Key Technology of Distributed E-commerce System Architecture

Guo Xiaohui*, Gao Rong, Wei JianYu, Huo Chongning
Tobacco GuangXi Industrial CO., LTD China
Bei Hu Nan Road No.28, NanNing, GuangXi, 530001 China
*Corresponding author, e-mail: gxh_ltd@163.com

Abstract

A new distributed E-commerce architecture is put forward in the study, through the careful analysis of the existing shortcomings of the architecture of the present E-commerce system. The system integrates multi-commercial activities of E-commerce under the loose-coupled service programs so that the architecture of large scale distributed E-commerce system is formed. The trans-regional distributed E-Commerce architecture aims at solving the urgent problems such as resource recomposition and distributed deployment ahead of large commerce systems. Based on it, we propose the global scheme that could be built in the agent-based P2P network or other environment, and the latest software technologies could be used in the servers to publish the cooperation services. As far as the present technology is concerned, Web service P2P and agent technology are good choice, which are the three key supporting technologies of the architecture. Each branch market can be operated and maintained independently regardless of the existence of others, but their order services are to be centrally processed by the order server.

Keywords: P2P, web services, e-commerce system architecture, e-commerce mode

1. Introduction

Based on the open service system framework of the Agent–based P2P environment; the model which is applicable to both B2B and C2C transactions across geographically distributed architecture of e-commerce are proposed. But it is well known that in the traditional e-commerce basic transaction model and an important mode is B2C. Famous B2B website Alibaba and Taobao C2C website founder Jack ma recently stresses that the B2C will become industrial upgrading in the future [1-3], the manufacturing industry should be on high alert. In the study, it adopts the Web Service technology as the core, and explore across geographically distributed e-commerce system architecture, and based on the research of new architecture and globalization cross-regional, it puts forward the infinite joining e-commerce model. and the Logistic Structure of system we proposed is shown as Figure 1.
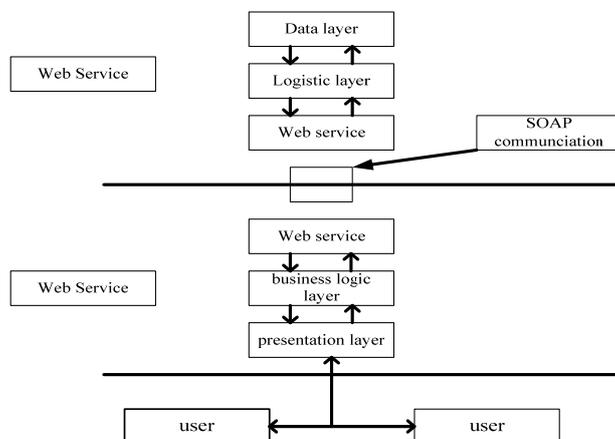

Figure 1. Logistic Structure of System

2. System Architecture Evolution

In the study, the across geographically distributed e-commerce architecture are discussed without emphasizing any additional conditions, such as P2P, network or pervasive environment; Only based on Web Service technology as the core, in-depth to explore the formation process of the architecture and key supporting technologies. And it is necessary to explain the interaction between the many components in terms of architecture and E-UDDI. Preliminary Architecture: the new architecture discussed in the paper is similar to the geographically distributed architecture, but in the client/server part the original architecture group has been added, it is a new concept, the purpose is to make the new architecture which is suitable for the B2C electronic commerce transaction mode. The architecture can support the low cost infinite joining, the so-called infinite joining, is refers to business and enterprise certification through the architecture. When the server authentication is trusted as merchants, it can be able to provide the web service, and register to the E-UDDI, and it also can be added to the stores with low cost. The store Market1 server, Market2 server... Market n server, can jointly constitute the cross-regional infinite join business system of virtual stores[4].

