

Design of Digital Campus Office Automation System Based on Portlet and Workflow

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Abstract

The digital campus information unified portal can provide the services not possessed by traditional campus network. Firstly, the portal technology and the relation with Portlet are analyzed for the secondary development of liferay technology; secondly, the digital campus portal system is realized according to the requirement analysis of the digital campus portal system and the system development principles as well as the system implementation characteristics. Unified portal system, SSO (Single Sing-on) unified identity authentication and campus workflow system are realized in this paper. Meanwhile, this design scheme can not only support the integration of data, contents and information, but also transfer the contents, application programs and services inherited thereby through the customizable portal channel, thus to reduce the operation cost of the campus information portal and improve the working efficiency of the users as well as play an important role in digital campus construction. This portal system design scheme has been applied in the digital campus system of Southwest Petroleum University, and is practicably proven to have certain feasibility and practicability.

Keywords: *Portal; Portlet; Digital campus; Information integration; Data integration*

1. Introduction

Various applications are significantly increased along with the continuous deep development and construction of digital campuses. If the separate login mode is still adopted, the workload will become very huge and the users will invisibly become scared and contradictive to use the information system. Therefore, it is imperative to integrate all applications into a unified platform. Due to the centralized information distribution realized by the information portal platform, the original information system can provide more active and extensible services, thus to significantly facilitate users' work and life. Meanwhile, users can define their own services on this basis. As a result, the information portal platform can integrate various business systems at the bottom layer so as to effectively realize information sharing and knowledge accumulation and actively provide customizable interactive services to the users.

2. Digital Campus Portal System

2.1. Portal and Portlet Technology

A portal system with complete functions usually includes three parts: portal server, portlet container and portlet. We call the information content generated by portlet as fragment, wherein such fragment is the Markup composed of HTML and

XHTML, and several fragments can form a complex page file, namely the portal page; the information contents are integrated according to certain principles and such content integration is namely the portal layout setting. Additionally, request/response is used to control the interaction between clients and portlet. For example, the content interaction between clients and portlet is firstly provided with request according to the connection confirmation, then the request is transferred to the portal, and then the portal transmits the request to the portlet responsible for processing the request. Of course, the contents generated by portlet completely depends on the portlet setting configured by the users rather than portlet users.

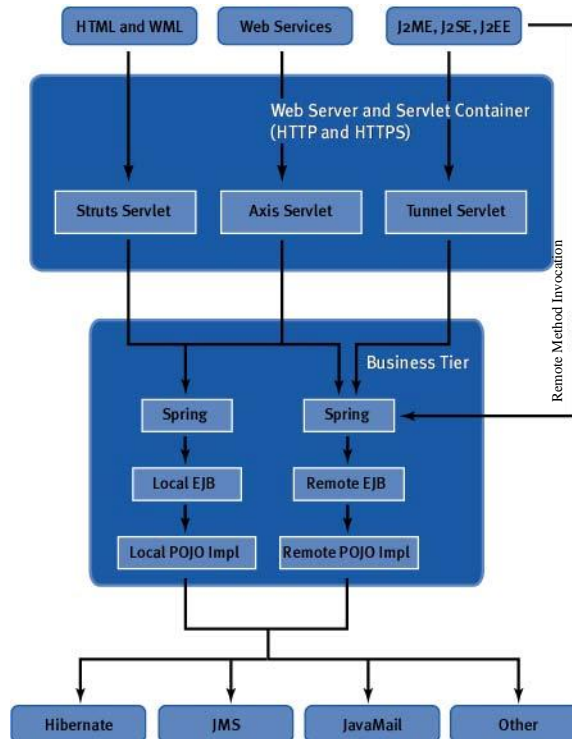


Figure 1. Liferay Technology Framework

Users can access portal through the following ports: SOAP, RMI, Custom tunneling. The business layer mainly employs wireless Session EJBs (local or remote) for access.

HTML and WML: Struts Servlet

Web Services: Axis Servlet

J2ME, J2SE, J2EE: Tunnel Servlet

A portal page is formed by zero or more portlets, and a portal system is composed of one or more portal pages, wherein portlet is not only used to present and integrate its information contents, but also used to customize the personal desktop information and define the portlet use permission.

