational resources and available supports like video, sound resources, manuals and digital resources;
- Offering a pooling space for each team: personalized support and any other organization requiring interdisciplinary communication;
- Offering individualized student monitoring systems: help, support, personalized educational success programs, and online educational resources;
- Offering collaborative working tools trough out blogs and shared files;
- Offering equipment and tools management to users: computer, multimedia room, meeting room, videoconferencing, audioconferencing, mobile classes, teleservices (registration, modification of data, online payment, etc.);
- Management of licenses and activation keys for students and teachers for access to digital resources etc.

2.2 Digital Workspace Architecture

The core of the digital workspace communicates with the presentation module according to a protocol using XML metalanguage. The presentation layer converts the XML flow into a flow adapted from the client of the user. This translation also takes place during the feedback of information from the client to the digital workspace. The presentation layer communicates with a Web browser according to the HTML protocol. The digital workspace communicates with the bricks through the application interface according to standardized protocols using XML metalanguage (see Figure 1).
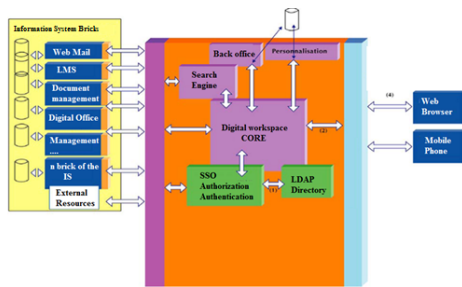
Figure 1: Digital workspace architecture (Genevois, 2011).

The search engine is able to carry out request from all information system bricks. Security does not appear on this architecture because it is present in all trade flows. The protocol used to communicate with the directory is LDAP V3. (Poyet, 2006) (Poyet, 2011).

3 PRESENTATION OF LIFERAY

Liferay Enterprise Portal is an open source American JEE portal, which presents an interface allowing the construction of several pages by assembling blocks with drag and drop actions in order to obtain simple ergonomic.

Liferay is an excellent solution for a corporate portal, allowing the standardized integration of all existing applications, offering portal animation and configuration settings for pages and modules, with ergonomics always worked, thus attracting users. (Jacobs, 1963) (Bailey, 2017)

We will focalize on this article to Liferay for several reasons:

- Simpletoadminister;
- Widely used for the creation of business solutions for companies;
- CompatibleJSR-168(APIPortlet);
- JEE compatible (it can be deployed on JEE application servers from IBM, Oracle, SUN, etc.);
- Available in Tomcat version (JSP / Servelet);
- Available in JBoss / Tomcat / Jetty version;
- Integrates with classic RDBMS (Oracle,
- Mysql, PostgreSQL,);
- OpenSource;
- Offersseveralready-to-usePortlets;
- Documentationavailable;
- Amongthenewportals.

3.1 Liferay Architecture

The common digital workspace services offered by LifeRay are: Registration to the workspace, Unique identification and management profiles, personalization of the environment, Management of user groups, search engine, Notes, Notifications, Forum, Calendar, Wiki, Management of the storage environment.

A portal is made up of members; they can belong to groups and/or belong to organizations. Organizations can be grouped into hierarchies. Members, groups and organizations can belong to communities that have common interests. The fact of grouping the users facilitates the specification of the access rights of some users. A user can belong to several groups, organizations and communities (Puimatto, 2006) (Attaran, 2019). There are three types of communities:

Open: A user can join or leave an open type of community when he wants to help the portlet "Communities".

Restricted: A Restricted type community requires sending a request to the community administrator to join it.

Hidden: A community of type Hidden is like a community of type Restricted except that it is not in the list of communities in the portlet "Communities". (Khachouch, 2020)

3.2 Roles

Liferay identify four types of roles in its architecture:

- The owner: The owner has all the access, he has all the access rights on all the portal pages and on all the features offered by Liferay. Simple to administer;
- The administrator: A portal can have several administrators. An administrator has all the same rights as the owner except that he cannot assign members as administrators;
- Power Users: They are simple users who have additional powers;
- Single users: These are the simple users of the portal.

