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RESEARCH OF BEIJING AGRICULTURE INFORMATION SERVICE PLATFORM BASED ON SOA ARCHITECTURE

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ABSTRACT

Beijing agricultural comprehensive information service plays an important role in agricultural resources using and rapid development of the rural economy. Combined with the Web Service and its extension technology, Beijing agricultural information service platform was built with the base of SOA (Service Oriented Architecture) framework. The platform enables efficient management and using of agricultural resources data, achieves scientific analysis and decision support. The platform with a full open architecture, which made it be able to accept different levels, different applications of the business into the platform system through the services.

Key Words: *SOA, Information Service, Agriculture Informatization, Web Services*

1. INTRODUCTION

Agriculture has always been at the top of the national economy in China, and agriculture informatization is the inevitable requirement of the national economic development. Building agricultural information service system has an important meaning for improving agricultural informatization and modernization, and enhancement of Chinese agricultural competitive strength [1]. Accurate, comprehensive, and timely agricultural information service is the focus of solving the difficulties of farmers and helping them to get rich by agricultural information services [2].

Currently, Beijing has built 10 suburban districts and counties comprehensive information service systems in Daxing, Huairou, Miyun and so on. However, information "Isolated Island" still exists. Moreover, traditional tightly coupled integration of information resources is not conducive to the reuse of existing resources, there are problems of low standardization degree, poor open defects and can't meet the development needs of agricultural information construction [3]. Platform based on SOA architecture has the characteristics of loosely coupled, high degree of flexibility and scalability, which made it be able to accept different levels, different applications of the business into the platform system through the services. Furthermore, throughout the Beijing joint construction and sharing of agricultural information system.

Literature [2] gives integration service mode and key problem solution of agricultural market information service which based on SOA, it is worth to draw lessons from the idea of its integration; Literature [3] uses 3S technology and GIS software based on SOA framework to realize the high efficient agricultural resource information management, the database management method is worth learning and reference; Literature [4] gives an efficient method to integrate existing SOA system and SOA system. But these documents all fail to solve the actual problems of this platform: integrate and manage various agricultural information resources which are distributed in various districts and heterogeneous. Therefore, it is necessary to draw lessons from forefathers achievement to research SOA based Beijing agricultural comprehensive information service platform.

This paper first introduces the architecture of SOA and its related technology; secondly, summarized the platform and analyzed the objectives and advantages of the platform; Then, a detailed description of the design and implementation of platform: structural design, communication mechanism, working principle and construction procedure; Finally, summarized and

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expected this paper, and the research conclusion of this paper was given.

2. SOA ARCHITECTURE AND RELATED TECHNOLOGIES

Service Oriented Architecture (SOA) is a software system architecture which can meet the business integration needs under Interne environment by connecting the independent functional entities to accomplish specific tasks. Therefore, it is particularly suitable for collecting different applications to form a unified service system which is available to users. For users, the services of the system is a unified interface, they do not need to understand how SOA integrate different systems to provide these services [5]. SOA-based platform has advantages of outside enterprise, readily available, coarse-grained service interfaces, loosely coupled, reusable design and management of services and so on. With the continuous development of web services technology, SOA has become the basic architecture for the next generation of Web services, its service-based design concept and component-based development model has received wide attention [6-7].

In order to better achieve the loosely coupled and coarse-grained nature of SOA, Beijing agriculture information service platform fully applied a variety of related technologies: Web Services as a mainstream technology to implement SOA, is the main way of the platform to provide services; Extensible Markup Language (XML), as the data form of platform, ensures that the Web services are independent from platform and language. XML has the advantages of easy to set up and analyze, platform-independent and vendor-neutral; The application of interface technology made the platform has a high flexibility, each subsystem is relatively independent but can communicate with each other, which also facilitates the expansion and use of the platform; Middleware technology defines a relatively stable high-level application environment, regardless of the underlying computer hardware and software, as long as the middleware external interface definition unchanged, the software application is almost without any changes, thereby protecting the major investment of software development and maintenance.