The contents generated by portlets are received and executed in the corresponding container, and then the processed contents are sent to portlet server, and then these contents are adopted to establish portal page for inheriting client contents. Portal page establishment process is as shown in Figure 2.

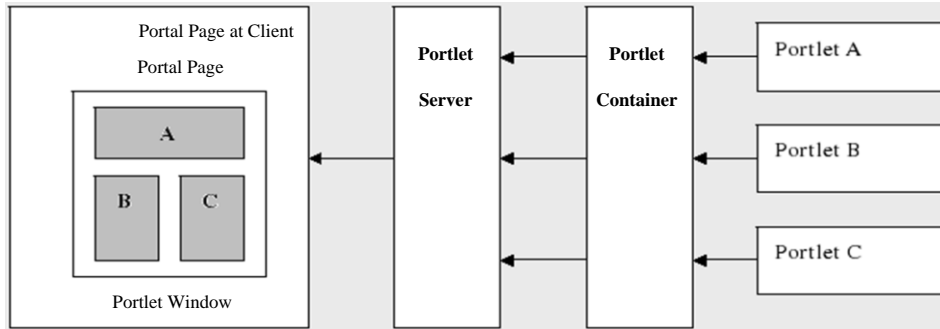


Figure 2. Portal Page Establishment Process

Portal page request process:

System users can adopt client browser to access portal, and then the portal confirms the portlets to be called according to the received page request. The final processing result of the page is a set composed of multiple portlets. The portal system calls portlet through portlet container, and then returns the portlet to the portal through the fragment information generated by portlet, and then returns the portal display page to the client browser in HTML form. Portal page request process is as shown in Figure 3.

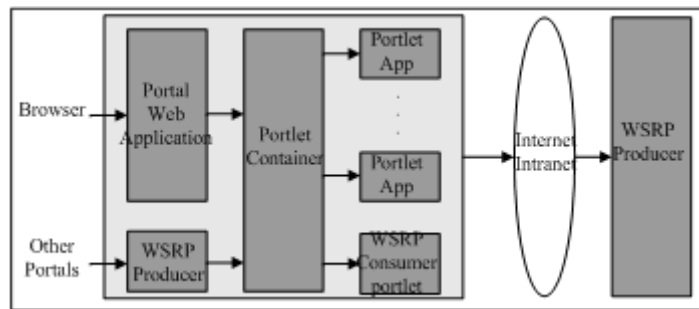


Figure 3. Portal Page Request Process

2.2. Workflow and Data Processing Flow

The following three schemes are jointly used to solve the above problem:

- (1) Component frameworks;
- (2) Web Services;
- (3) Open design architecture.

Workflow system = workflow management system + component based development tool + Web Services coordination tool

The workflow engine is mainly provided with separation function and logical function so as to assist the developers to add such new functions as Swing, Web Services, XML, EJBs and Message Queuing in the existing workflow system. Specifically, the workflow engine is established on the basis of the components to realize convenient operation execution and management. Moreover, as the same as other workflow engines, this workflow engine also has the remarkable characteristic of adding new processes to the organization structure.

Web Services are mainly used to facilitate users to access the corresponding processes through the internet at any time and at any place. The working principle is as follows: WSDL-SOAP is adopted to call and integrate SOA service framework, and meanwhile users can bind and set Web Services. The main design principle of

such framework is as follows: the dynamic management is adopted for Web Services for the discovery, operation and activation thereof; Web Services are also used to manage a lot of human resources, business resources, Web Service ports and other resources; XML is adopted to realize data interaction and exchange. Additionally, enterprise Session EJB is allowed to be used in EJB server, middleware server and database application server, and after deployment on these servers, enterprise Session EJBs will be separated from each other so as to establish the system with three layers or even N layers. Actually, which layer the Session EJB is located is not concerned by the users, and such strong function of Session EJB can be presented only in the application thereof in large enterprises.

