



Model of On-line Room Reservation System Based on Web Service and XPMS

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Abstract

This article analyzed the on-line hotel room reservation systems which had being widely used. Aiming at the advantages and disadvantages of the systems, this article introduced the XPMS theory and put forward a sort of optimized model by using the Web Service technology. The new model can provide sorts of ports aiming at different commercial demands and exchange real-time data under the premise of semantic consistency, which can attract more product providers to join in this network platform and minimize the network cost in the effective range.

Keywords: Heterogeneous data integration, Semantic consistency, Web Service, XPMS, XML

1. Introduction

With the flourish development of network technology, E-business has been very important management mode and concept with the advantages of high efficiency and globalization. To establish the quick response between customers and enterprises, it requires that various systems with same functions and heterogeneous frames must be reintegrated to a new trans-regional network platform with loose coupling.

The on-line room reservation system is a typical representation of E-business information integration, which is different to general search engine. For example, Google computes the relativity among the contents through web link, and grasps data factors in them in time and returns the integrated and standardized result to customers. Because the hotel industry has its own characters such as numerous quantity and regionality, various hotels have different orientations according to actual situations, and many hotels may only construct their interior database, but not the exterior web sites, which can not depend on general search engine to implement.

About the on-line room reservation system, at present, there are some works and products such as www.elong.com and www.ctrip.com, which have been perfected in the aspect of customer service. However, because the network environments in various enterprises are different, so much data are under the distributed environment and have the diversity and complexity of semantic mode, and it is very difficult to realize high efficiently real-time inquiry to different database only through one on-line inquiry platform. Therefore, most present systems adopt the mode signing agreement with hotels. Even overseas hotels also adopt this mode. Customers put in order form first. Then the platform confirm and alternate information through telephone or fax. As viewed from users, it likes that the network platform and hotel databases are alternated real timely, but in actual operation, there are many limits in the on-line room reservation system, for example, the quantity of room reservation can not exceed the promissory quantity in the agreement.

Aiming at above situation, this article puts forward the on-line room reservation system model based on Web Service and XPMS, and except for dynamically implementing real-time inquiry, it also can solve the problem of semantic consistency, and it can classify hotels on different business needs to design and develop different ports and minimize the network spending in order to attract more possible hotels to participate in this platform.

2. Key technologies

2.1 Web Service

As a sort of new distributed computation system structure, Web Service provides a convenient, safe and high efficient platform for the commercial application. At present, there is not a strict definition for Web Service, and people generally think that Web Service is a sort of new Web application program, which has characters such as self-inclusion,

self-description and modularization, can implement issuance, search and binding through Web, can create the abstract definitions of the service and offer concrete implementation of the service, and realize the loose integration from simple asking to complex business logic processing. Web service can be a simple asking to respond the customer, and also can be to complete a complex flow. Once one Web Service is configured successfully, other application programs and other Web Services can directly find and transfer this service. It changes the commercial operation among enterprises and the applied design and development between business and business, and makes the “dynamic integration” among product provider, cooperators and users possible.

2.2 XPMS

XML allows the mutual communication of various programs compiled by different languages on different platforms with the standard form, so it has been the technical base of the trans-enterprise application based on Web Service. XPMS (Extensible Markup Language Product Map Schema) introduces XML Schema to describe the data, finds the mapped relationship among modes with data source through the definition of complete data mode, and offers theoretical base to realize the partnership of semantic consistency. For the data with different structures in Web, the complete mode is used as the uniform data view of complete user and application, and the developer defines corresponding exchange rules through the XML format, and shields the differences of application environment and data structure in the data source through the encapsulation of data sources such as exchange rules and mapped relationships.

3. System design and implementation

Considering that not all hotels are happy to accept the marketing strategy of on-line reservation, we divide hotels into two sorts including the mature type and the growing type according to the grown cycle. The mature hotels generally have centuries-old history and higher reputation, and they always possess stable customer flow even without some certain special on-line reservation platform, so they are not wild about joining in a certain on-line reservation platform. For growing hotels, they always possess modern management technology, but they have not established stable customer group and good public praise, so they need a network platform to develop the market and enhance their reputations, but this sort of hotels always will worry about higher maintenance cost of the network.

Aiming at different market orientations of hotels, we can divide these hotels into the common type and high-level type. Comparing with those common hotels facing the public, the hotels of high-level generally possess special sale channels, and they pay more attention to the band influence and better industrial state, so they will adopt the wait-and-see attitude to the network reservation platform facing the common public.

