

THE CONSTRUCTION OF SMALL TOWN INFORMATION PORTAL USING OPEN SOURCE SOFTWARE

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Abstract: Along with the development of small towns, traditional or common methods of urban informatization construction are not fit for small towns. Therefore it's essential to bring forward an appropriate way. By studying on the latest open source portal software uPortal, the paper discussed the application of personalized service, portal technology and information integration technology in informatization construction of small towns. Finally, the design and realization of the information portal and a portal website of small towns, which achieve the management and sharing of information in small towns, were presented.

Keywords: open source software, portal technology, uPortal, small town information portal.

1. INTRODUCTION

In recent years, the means of informatization management has been adopted in increasing small towns of China. However, as a whole, information service system is immature and the level of informatization is not high. A few application cases in demonstration plot are just initial experiments, far below the proper level. These cases have limitations in their extensibility, because most of them are established in metropolitan or developed area, where there are good informatization conditions and large investment, being a sharp contrast to numerous small towns where there are

poor informatization conditions as well as shortage of funds (Li, 2005). Therefore, customized solution to the construction of small town informatization should be proposed to meet the special need of small towns. Besides, reusable models and other methods should be applied to reduce developing cost.

Considering departments and organizations are usually simple in small towns, “centralized” informatization method is considered to be applicable in construction of small town informatization. Thus, a general integrated platform of small towns can be established to enable each industry department to process informatization in the platform, based on which a portal website can be built to implement information integration, process and management of small town with high efficiency. This paper focuses on the application of Open Source Software and portal technology in establishment of integrated informatization platform of small town and proposes a new method of propelling the development of small town informatization.

2. INTRODUCTION OF UPORTAL

2.1 Open source software

Open Source Software (OSS), with features of being free used and open source code, is a new mode of software development and publication in current years. With the continuous development of information technology, OSS has more extensive application and wide influence. From scientific research to business application, from operating systems and application servers to application software of education, office, ERP and CRM, OSS has been extended in various industry fields.

Compared with traditional commercial software, OSS has many advantages which lie in: □Low cost: installation and operation cost is not necessary; □Open source code: codes of OSS are usually distributed with software, which make it possible that the source codes can be modified to add new functions; □Easy to modify: anyone can modify the software to catch and solve errors as he likes (<http://www.open08.com>, 2006). Due to the modification and improvement of many users, software that are developed in this structure are very flexible and reliable (Paolo, 2005).

In contrast with the informatization of metropolitan such as Beijing and Shanghai, the informatization scale of small town is so small that OSS not only fits the features like small-scale, low-cost and flexibility in the informatization of small town, but also avoids high cost and unchangeability of normal commercial software.

2.2 Portal technology

Portal technology is a kind of integration solution based on application layer and presentation layer. As a web application program and presentation of information system, Portal provides functions of personalized service, uniform login and content integration function. From view of architecture, Portal, an application level service above web server and application server, is essentially a web application in platform level (Huang, 2004). The key technology of Portal model is Portlet. Being a web component based on Java technology, Portlet is a packaging component based on web content and application function, running in Portlet container of Portal server. Portlet can connect different data sources, which may be local or remote web page, data from database, or application program (Huang, 2004). On the other hand, Portal can display Portlet from different sources from view of user interface.

As Fig.1 shows, the portal page is divided into several Portlet zones, each of which can display content that is independent from each other. Moreover, content can be customized according to specific requirements and each Portlet can be shut down. An excellent Portal has features of friendly interface, self organization, self service, expandability and safe compatibility (Jin et al., 2005). Fig.2 shows the implementation environment of Portal.