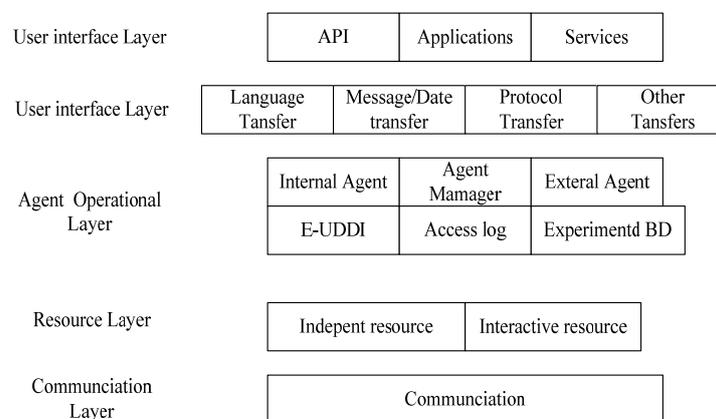| User interface Layer	API	Applications		Services	
User interface Layer	Language Tansfer	Message/Date transfer	Protocol Transfer	Other Tansfers	
Agent Operational Layer	Internal Agent	Agent Mamager		Exteral Agent	
	E-UDDI	Access log		Experimentd BD	
Resource Layer	Indepent resource		Interactive resource		
Communciation Layer	Communciation				

Figure 2. Five-layer Model of System

The structure data layer includes the underlying database and table relationships, it is the system of the underlying data support; Data logic layer encapsulates some data logic, it includes stored procedures and transactions, triggers, logs, etc.; According to the corresponding Web service logic events, the wrapper will be packaged into a web service function, interfaces are exposed to trusted users. Various malls are in independent operation and maintenance, there is no need to consider each other, but they put invoicing service to order servers [5, 6]. The structure of the original large centralized database structure is decomposed into multiple respectively separate database module, each different server. This kind of distributed database architecture can put very large and complex data layer, effectively dispersed into a single independent and relatively simple business data. Facts have proven that the database constitutes is the simpler, the using of it is easier, and the maintenance efficiency of the system can be improved effectively [4].

Applications to access Web database way is not deal directly with the database table, but through the Web, the service can obtain the data needed. The benefits of this design is obvious, it can not only protect the network effectively, the security of the data, and effectively solve the heterogeneous platform, heterogeneous database between storage access problems, but also it has well block function of the logic of the database table, then the database access service will be changed into a Web Service provided by service access. The five-layer model of system is shown as Figure 2.

New Concept of the Customer-server: In the architecture, the user can not be directly to access the stores in the malls through the internet, and it needs a guest server to support the family visit. First, client/server is the core of the new architecture, it draw the virtual stores of each store server in its local Web service, the virtual stores and other functions in the framework

of the server such as billing server image of the show in front of the visitor, let the visitor login as a traditional regional centralized Web site. Above diagram is somewhat simplified, there is no join E-UDDI components, but it actually exists, client/server can realize the registry in each store server In E-UDDI of Web services and it can complete business logic through binding the virtual stores [5].

Second, the client/server also can be divided into Web Service proxy layer, business logic layer and presentation layer. Web Service broker layer generates local proxy class, pass object using the Web Service function through the SOAP protocol and other various Web Service server connection; The business logic layer encapsulates the client the entire logical rules and transaction processes. Performance layer is the user interaction interface, the system can use J2EE [5] or NET [6] platform to improve the system.

Third, client server does not need to have its own independent database, which does not like the traditional e-commerce sites, including security, market research and sells ,saves, etc,. and other complex and varied business actions. It is like in the workshop of large-scale assembly line, its role is the stores in the mall server and provides individual and national health full service, at the same time, it can make customers enjoy professional, perfect and reliable core services provided by the malls, these services includes invoicing, customer authentication, virtual bank, the CA certification, etc.; Users also can enjoy more safe, more efficient feeling and unprecedented huge amounts of goods and services, which is the same as the other traditional e-commerce sites. Improved Architecture: The cross-regional infinite joining e-commerce system architecture is different from the general software architecture, it should not only consider the soft of architecture but Also should consider the deployment of hardware problems [7]. From this perspective, the single customer server array columns to deal with the above assignments will become the bottleneck of the whole frame, because the single point of access for all users can load large, so it must be improved. The improved architecture simplified diagram is as shown in Figure 3. The improved architecture based on the user's physical location can be divided into several regions, and each domain has its own domain client server group to handle the request of customers in the domain, so that it can distribute pressure, each client server in the domain is designed in the same. But it arise a new question, which seems to require different regional users must remember their regional customers' IP address of the server, but any e-commerce site may not let users remember a lot of different regional access address for user when they visit the site, they should adopt unified address, can be easy for loading in any areas [8]. In our architecture, the IP redirection server is adopted to solve this problem.
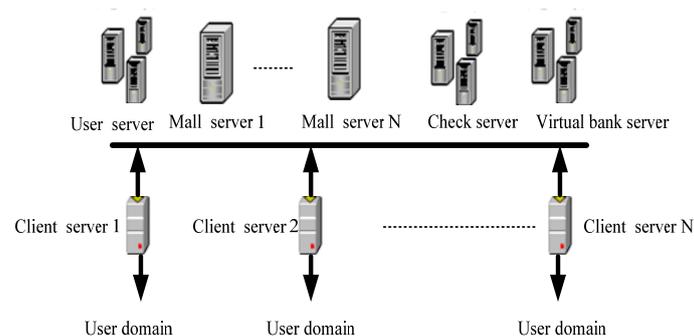