3. PLATFORM OVERVIEW

Beijing comprehensive agricultural information service platform is not an isolated system; it is an integral part of the whole city informatization construction. The platform includes a message service system, data acquisition and interactive systems, video systems, and information dissemination systems and other subsystems, each subsystem is relatively independent, but can communicate with each other. The system design uses a flexible, standard, extensive development interface and data interface, which made follow-up expansion of the system and utilization easily.

3.1 Goal Of Platform Building

Establish Beijing comprehensive agricultural information service platform by integrating district and county information resources, and achieve high-quality rural information services; municipal information-sharing resources and a unified team of professionals, and achieve the diversification of service forms; shield the differences between the different platforms, and achieve the seamless connection between the platform and real-time sharing of data.

3.2 Advantage Of The Platform

SOA and Web Services technology have the characteristics of loosely coupled, standardized, open and cross-platform. Building a comprehensive agricultural information service platform with these enables platform for unified management and integration of heterogeneous data sources at the same time, and maintains a strong openness and scalability to integrate existing or new systems. External business systems can easily call the agricultural resource data and functional services of the platform through a Web service interface. Because SOA and Web services are coarse-grained, loosely coupled software architecture, it can ensure the independence of the various business systems while in data sharing and interoperability.

4. DESIGN AND IMPLEMENTATION OF PLATFORM

Beijing comprehensive agricultural information service platform is a management and sharing platform which is based on SOA and combined with a variety of information services. With Beijing districts and counties agricultural information database as the main source of data, the platform combined with the information service needs of various districts and counties, and achieved Internet/Intranet-based heterogeneous data integration management, data sharing, scientific analysis and decision support services. The platform used Web Service Extension in Microsoft's 3.0 to build web service, and used ASP.Net AJAX to build cross-browser Web applications. Then develop the system under a unified integrated environment with Visual

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Studio.Net 2008. The overall structure of the platform is shown in Figure 1:

4.1 Structural Design Of The Platform

The overall structure of Beijing comprehensive agricultural information service platform is divided into four parts of data layer, intermediate layer, web service layer and application layer:

(1) Data layer is the data provider, which is built up by distributed and heterogeneous databases of districts and counties, national public database and the Beijing Academy of Agriculture database;

(2) The middle layer was build up by middleware which supports software platform and configuration data and other functions. The support software platform includes message service system, data acquisition and interactive system, video consulting services system and information dissemination system;

(3) Web service layer is in accordance with the SOA Organization. It contains infrastructure services and business logic of components such as application, which can provide a coarse-grained, loosely coupled information services, as well as system functions and web service interfaces to meet the needs of users at different levels.

(4) Application layer consists of a unified interface as well as other business systems. Various types of external business systems have different use of the platform according to their different needs and rights: Some of them directly obtain spatial and attribute data of the platform by calling platform's data services. The others have the functionality of Web-based business system just by calling the corresponding service to, while they don't need the data and related software.