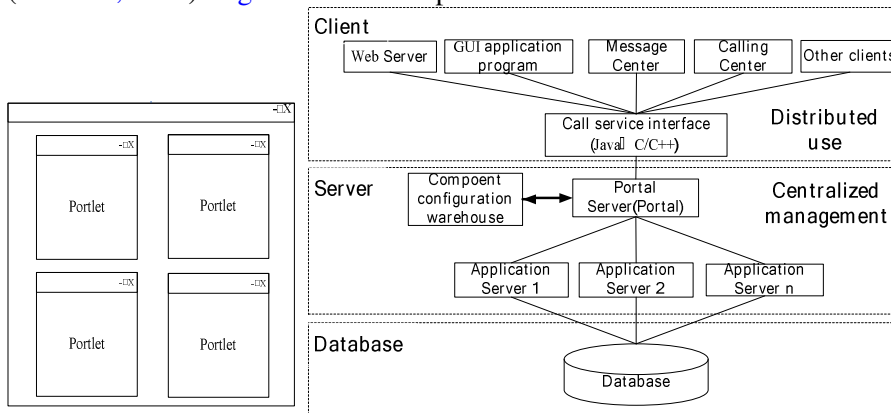


Fig.1. User interface

Fig.2. The implementation environment of Portal

2.3 Open source program uPortal

Portal is an important developing tendency of web application. At present, almost all big software companies have their own Portal products, such as WebSphere Portal of IBM, WebLogic Portal of BEA and Oracle Portal of Oracle. Besides commercial products of Portal, there are several open source Portal products, such as Jetspeed, Pluto, uPortal and Enhydra provided by Apache Community. An open source product uPortal, that has been developed and maintained by many US colleges, is discussed here.

uPortal is an open source program which is based on Java, XML and XSL. As followed by OSS development and distribution protocol, uPortal can be freely downloaded, installed and operated. It also can be improved and distributed according to requirements without profit making (Li, 2005).

Focusing on colleges and education institutions, uPortal is also applied for some business organization to construct cooperation community framework. uPortal enables users to add new features and functions in which they interest as well as customize the display style. Current uPortal includes function components such as web service channel, authority and user group management.

uPortal adopts mainstream technologies in open source field and provides a whole set of free and open platform. The installation and operation of uPortal are very easy and it can run in any server that is compatible with JSP. There are two distribution versions: fast version and source code version. Fast version is appropriate for users who have not deployed product environment; source code version suits to those that already have had J2EE and product database environment (<http://www.uportal.org>, 2004).

3. TECHNIQUE ROUTE

3.1 Customization of personalize service based on user

Personalized information service is one of network information services, which is hotspot of research domain. The realization of this service mainly bases on the customization of user. In virtue of computer and network technologies, the service collects, settles and classifies information resources to satisfy the requirement of user, providing different service policies and matters for different users. The service has several characters as follows:

- (1) Different user interface based on role of user;
- (2) Customize page layout and content, select diverse functions and contents local or remote to assemble page layout;
- (3) Customize the display style of page layout, such as font, color or style;
- (4) Control of user authority. Different users have relevant available operation and authorization of accessing content.

Portal provides personalized service of single sign-on access and user can customize page layout, content and style according to his demand and like. After entering into Portal, each kind of service corresponding to the user's role is available. The web pages offer different users different contents and functions to help them obtain information rapidly. For example, the user, who is interested in the weather information, can put the weather website on

the customized web page. Therefore, such personalized service certainly makes acquiring information more easily, which increases user's satisfaction, the attraction of the website, and improves the integration of information (Cheng, 2005). At present, such service is already practicable, including the technique of customizing web page, channel or column.

The method of realizing individual service of uPortal is introducing identity authentication center to validate user's login information. After the user logs in the system, the identity authentication center saves the whole information of the user; on the other hand, the role and authority of the user are saved in each system, thus the authority of the user is judged by each system. In the identity authentication center, cookie is used to save the user's login information; in each system, session is used.

