The Case Study on Service Encapsulation for Web-Based Application System

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Abstract—Web-based application system for the Service-Oriented Architecture (SOA) is focused by many researchers because of its widely employed in distributed systems. The SOA technologies are usually opted employed for building reliable service composition on top of unreliable Web-based application system. As the case study, through the call center service system, the sort message synchronization system, the rural industry service for the local e-Government, and the warehouse intelligent management service, how to encaase each system’s service is discussed in this paper. The service encapsulations architectures of the call center service system and the warehouse intelligent management systems are shown in detailed. The management platform of commercial city and the service encapsulations for the high-level course website based on muti-technology integration are given as well. Those service encapsulations above for Web-based application system get smoothly implementation in the different scopes, but how to get universal application service encapsulations wait for researchers the future work.

Keywords—Web service; Service encapsulations; Call center service; Intelligent warehouse; Commercial city; High-level course

I. INTRODUCTION

As the Web-based service application developed very fast and it is used widely and deeply, the Service-Oriented Architecture (SOA) is become very important day by day. How to share the dynamic data in the Web-based service application system or platform for one or more governmental departments or enterprises turn into interesting is research and application. Some researchers give their research results on the encapsulations method, some encapsulations architecture or frameworks based on the vacation application are introduced as well. An integration framework of web-based learning system is given in reference [1], the mother of green System architecture is shown as reference [2]. The reference [3] used VCL technology to implement distributed reconfigurable data centers and computational services for educational institutions. The architecture of scientific computing library portal on sequential algorithm based on partial differential equation is introduced in reference [4], the reference [5] focus on the service encapsulation for middleware management interfaces, and a mapping rule for middleware management interfaces, the mapping rule for Web consoles, the tool for management services encapsulation, and the middleware management styles based on management services are described in detailed. The reference [6] and reference [7] research on the encapsulations vacation application. A call process of Web service encapsulation experiment for Fortran-based geographical model is shown in the reference [8], the resource encapsulation framework for service-oriented manufacturing application is shown as in the reference [9].

Some researchers may focus their interesting in the service-oriented security architecture like the reference [10] and some may interest in the integration framework like the reference [11]. Based on the trust or identification, the reference [12] after researched the mixed service-oriented systems and the trust concepts utilized for trusted information sharing, the sharing framework overview are given. The overview of service-oriented modeling and architecture for SOA is shown as in the reference [13].

Many departments and enterprises provide with a lot of services on their Web-based service application system. For example, the office of letters and calls of local government should to accept the advice come from the different ways such as letters, calls, sort messages, Web- inquiry, e-mail etc., and the clerk should to response the issues pass through different channels. The Web-based application structure holds a high stability and easy integration, so it is one of the best architecture for the Web-based service application system built. Because of the different service may deal with different device or software, so our researches interesting focus on how to encapsulate those services on the SOA application system.

II. CALL CENTER SERVICE ENCAPSULATION

Call center is based on the Computer Telecommunication Integration (CTI) technologies, it have simple operation, specialization and abundant variety service, intelligent and display the user information on time. It can achieve the call assignment automatically, check caller-ID, infix calling, switch over the calling, cover for the calling, switchboard automatic service and leave the messages, user data, expenses management, and far-user telephones.

A System Compose, Functions and Main Technologies

A typical call center mainly includes calling processing center, network equipments, computers, terminal units, and peripheral equipments.
1) Automatic Call Distribution (ACD)
   The ACD is an automatic calling distribution system, and composed of ACD SPC exchange. The trunk lines connecting and automatic controlling is accomplished by the ACD.

2) CTI Technology
   CTI Technology is a kind of computer telecommunication integration, which means the CTI Technology should to deal with not only the traditional calling but also the electrical transmission, e-mail, and the other formal of information media.

3) IVR Technology
   The basic function of IVR is to achieve the voice intercommunication between the person with the machine which use the telephone and the computer voice equipments.

4) Record Equipments
   Record equipments are used to record the manual operator communicate with the caller, it stores and manages the recorded data.

5) Calling Management
   Calling management implement the state monitoring and call statistic for the call center. The system administrator can find out the system working state by the state monitoring and call statistic.

6) Background Service System
   Background service system supports the data accessing for the call center. It includes the system management, Web service, e-mail service, database service and application service.

B Service Encapsulations
   Based on the call center requirement, we implement experimentation for the encapsulation system service which composes by the private branch exchange (PBX), CTI service, IVR service. The system attains a bigger disposal ability and stabilization performance, it can run at more then one hundred manual seats of call center system. The system architecture shows in the Figure 1.

III. RURAL INDUSTRY SERVICE FOR THE LOCAL E-GOVERNMENT

A. System goals
   • Human interface: Through the leading text, graphic language, personal interaction, etc, makes the system more friendly and conducive to client browser.
   • Convenience: The website will be very easy to use, content distribution will be reasonable and consistent with customer behavior.
   • Logic: The overall site’s operation and work flow are accord with customer psychology; customers can enjoy the course of the visit base on satisfying customer’s industry demand.
   • Science: The web site’s menu planning, reasonable positioning, not only fully representative of the site's intent, but also fully mobilizes the enthusiasm of visitors to click on.
   • Controllability: website accesses control, customer behavior, accord with business rules, different types of customers have different permissions.
   • Interactive: it will have asynchronous communication system (help center, message boards, operational guidelines), to facilitate communication between customers and web site; also have synchronous communication system (QQ instant messaging tools, etc.), to achieve real-time communication purposes.
   • Security: with network security, data transmission and application security, complete security architecture with three levels’ user security.