Figure 3. Schematic Diagram of Improved System Architecture

Application of IP Redirect Server: If IP redirection server is added in the new architecture, the purpose is to solve the problem of unified address access, when the user access to the malls, the first visit is IP redirection server, and it has a fixed address for user to be remembered. Redirection service device can analyze the user's IP address, and distinguish the area it belongs to.It also can deal with customer's various requests, because the IP redirection server (array) is only responsible for IP redirection, without dealing with other business, the load bearing is too big, so such scheme is completely feasible. Redirection process is as shown in Figure 4.
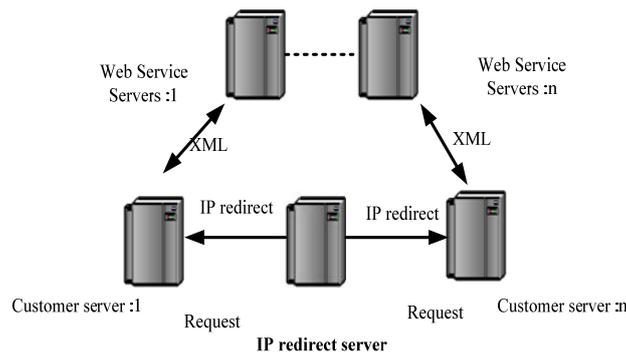
Figure 4. Application of Redirect Server

From another perspective, as long as users can pass through the servers' authentications, the single sign-on problem will be solved, and then the users will become the legitimate users, users can access the customer servers and get the virtual image business services provided by different stores, and other core framework and services provided by the service.

Final Architecture: After the above improvements, the eventual architecture is as shown in Figure 5.
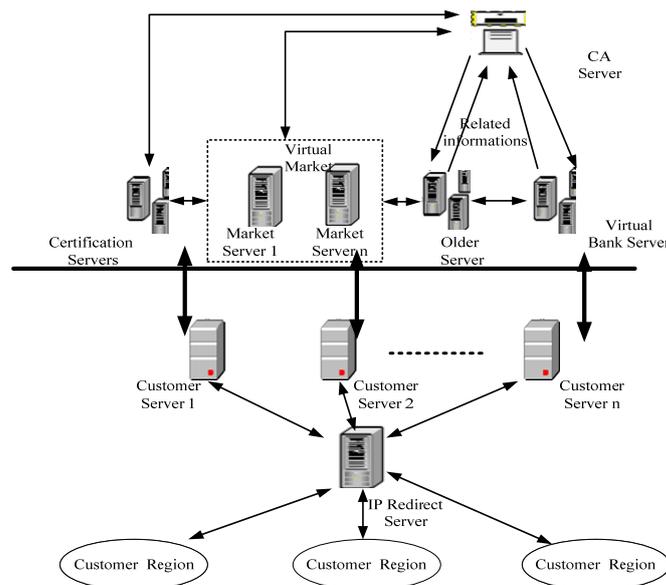

Figure 5. Final Architecture of Trans-regional Distributed E-commence System

This architecture has the following characteristics:

(1) When the user access name e-commerce stores through domain name, it is actually a redirect server via IP directed to the areas of client server, and it is through its access to the entire stores and other core architecture to provide services, and the customers servers get the scattered points mall images around the world. Only the user passes through the architecture of the user authentication service and device authentication, then business operations are performed, when the shopping is finished the payment will be finished through unified checkout server.