In a word, this article puts forward the strategy which designs different ports to different customers and controls the network cost in the reasonable range to attract different types of hotel.

For the growing hotels facing the common public, we should only offer a standard port supporting the port agreement and a set of standard stencil which they need, and the hotels put in data according to the fixed stencil and the service program automatically issues the accepted information to the platform, which can effectively control the network cost. For those hotels facing high-level customers, because they are absolutely necessary part in the network platform, so the network platform can attract their participations through offering more safe ports even assuming a part of network spending.

In the implementation, based on the XML standard frame, we can define the network ports supporting the visiting from different database systems and different programming languages, and describe these ports by WSDL (Web Services Description Language). The hotel server can issue a service offering inquiry by means of the document of WSDL, and the source data of the service is still stored in the local database, so the server can quickly complete the dynamic use of Web Services to the service through analyzing the inquiry demand. The network integration platform offers necessary control function of the service work, and the user can participate in the whole service through the mutual operation with Web Services.

The model offers the integrated market of Web Services, and many hotel servers coexist in it, and there are the relationship of competition and cooperation among them, so the security of the communication process must be ensured. To implement real-time data exchange among hotel servers and network integration platforms and ensure the semantic consistence in the network transfer, we design the system which is seen in Figure 1.

The session level is mainly to offer the operation interface. The presentation level (Servlet or EJB) encapsulates the information of SOAP, offers a logic view, treats the inquiry input from the session port, transfers the customers' demands to the business logic level, and transfers concrete implementation and complete the users' response. SOAP is defined on the base of XML and takes XML as the data transfer format, which completely inherits the opening and expansibility of XML, and can better solve the problem of passing the firewall and eliminate the differences among component platforms through defining basic rules and trans-platform information mechanisms.

The business logic level is responsible for the implementation of platform operation logic, describes and produces

SOAP asking information, binds the supplier of hotel service, and judge whether to use one or several hotel servers' remote services according to customers' asking. If needed, the business logic level will integrate corresponding source data based on XPMS and implements the remote use to the service by Web Services, and return the result to this level, and the business logic level implements logic judgment whether the remote use of the next service is needed, and if it is not needed, this level will put in the result to the presentation level, and the presentation level will finally obtain the SOAP information including the exertion result. Servlet asks EJB to treat SOAP information and use the JSP display result, and send HTML to the customer port.

The right part in Figure 1 is the analysis to the system data flow.

The transport layer on the bottom is to send and transport concrete data documents encapsulated by SOAP.

The structure layer designs and implements the semantic consistency arithmetic of data integration base on XPMS, and it is the key to integrate heterogeneous data.

The concept layer includes the descriptions of relative glossary, and it is the premise to implement the XPMS integration arithmetic. It is similar to a compendium which enumerates keywords in the document.

In the simulation experiment, hotel A and hotel B respectively adopt two different database, ACCESS and Sql server, to implement modeling and use different database fields. The integration process of semantic consistency based on XPMS is seen in Figure 2.

In the implementation, define the XML factor as the unit group <id, value>, where id is the only factor identifier and value is the string constant or the complex value including objectives, which is seen in following example.

< Concept >

```
<xpms : id="hotel_name"   xpms : value="concrete name of the hotel">
<xpms : id="hotel_address" xpms : value="address of the hotel">
<xpms : id=" hotel_address.1 " xpms : value="the country that the hotel is in">
<xpms : id=" hotel_address.2 " xpms : value="the city that the hotel is in">
<xpms : id=" hotel_address.3 " xpms : value="the region that the hotel is in">
<xpms : id=" hotel_address.4 " xpms : value="the post number of the hotel">
<xpms : id="hotel_rating" xpms : value="the class of the hotel">
<xpms : id="hotel_type"   xpms : value="the room type of the hotel">
<xpms : id="hotel_type.1" xpms : value="the room type 1 of the hotel">   //(such as standard room, seascape room
and flatlet)
<xpms : id=" hotel_type.1.1" xpms : value="the quantity of the room type 1">
<xpms : id=" hotel_type.1.2" xpms : value="the price of the room type 1">
<xpms : id=" hotel_type.1.3" xpms : value="the discount of the room type 1">
.....
<xpms : id="hotel_special_features" xpms : value="the special establishment of the hotel">
<xpms : id="hotel_special_features.1" xpms : value="the special establishment 1">
<xpms : id="hotel_special_features.2" xpms : value="the special establishment 2">
<xpms : id="hotel_introduction" xpms : value="the introduction of the hotel">
<xpms : id="customer_evaluation" xpms : value="customers' evaluations">
.....
```