B. System Architecture
   The S2SH and FreeMarker +Struts2 are used to construct the system architecture which includes the web layer, business layer and persistence layer. According to the system service requirements, the data model and control class, the ultimate UML model of the Business layer, and the UML model actions are designed for the local e-government Web service system. For more detailed show in the Reference [14]. About the Struts2, Spring and Hibernate integration of the framework sequence and interrelation, and the more information please read the Reference [15].

IV. INTELLIGENT WAREHOUSE MANAGEMENT SERVICE

A. System Proposed
   The proposed system is based on the existing software environment and working under the RFID-based intelligent system. It can manage the products information automatically and without conflict to other software by using the PDM.

   The supported services include the system maintenance, basic information, business management, business reporting and accessibility. The basic information includes the company information and commodity information adds modification and deleted respectively. The warehouse services include the warehouse ID, type of warehouse, capacity, and numbers of stock-in-trade. The goods services include the good ID, name, types, numbers, and time of check in or check out, price, expiration date, manufacturer etc. The goods stock-in-trade and sales inquiry services include the good ID, name, types, numbers, time of check in or check out, price, manufacturer
and so on. The intelligent warehouse management service system architecture shows as in the Fig. 4.

Figure 4. The system architecture of intelligent warehouse management

B. Data Service

The data service processing flow which include the data update, input, query and analysis. The data services also support the analysis results output of the text, chart, mapping respectively, it shows in the Figure 5.

Figure 5. The Data Service Processing Flow

V. MANAGEMENT PLATFORM OF COMMERCIAL CITY

A. System Architecture

This research proposes a SOA based application system which can achieve the data synchronous dynamic update for the Data Terminal Equipment (DTE) with the MIS. The DTE such as cell phone based on GSM, the Intelligence cell phone based on CDMA or GPRS, the PDA, laptop, and desktop etc., different DTE should be used the different channel to transport the data to the Web-Service-Database of SOA. The MIS, OA, or ERP etc., can be implement on SOA. The proposed system architecture is shown in Fig. 6.

B. System goals

SMS Technology, micro-voice and micro-Blog, E-mail, SMS and micro-Blog statistics algorithm customer and management functions, system database are integrated for the proposed system design.

1) SMS Technology

Through a wireless control channel transmitting, message centres completes storing and forwarding. The maximum amount of information for each short message is 160 ASCII characters.

By requesting, it will send the data in the database to personal mobile. SMS cat works as the same as cell phones. It also needs the support of the SIM device, and through power, USB data lines and computer, SMS can receive and send the data which is stored in the system database of SOA and will be used to statistics analyze.

Figure 6. The system architecture of management platform of commercial city

2) Micro-voice and Micro-Blog

Nowadays, Micro-voice and micro-Blog are more and more welcome and used widely in China. Hand out the suggestion or advice on these ways promotes their enthusiasm. And the ways also make communication more and more effective. At the same time, customers can ask for help or issue their ideal by oral way, which can solve their problem as quickly as possible. Besides, the manager of the commercial city can support the solving method more effectively. The micro-Blog can receive and stored in the system database of SOA and will be used to statistics analyze.

3) E-mail, SMS and Micro-Blog Statistics Algorithm

4) System Database

The platform designs six basic data tables: UserInfo table, SalesInfo table, ProductInfo table, Category table, ShoppingCart table and AdminInfo table. User Info table contains customer basic attribute, (Id, Username, Password, Phone, Addr,Rdate). SalesInfo table contains businessmen basic attribute (Id, Salesname, Password, Shopsname and so on). ProductInfo table contains elements like product’s Id, Name, Dresr and so on. Category table contains product’s Id, Name, Descr. ShoppingCart table contains the basic situation of shopping cart. AdminInfo table contains administrators basic attribute (Id, Username, Password, Phone, Addr, Rdate). Class(ClassID, ClassName, CategoryUrl), Detail(DetailID, BookID, Num), BookInfo(BookID, ClassID, BookName and so on), OrderInfo(OrderID, OrderDate, BooksFee and so on), LeaveWord(UID, Subject, DateTime and so on), Reply(ID, Uname, ReplyID, IP) etc.

VI. HIGH-LEVEL COURSE

A. System Architecture

The high-level course website can be divided into five modules: user module, news and announcements management module, attendance module, interaction module and data storage module. The user management includes user login, user registration, finding user’s password, and user’s information updating. The news and announcements management module involves adding, deleting, updating and finding of the
information. The attendance module is aimed to change traditional ways to count the number of the students who attend to class. The interaction module is for the purpose of improving the communication between teachers and students. Last but not least, the data storage module is in order to ensure the integrity of the data and prevent missing. The whole project is complex that integration with B/S and C/S which is shown in Fig. 7.

B. System Module

Users of the high-level course website are divided into three big parts—students, teachers and viewers. And then teachers can be further divided into two parts—common manager and super manager. Common manager can manage students’ information and can publish paper and update the news and announcements, but what they publish must be examined by super manager. As a result, super manager can manage common manager. The News and announcements management module includes these parts as follows.

- Information. It is just to inform students to know what they should understand.
- Course introduce. There are course leader, speaker teachers, teacher’s team, course’s plan and school policy. All these are a better understanding of Signals and Systems.
- Course teaching. There is schedule of teaching and experiment.
- Course study. It includes many learning materials. All of those the teacher provides prepare for students.
- Helps. It helps users of the website to use it more skilled.

VII. CONCLUSION

Our team research interesting forecast on the Web-based application system many years. How to encase the different service is very valuable. We support some cases of different application service encapsulations. However, when an application system is very complexity or provided with a great many type of data and service, then the encapsulations may be very difficult. We have achieved some successful applications on the Web-based service system, but how to get the universal application encapsulations wait for our further research work.

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