3.3 Pages

A portal on Liferay is organized according to a set of public pages and private pages. The private pages and the public pages have the same structure, the only difference between them is the access rights. For example, the public pages of a user on the portal are seen by all the members of the portal. On the other hand, the private pages are not seen and access only by himself, even the portal administrator cannot access the members private page. Each user on the portal has private pages and public pages. Each community

has private pages and public pages. Each organization in the portal has private pages and public pages. (Khachouch, 2020) (Korchi, 2020)

4 LIFERAY AND MODEL COMPOSITION

4.1 Main Contribution: Liferay Design in the Context of Model Composition

With Liferay we can create several portlets which can be grouped together to build a generic platform. In the context of model composition, these portlets can be represented as models. Based on the Spring IoC and Hibernate frameworks, it allows us to easily create our models, the persistence layer and the service layer, so this tool generates the Spring and Hibernate configuration files necessary for the setting operation. Use Case Diagram: After authentication, each user has the right to submit a request for inspection to the department concerned, after processing the response is sent to their mailbox and also in the form of a notification accompanied by the various details within the digital workspace itself. The administrator according to the department to which he is affiliated, he has the right to process the various user requests. (Khachouch, 2020)
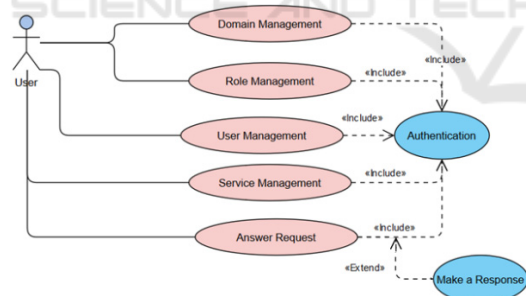

Figure 2: Liferay Use Case diagram.

Class Diagram: Each user can access several services depending on their role and area of activity.

A user can make several requests and get an answer.

A service has a very specific request, which is in its role can be intended for several services.

With Liferay, we can create a service builder. A service builder is nothing else than a XML file that contains the definition of our entities and relations between them, a service builder is always associate with a Liferay project as a portlet.

The Layer Model contains all our entities. The persistence layer, responsible for requests and operations on our database entities. The Service layer, performing all technical and business operations other than those of the previous layers. The Utility layer, this layer represents a glue in the global architecture and it's mainly called within our portlets. As shown in figure 4, we present an example of the portlet skeleton referring to the example provided in the class diagram, we have developed the domain part by calling the services used "DomaineLocalServiceUtil" and associated methods "getDomaineCount".
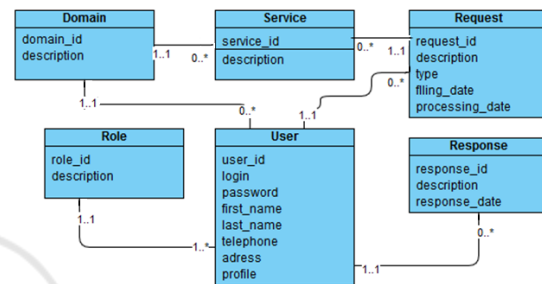

Figure 3: Liferay Class Diagram.

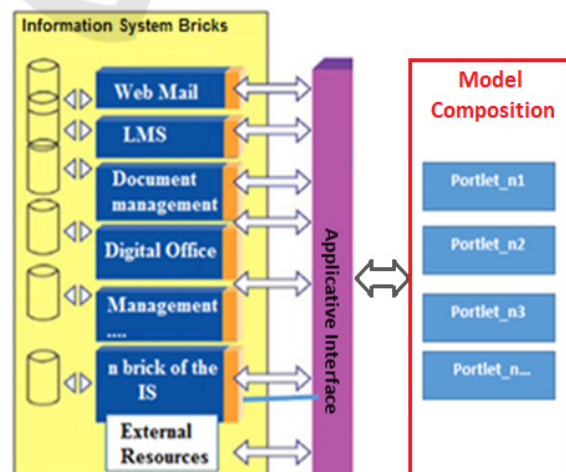Figure 4: Example of using the classes generated in a portlet.

Figure 5: Liferay digital workspace in the context of model composition (Bailey, 2017).

The reference architecture in the figure 5 presents an organized view of the various services offered by the digital workspace, services which must be adapted to the needs and uses of the educational community.

It should be noted that the client, part of a digital workspace, is today intended to be multi- channel, multi-support and that it goes beyond the simple web browser client by presenting mobile clients, the other part of a digital workspace answers the needs of increasing exchange and collaboration between users. The qualities expected of digital workspace (quality of service, adaptability, extensibility and security) are made possible by the capacities provided by the base services and user services. The base services (core) are those on which all user services are based. User services are divided and organized into service typologies which take in consideration the pedagogical and educational dimension. (Bailey, 2017)

4.2 Use of Digital Services

As shown in figure 6, in terms of basic services, there are: Integration services, Import / export of data, Call for external services, Presentation of services to the outside, Provision of data to services, Security services, Identification and authentication, authorization, propagation of identity information, application of security policy, detection and prevention of security breaches, portal services presentation, portal customization, multichannel management, search engine, support services, operation, administration of back office and User assistance.

In terms of user services, there are: Communication and collaboration services, email, spaces for exchange and collaboration, instant messaging, information display, web publishing, audio and video conference, Information and documentary services, research, individual student monitoring and room equipment reservation.