The process of login of uPortal is as follows:

(1) Validation: Firstly, the user inputs username and password. Secondly, uPortal makes use of AuthenticationServlet to transfer validation service and AuthenticationServlet makes use of Security Provider to dispose data submitted by the user. Then SimpleSecurityContext class is used to validate the encrypted md5 password. If validated and got across, AuthenticationServlet will turn to main interface;

(2) Acquiring the directory information of current user: When the validation finishes, uPortal makes use of PersonDirectory service to acquire directory attribute of validated user. PersonDirectory service gets attribute information by JNDI (Java Naming and Directory Interface) or JDBC source, matches it to the user and acquires the user's directory information. The document of PersionDirs.xml manages the process of matching;

(3) Acquiring the identity of current user: IUserIdentityStore interface creates identity and authority for current user to get the original user interface.

3.2 Integration of multi-source information systems

Another important character of Portal is integration of multi-source information systems. Having considered the requirement of integration of Portlet from multi-source, it's key to operate multi data sources transparently and display content from diverse systems through a portal web application. XML technique is a good solution.

XML (Extensible Markup Language), come of semi-structured mark language from web, is a meta-marker language. As the agency of data exchange, XML has the capability of solving the information exchange problem since XML fulfills two essential demands:

(1) Taking data as the core, XML separates data and expression. In this sense, various data sources will be shielded by XML and showed with uniform XML format for users. The receiver deals with data according to

DTD of XML, such as breaking up data or displaying with different manners. For instance, the weather information can be showed in diverse equipments, like TV, mobile telephone or others.

(2)Transmitting data in different applications, XML provides a format which describes structured data, permits user to create his own tags and endow them with different semantemes. Moreover, tags can be changed dynamically. This capability of self-description makes XML applicable to the integration of data exchange and heterogeneous data among all kinds of applications (Liu et al., 2005).

UPortal offers integration framework for different information sources and effective flexible tools for displaying centrally. In view of different information sources and style-sheets, uPortal framework takes XML as its kernel to manage the relation between XML and last interface document. The architecture of uPortal consists of function component, framework component, theme component and skin component (Fig.3). Processing requires the following steps (Justin, 2004):

(1)Structure Transformation: Obtain the user interface, an XML document generated from database, and transform it into the structure layout document by XSLT transformation. For example, the interface framework of guest user will be obtained including tables, rows and columns;

(2)Theme Transformation: Add the function component to the structure interface document and convert it to marker language by XSLT transformation. For instance, HTML is the result in Internet Explorer and WML in mobile telephone browser;

(3)Finally, the markup language utilizes CSS (Cascading Style Sheet) to control the display style of page and add logos, pictures of buttons and etc to get the last user layout.

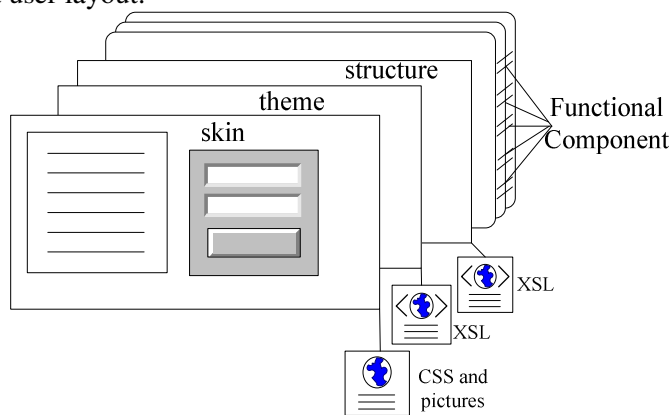


Fig.3. The architecture of uPortal

The advantages of these multi-stage transformations include:

(1)With the aid of XML, it's simple for uPortal to connect different information sources from different systems, convert XML to HTML by XSLT and display uniformly in the end, which implement the kernel aim of Portal: manage in centralization, use in distribution;

(2)XSLT, a language which is used to describe how XML document transforms into another XML document, can transform one data format into another data format from different systems. The business logic and presentation are separated by XSLT to enhance the flexibility of system;

(3)Multi-stage transformations allow for flexible designs targeting different markup languages and devices (Justin, 2004), just like person computer or mobile telephone, etc;

(4)CSS creates coherent interface for diverse function components and applications.