(2) Another core characteristic of the architecture is that enterprises and businesses can use the Web Service server as a join stores at various points mall server, and only provide

the service in the local. Such as a car sales store, GM company provide the services to join global markets in the U.S., Toyota provide the service to stores in Japan, and Mercedes can offer services in Germany convenient and put it into the global markets. Of course, it needs the user authentication server validation and binds its service in E-UDDI architecture.

(3)The whole system through component interfaces, component of the context and environment build consistency, both can make use of existing mature and robust module can also continue to release new services to improve the system. Such processing can achieve reuse at levels, such as the invoicing service is one of the core services of the whole system, so it can be in accordance with the unified model call, at the same time, the invoicing service also can increase the service according to the new rules and requirements.

(4) Large database structure can be decomposed into several independent modules, respectively, in different server array of each region. In fact, these database systems are different enterprises. This across geographically distributed database architecture can break down complicated data layer business logic is into independent relatively simple business data. It has been proved that the database is simpler; the use of maintenance and restructuring is easier, it can be improved and enhanced efficiency.

(5) Under this architecture, an application can access web database way not dealing directly with the database table and through Web services to obtain the data needed. In this design, it is obvious that the benefits of it from the system level. It can solve the heterogeneous reusability and interoperability, it not only can protect the safety of network data effectively, and it also can solve the heterogeneous platforms, storage access between heterogeneous database problems. At the same time, it is also very good to shield it from the database table logic, which makes the database access into a Web service provided by service access.

Thus it can see that, the core services such as the customer authentication, invoicing service and CA certification of the mall are formulated and published. While at various part of department stores market either by individual merchants or manufacturers adopt the unified technical specifications in development and release, they also can take advantage of the stores in the mature Web services and self-research and development combined form. They play the different roles, bear the different obligations, and also enjoy different treatments.

3. Other Key Technologies

Across geographically distributed e-commerce systems can be realized through various techniques such as.net and J2EE, etc., in the paper, taking the. Net as an example, we will discuss the implementation of the technology used in the application instance.

Design of logic structure: From the logical view of distributed e-commerce architecture, it can be divided into two layers of the server, the Web service machine, the client server. As mentioned above, Web Service server is divided into data layer, logic layer, data Web Service interface layer; the guest server can be divided into the Web service proxy layer, business logic layer and presentation layer. Data layer includes the underlying database and tables relationship, it is the underlying data support system; Data logic used to encapsulate the data logic, including stored procedures and transactions, trigger, logs, etc.; According to the corresponding logic events, Web service wrapper will be packaged into Web Service function interface, and are provided to trusted users.

Client server only needs to be responsible for the composition of virtual stores image and support customer browsing after the single sign-on, and the customer validation server is to verify identity, etc. Client server from level is divided into Web service broker layer, the business logic layer and presentation layer. Web Service proxy layer contacts Web service server through the SOAP protocol, and generate a local proxy class and use the Web service function through the object; The business logic layer encapsulates the entire logical rules and transaction processes of the client; presentation layer is friendly interface with end user interaction, the system USES.net (or J2EE Build) technology.

The distributed storage databases can the change the complex business logic of data layer effectively into scattered individual simple business data storages. Table structure is more simple, the easier it is to improve the efficient of maintenance, As this, the existing database structure of system can be decomposed into multiple independent database module and ate placed on each server, respectively. Access web database way is not dealing directly with the database table, but it is through web service to obtain the data needed. Some advantages of

this design are obvious, such design can not only effectively protect the safety of network data, and solve the heterogeneous platform, heterogeneous database storage access between the problem, at the same time it is also very good to block the logic of a database table, make the database access into the service access provided by Web service.

Design of the agent layer: Agent also call SOAP interface layer, it is web service access open to web service server, through the simple XML protocol, namely the SOAP protocol, exchange structured information and type information on the Web. In addition, local Web Service proxy classes are generated in the guest server, and define the object mode through using the function of the Web server. The interaction process is as shown in Figure 6.
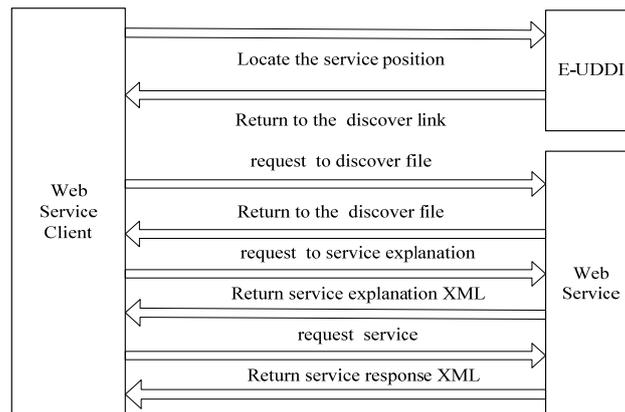