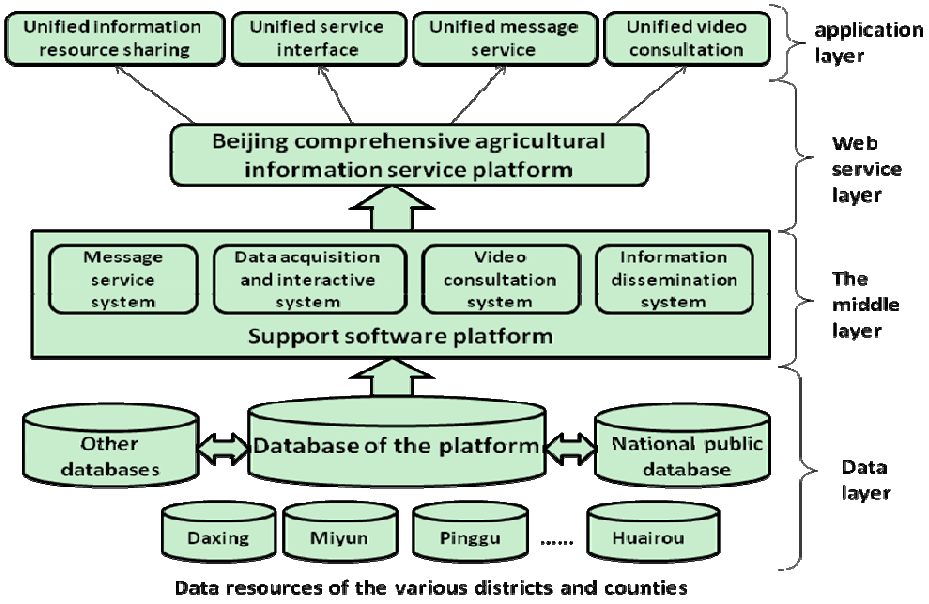

Figure 1 The Overall System Structure

4.2 Communication Mechanisms Within Platform

The web site framework of Beijing agriculture integrated information service platform used mature B/S structure, and MVC system was used to construct entire site. The entire platform is divided into four-level layer to develop, which are data layer, middle layer, Web services layer and application layer. Single data management technologies and products can't achieve the goal of building the system, a variety of related technologies must be reasonable used, such as middleware technology, XML technology, distributed shared and so on. Only in this way can it be possible to achieve the goal of building this platform. SOA architecture shielded the differences between different platforms, structures and hardware, and achieved seamless connection between the platform and real-time sharing of data.

The platform linked each subsystem services to one another through well-defined standard interfaces. The interface design is independent of the specific system, hardware platform, operating system and programming language, various system services can communicate in a uniform and

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standard way. Various subsystems provide services and communicate with each other using XML language and in Web Services way.

4.3 Platform Works

In Beijing comprehensive agricultural information service platform, all business systems at application layer are as service requestors and platform is service provider. Business systems get integrated services; resource data and related functions by interact with platform. The application layer also includes a decision support system, it calls platform service to get agricultural resources and space data its need, and then it calls a model library for agricultural resources data analysis. It can analyze the overall use of the status quo for agricultural resources, and provide decision makers with high-level spatial decision support services. A service request response process of the platform is as follows:

Users selected desired services, such as information, SMS consulting, video, advice and so on, through a unified service interface in application layer of the platform, the platform passed user requests to logic layer of the system through interfaces.

The logic layer consists of uniform application supporting platform and supporting software platform: the former is mainly achieved user and rights management, system interface management, data sharing process management and resource management and configuration; the latter includes a system of related functions, such as information service system, data acquisition and interactive systems, video consulting system and information dissemination systems. The user's service request will be realized in this layer, at the same time the layer corresponding data request to data layer.

The data layer is used to provide data to platform. It uses the XML language integrated each district and county information database, Beijing Academy of Agricultural Sciences database, public database into a single logical data layer in the form of interface. This layer provides data to the upper and meets the data needs of users' service through web services.

4.4 Construction Steps of Platform

First, analyze the construction of platform by caring out counties user needs research. Take means of survey analysis and empirical research to achieve an accurate grasp of the target counties comprehensive agricultural information service status quo.

Secondly, on the basis of needs analysis, combined with network security issues, system interface design, key subsystem design to research the service platform based on SOA architecture framework. What's more, the researches of interface technology, XML technology, middleware technology and other related technology are needed, which will do the preparatory work for the development of software systems.

Thirdly, develop the platform software system architecture and software systems, with emphasis on text messaging, interactive video communication function and application of data acquisition and interactive technology. Integrate the resources of the various districts and counties by web service and provide services on the user interface mode. After platform system development is completed, research of agriculture-related information resources sharing mechanism and standards is followed by, which mainly to solve the problem of formulation of data and shared interface standards.

Finally, after the completion of entire platform construction, day-to-day maintenance and management of the system is needed. Then formulate system management specifications and standards, and achieve good system management and data maintenance.

5. CONCLUSIONS

Beijing comprehensive information service platform which based on SOA and Web Services technology is a fully open platform. It overcomes some shortcomings of traditional tightly-coupled integration of information resources, such as hard to re-use resource, low degree of standardization and poor open. Beijing comprehensive agricultural information service platform achieved information resources sharing and improve the quality and level of integrated information services in rural areas.

Although the platform achieved high quality of rural information services to a certain extent, improved the interaction with the farmers and had certain advantages and practicality. However, due to the complexity of the practical problems, there are still some problems in the follow-up research and exploration. Mobile terminal based service, intelligent service and unified standard SOA service all of these are the future development direction of this platform should be considered.

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