4. CASE STUDY

4.1 Aims and implementing environment

Based on the above research, the prototype system was constructed. By constructing uniform information portal system, the system not only integrated various inner application systems and business process in existence, published information through Web, provided safety management and personalized service for distributed users, but also allowed cooperating with other business websites and application systems to realize integration.

Main functions in the system included release, subscription and integration of web component; Customization, such as customization of content, format, skin, language and so on; User management, such as group management, role management.

The system was developed using J2EE framework and Open Software tools: Apache, MySQL and JSP.

4.2 Architecture

The whole framework of system was made up of three layers: Browser/Server/Database.

In database layer, MySQL was used to storage and manage data. MySQL is a small cross-platform relation database. It's excellent in powerful function, fast operation, good performance and high reliability and security.

In server layer, Tomcat was adopted as web server. As an open-source servlet container, Tomcat has stable performance, advanced technology and is completely free.

In application layer, the client was composed of JSP (Java Server Page). JSP is a dynamic web page technique based on Java, which is easy to develop complex web application program and support cross-platform and cross-web server.

4.3 Operation Interface



Fig.4. Customization of web component



Fig.5. Authority management

4.4 Characters

(1) Constructed by open source software

The small town information portal system is constructed by all open source software such as uPortal, Tomcat and MySQL. It's an ideal solution for constructing information portal to provide excellent, reliable performance and low cost;

(2) Integration of information resource

The advancement of Portal is mostly reflected in the capability of integrating various kinds of application systems, especially in the portal website. The system integrates content management system, email service system, calendar, video-on-demand system and other existing systems to achieve the transferring, sharing of information among diverse systems and efficient operation, management of all types of information in small towns.

(3) Personalized service

Different services are available for different users in the system. It's convenient for the user to customize the layout, content of page as he likes, improving user's efficiency and satisfaction.

5. CONCLUSION

This paper analyzed the basic condition of small town informatization development, proposed a new construction method, and adopted the latest portal technology to process information integration and to establish an advanced portal site which can provide integrated, intellectual, shared and open information services, all of which have been applied successfully in a real case. The further work includes:

(1) Adoption of pre-construction of Portlet and declared develop tools can not meet user's complicated need when integrating portal content information (Cheng, 2005). The next step is to develop more general customized Portlet to implement the application integration of portal sites in small towns;

(2) There are still many technical problems such as how to synchronize different accounts in the system and control different authorities among access nodes in portal site.

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REFERENCES

- Cheng Hong-bin, Research on personalized service and safety in campus web based on J2EE, Wuhan: Wuhan technology university, 2005 (in Chinese).
- Huang Xue-wu, Constructing integrated application with Portal and web Service, Journal of Shaoguan University(Natural Science), Vol.25, No.3, 2004, pp. 24-26 (in Chinese).
- Jin hong, Yang yan-hong, Review of Personalized information service in university library, Modern Information, No.6, 2004, pp. 17-19 (in Chinese).
- Justin Tilton, Chief Executive Officer instructional media + magic, inc. at the JA-SIG Conference Destin, Florida, 2004.
- Li Guang-qian, Informatization of Small Town must make clear the idea, <http://www.echinagov.com>, 2005
- Li Xin, Research on open source software in electronic commerce, Fujian Computer, No.3, 2005, pp. 33-34 (in Chinese).
- Liu Ke-yan, Wan Li-rong, Zeng Qing-liang, and etc, Research and realization of information integration system based on XML, Research of Computer Application, No.4, 2005, pp. 149-154 (in Chinese).
- Paolo Diviaco, An Open source, web based, simple solution for seismic data dissemination and collaborative research, Computer & Geoscience, Vol. 31, 2005, pp. 599-605
- Solution of open source software website, Review of Open source program, <http://www.open08.com>, 2006
- uPortal official Website, uPortal Home. <http://www.uportal.org>, 2004