The whole portal processing flow is as follows:

Struts Action -> Stateless Session EJB Facade -> Persistence Helper Class -> Hibernate

The deletion of abcontact in “ADD Label” part is taken as an example to explain the whole process, as shown in the following figure:

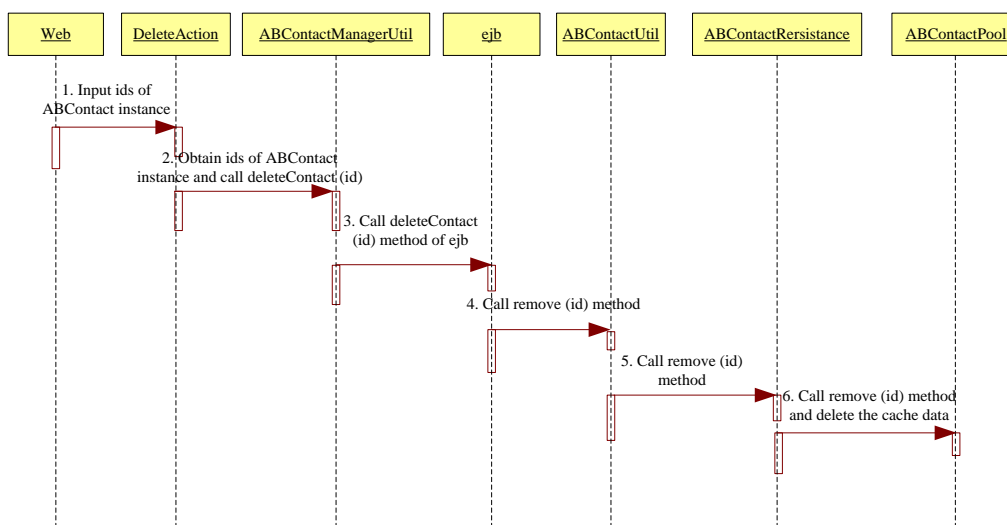


Figure 4. Portal Data Processing Flow

Contact id is input in web page to request DeleteAction to delete the data, and DeleteAction calls agent class ABContractmanagerUtil to execute “Delete” function. ABContractmanagerUtil is encapsulated with .ejb functions, but SessionBean itself is not directly provided with “Delete” function and is encapsulated with ABContactUtil of ABContactPersistence of Hibernate for function agent. Specifically, ABContactPersistence can simultaneously maintain the database and the cache data for synchronization. Besides listener function, ABContactUtil can also read ABContactPersistence cache.

3. CIP Design

3.1. General Portal Framework Design

The digital campus information portal of Southwest Petroleum University is designed on the basis of the extension of the classic portal system structure. Unified portal platform is an advanced representation form of digital campus. As the external-internal windows of the digital campus, portal services are configured on various applications and are adopted to present the application information of the digital campus for the users through browsers.

The authorization authentication based on unified directory management can realize the two-way authorization between users and items. In the whole digital campus, the unified portal platform can provide single access point service regarding the campus information to the users, namely unified identity authentication and SSO, thus to provide comprehensive information and services through the unified campus information portal. In this way, users can use various application subsystems or access corresponding data and information within the specific authorization range. Through such strong personal portal, teachers and students in campus can rapidly and conveniently search and access various resources, thus to help them finish subject or project tasks.

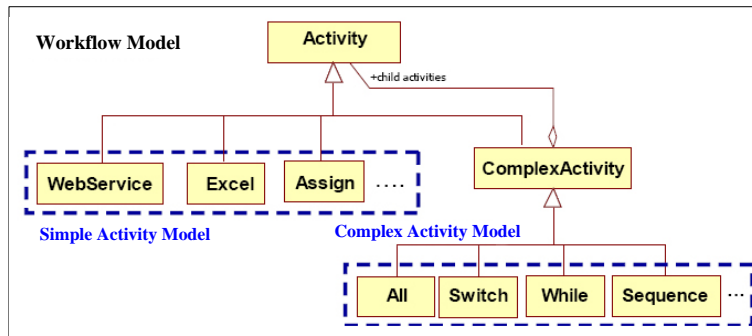


Figure 5. Activity Component Model of Workflow System

As a scheme for the object model to realize self-encapsulation in the container module process, activity component model can not only include the activities only with task logics, but also include the logical activities with child activity process control. Specifically, the simple activities with task logics include web service activation, email transmission, data push, *etc.*; the activities with process control include While, All, Switch, Try~Catch, *etc.*, and these activities all include meta and other child activities. The above process activity component model is also applicable to Javabeans setter/getter mode, thus to be favorable for data security. Process is designed as a Bean without form, and the activity can be edited through GUI provided by the Process.