5 CONCLUSION AND PERSPECTIVES

The use of the digital workspace must be accompanied by a reliable IT environment: functional IT equipment and stable software. In order to support its deployment in the establishment, it is appropriate to set up a steering committee. This committee could be endowed with several functions, in particular in the field of editorial policy (management of sections, management of roles, publication rights).

The precautions to be taken arise from the legal difficulties caused by the online services implemented by the establishment and from data protection (access, processing, protection, integrity and backup). The following points should be carefully considered: guarantee the integrity of IT systems (responsibility which can be shared with other partners if the data is outsourced). This responsibility includes:

establishment by the academic filter; file security relating to data processing and files and confidentiality of data.

Many researches have been done in the same stream of works, but most of them focused generally on the university architecture, that satisfy the institution needs and presents functional details, without interesting to the complexity of developing this kind of systems. With the prototype that we propose based on a model composition concept and using as a strain Liferay digital workspace which propose a portlet concept in order to overcome the complexity of developing a huge system and managing the security gaps by treating the system like bricks and offering ready-to-use portlets, from this prototype we are looking to guarantee the continuity of the school outside the walls, especially in the era of the covid-19.

In our future work, we plan to use and expand this architecture in order to develop several portlets that will fill the gaps in term of our need, while allowing a composition of these portlets and also promoting the reuse and flexibility of these bricks in a model composition frame.
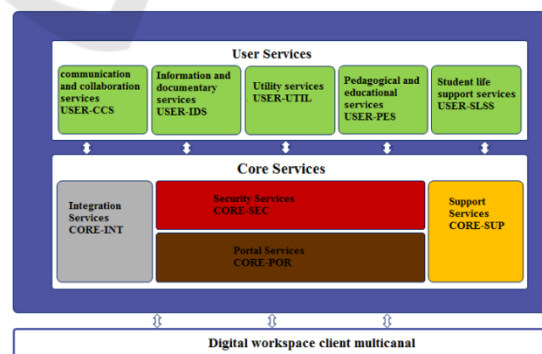

Figure 6: Structure of a digital workspace prototype in the context of model composition (Bailey, 2017).

REFERENCES

Jacobs, I.S., 1963. Fine particles, thin films and exchange anisotropy. Magnetism, pp.271-350.

Bailey, D., 30. online small business tools to use in 2017. [online] https://blumint.co/30- online-small-business-tools-use-2017.

Digital workspaces: what uses in teaching? Online file of the Educnet site (MEN): http://www.educnet.education.fr/dossier/espaces-numeriques-de-travail [accessed on July 2020]

Genevois, S., 2011. Internet or the new figures of spatiality, In Poyet, F., Develotte, C., Education in the digital age. INRP.

Miller, P. and Marsh, E., 2016. The digital renaissance of work: Delivering digital workplaces fit for the future. Routledge.

Leclercq JM, Boissière J., 2007. The digital workspace project: building a trusted digital school system for the whole educational community, digital workspace and extended school. http://www.cndp.fr/archivage/valid/93838/93838-15542-19530.pdf [accessed on July 2020]

Poyet, F., Genevois, S., 2009. Integration of Digital Work Environments in Teaching Practices: Between Continuities and Ruptures, In Rinaudo, J-L, Poyet, F., Digital Environments in Schools. Lyon, INRP.

Poyet, F., Baconnier, B., 2006. Digital work environments in schools, The letter from the Scientific and Technological Watch-INRP.

Poyet, F., 2011. School culture and digital culture in tension, In Poyet, F., Develotte, INRP.

Puimatto G., 2006. Digital educational networks. Regulators, actors and vectors of the evolution of practices and the organization of educational establishments and institutions (Doctoral dissertation, Paris 13).

Attaran, M., Attaran, S. and Kirkland, D., 2019. The need for digital workplace: increasing workforce productivity in the information age. International Journal of Enterprise Information Systems (IJEIS), 15(1), pp.1-23.

Khachouch, M.K., Loukili, Y., Benjelloun, S., Korchi, A., Lakhrissi, Y., Moumen, A. and Aghoutane, B., 2020, December. E-learning techniques and technologies analysis for a moroccan virtual university perspective. In 2020 IEEE 2nd International Conference on Electronics, Control, Optimization and Computer Science (ICECOCS) (pp. 1-5). IEEE.

Korchi, A., Benjelloun, S., El Aissi, M.E.M., Khachouch, M.K., El Marzouki, N. and Lakhrissi, Y., 2022. Toward Moroccan Virtual University: Technical Proposal. In WITS 2020 (pp. 189-199). Springer, Singapore.