Figure 6. Web Service's Basic Structure and Interaction

Design of business logic layer: Business logic layer can encapsulate the business logic and rules. Such as shopping, order processing, account management, product to check, management consulting, commodity, the secondary market, bidding released online, fill in and reply message, user management, leave a message, management, backstage management, bidding books management, site management and used as a web service module, n are all concrete industry business logic. As the interact layer of the user is not the problems of middle tier need to deal with, it has nothing to do with the specific user interface and interaction, it is only the core of business rules and logic. Business system middle tier of business logic is encapsulated as a. NET component, its namespace is Ecommerce. Component, it can easy and convenient to access rich services provided by the Web service.

Design of presentation layer: Presentation layer adopts Microsoft's technology that Asp.NET and Asp.NET web forms and related technology, it can and fully apply its technical advantages, and maximize the running speed of the program, the security, the reusability and maintainability and obtain good effects. All interface presentation layer adopts the aspx page, after the separation of the logic of the generation code. In order to facilitate the client website development, and improve the efficiency of development, in the web page design, we can also make use of the module design method; points of page structured processing can achieve high open efficiency and maintenance efficiency.

4. Conclusion

In the paper, it introduces the research of building of across geographically distributed infinite joining e-commerce system and its architecture evolution process; And then its key support technology is studied, and present the design of joint signature support multiparty secure communication case; According to the actual architecture need, we extract the web service composition model; Finally, based on the discussion the architecture , Cross-regional infinite joining a new e-commerce mode is proposed.

References

[1] Tiezheng Nie, Ge Yu, Derong Shen, Yue Kou, Jie Song. *An Approach for Composing Web Services on Demand.* Proceeding of the 10th International Conference on Computer Supported Cooperative Workin Design. 2006; 78-83.

[2] S Helal, S Su, J Meng, et al. *The Internet enterprise.* The 2nd IEEE/IPSJ Symposium on Applications and Internet, Nara. 2002; 54-62.

[3] E Karakoc, K Kardas, P Senkul. *A Work flow-based Web Service Composition System.* Computer Society. 2006; 36-40.

[4] Kruchten P, Obbink H, Stafford J. *The past, present, and future of software architecture.* IEEE Software. 2006; 23(2): 22-30.

[5] Shaw M, Clements P. *The golden age of software architecture.* IEEE Software. 2006; 23(2): 31-39.

[6] Hongbing Wang. *Web Services: Problems and future direetions.* Web Semanties: Science, Serviee and Agents on the World Wide Web. 2004; 1(3): 309-320.

[7] Yang Xia, Hongwei Zhang, Zhao Xu. *Application and Research of a New Multi-party Digital Signature Scheme in E-Commerce and E-Government.* International Symposium on Distributed Computing and Applications for Business Engineering and Science. 2008: 511-516.

[8] Yang Xia, Qiaofen Gao, Zhao Xu. *Research on E-business System with Dynamic Service Composition.* International Symposium on Distributed Computing and Applications to Business Engineering and Science. 2007: 955-958.

[9] Xin Li, Ting Li. E-commerce System Security Assessment based on Bayesian Network Algorithm Research. *TELKOMNIKA Indonesian Journal of Electrical Engineering.* 2013; 11(1): 338-344.

[10] Hongsheng Xu, Ruiling Zhang, Chunjie Lin, Wenli Gan. Construction of E-commerce Recommendation System based on Semantic Annotation of Ontology and User Preference. *TELKOMNIKA Indonesian Journal of Electrical Engineering.* 2014; 12(3): 2028-2035.

[11] Hong Sun, Shi-ping Chen, Li-ping Xu, Ying-ying Chen. Base-on Cloud Computing A new type of distributed application server system design. *TELKOMNIKA Indonesian Journal of Electrical Engineering.* 2012; 10(7): 1800-1807.