3.2. Integration Scheme

Facing the existing scattered application system problems, we usually take the measure of establishing a unified information portal for information and resource integration. In a portal, portlet is not only a small window, but also an application and a business integration tool. Like this, we can have a good information and application integration platform. For example, a NwesPortlet can be used to collect information, list the most important news on that day, retrieve information and realize other functions. Therefore, by virtue of these portlets for different business applications, users can define their own portals according to their authorizations so as to access information through a unified interface, realize internet interaction and coordinate with others, thus to access the whole application system.

The application program integration for the digital campus portal of Southwest Petroleum University can be achieved by the following two method: (1) load existing portlet application: for existing portlet application, it is only necessary to deploy .war files of the application in web server and then add or modify the corresponding configuration file so as to conveniently register and deploy the application in portal container for distribution; (2) establish new portlet to integrate application program portlet so as to provide the user-defined function of the portal

and the integrated function to the final users. Additionally, users can define the portal contents and the integration data through the self-service interface.

With comprehensive background integration characteristics, the information portal system can easily integrate events, applications and data into the portal, so the users do not need to recreate existing systems and business processes. Specifically, the data streams generated by the information source of a university are encapsulated as the portlet to be distributed in the portal platform, and the registration information of this portlet is added into the user permission database during portlet distribution, and only the users authorized by the administrator can use the corresponding portlet.

4. Implementation

The software environment for system development is as shown in Table 1.

Table 1. Software Environment for System Development

Name	Description	Version
Operating System	Windows XP	Ultimate
Development Language	Java	Newest
Project Development Integration Environment	MyEclipse	8.0
Static Page Development Environment	Dreamweaver	8.0
Database	MySQL	5.5
Server	JBoss	6.0
Struts Framework	Struts	2.1.6
Spring Framework	Spring	3.0
Hibernate Framework	Hibernate	3.1.3

The hardware environment for system development is as shown in Table 2.

Table 2. Hardware Environment for System Development

Name	Description	Version
CPU	Inter(R) Core(TM) i5	M460 、 2.53GHz
RAM	2.00GB	
Hard Disk	500GB	

Portlet can be developed through various forms, such as JSP, Struts and user-defined framework, wherein JSP is usually adopted to develop simple portlet, and Struts is mainly adopted to develop the portlets of the system proposed in this paper. For convenient development and expansion, most portlets of the system are developed in user-defined framework which is an advanced form of JSP. Meanwhile, a framework class shall be defined to realize the link of each portlet. For convenient development and program reuse improvement, after a large framework class is defined, other portlet classes can be inherited from the father framework through changing the redirection address of the portlet in the subclass.

Located above Portlet API(JSR 168), the portal platform of Southwest Petroleum University can provide rich portlets and the functions and components needed by current portal solutions. Relevant content such as portlet service consistent with the corresponding identity permission can be added in the page, and unconcerned information source can be also deleted, thus to realize user environment

individuation. The affair platform of Southwest Petroleum University has been integrated with such application systems as electronic office platform, student management system, teaching management system, book management system, email system (Easy Mail), courseware management system, campus forum, personnel management system and employment management platform.

5. Conclusion

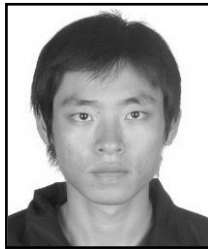
Many strategy and technology problems still existing in the construction of the digital campus information portal need to be solved in future. From the aspect of the construction goal of the portal technology, this paper aims at discussing portal system structure and describing the technical specification and the workflow. Meanwhile, a set of campus information portal construction scheme based on portlet technology is proposed according to the campus portal construction requirements in order to solve the problems regarding system fusion, information integration and user service individualization during the digital campus construction process. The adoption of portlet technology for campus information portal construction can not only reduce the portal implementation difficulty and management overhead, but also improve the working efficiency, thus making portlet technology play an important role in the digital campus construction process and have good effects.

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