< /Concept >

Because the database system of every hotel server is independently designed, implemented and operated, so the data with same semantic contents may have completely different definitions or names, which will present non-structured character or half-structured character, and the data values changes continually. To keep the semantic consistency of data integration, this article puts forward the arithmetic based on XPMS, which can be described that the same semantic data are transformed into same ID number when they are transported to the network reservation platform, and this ID number is only confirmed by the network system platform. Therefore, even for different languages or overseas hotel servers, the expedite exchange of distributed heterogeneous data can be realized when the heterogeneous data are transported and integrated.

The concrete implementation includes following steps.

The total glossary catalog is uniformly regulated by the network reservation platform, and the same semantic keywords possess same ID. It concludes all key glossaries in the databases of all service suppliers. Therefore, various words with different forms always occur after one ID, and the occurrence frequency of some words is even very low, which may only occur in one supplier's database.

The glossary catalog of various hotels is formed according the definitions in the databases of various hotel servers, and it is a subset of the total glossary catalog, and the keyword in the database of creation hotel only occur after ID. This module can largely enhance the efficiency of the data integration. To those hotel servers facing the common public, they can use the uniform stencil, i.e. putting in the data according to the uniform format, so the network platform can adopt the optimized arithmetic of mode matching and reduce the repeated network consumption.

The collection engine module of various hotel glossaries can implement the function that abstracts the keywords in the inquiry consequence of database (the hotel server uses his own database language to complete the inquiry that the customer required and form the inquiry result document which is stored by the fixed XML form). The local glossary collection engine of the hotel server analyzes the keyword glossary in the result documents and put in these keyword glossaries to the upper glossary catalog module to match. Generally, it should be true inclusive relationship. If some new keywords occur, the sub-glossary catalog will inform the total glossary catalog and join the new keywords into the total glossary catalog and relative sub-glossary catalog. If the database of the hotel server changes, for example, some certain keywords are not be used any longer, so it should inform the network system platform and timely refresh relative data catalogs to prevent producing garbage data.

When all matching results return logic true, the data integration engine of various hotels will alternate various inquiry result documents and sub-glossary catalogs, and make same concept possess uniform ID, and put in it to the network reservation platform through the port, and the network platform integration engine module cleans up various documents and return them to clients.

4. Characters of the system

The on-line room reservation system based on Web Service and XPMS in this article realizes the real-time data exchange of trans-database platform and keeps the principle of semantic consistency when implementing data integration. One important problem faced by the integration is the incompatibility of expression and semantics. The incompatibility of expression rules can easily adopt the software to analyze and arrange, but the semantic incompatibility is a problem with large disputes. This article uses the uniform ID to identify through establishing various conceptive keywords, and enhances the matching efficiency through establish the subsets, and accordingly abstracts the design of commercial concept from the whole system design, which possesses good expansibility and flexibility and makes the semantic consistency more easily completed. Secondly, according to the market investigation, this article puts forward adopting different strategies to develop different ports and minimize the network cost aiming at different commercial demands of service suppliers, in order to attract more hotel suppliers' participations.

To the on-line room reservation system, there are many service platforms at present, which can be mainly divided into two sorts. One sort is the hotel chain such as Motel168 and the Star of Jinjiang, this sort of hotel has uniform management and can adopt uniform database and uniform document format, so it is easily to implement real-time data exchange. But this sort of platform has single information, which can not offer information to overseas consumers and other hotels, and the semantic integration is still in the blank stage. The other sort is the third party server such as Ctrip and Elong. This sort of web site can offer supports of software and hardware, and it only needs supporting corresponding information to join in the hotel. But the exchange maintenance of data largely depends on the manual telephone or fax.

Table 1 lists the comparisons among three systems.

5. Conclusions

This system establishes highly efficient enterprise application model by means of the technologies of XPMS and Web Service. It can better integrate the heterogeneous data of various hotel suppliers to one information insurance and inquiry platform and keep the semantic consistency, which is propitious to enhance the enterprise image, develop international market, bring many new opportunities for the enterprise, enhance the economic benefits of the enterprise and strengthen the competitiveness of the enterprise. With the further development and maturity of the XPMS technology, network security and Web Service, the structure design of this system will be realized and applied better.

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Table 1. Comparisons among three sorts of system

Comparison of capability	First sort	Second sort	Model of this article
Data integration	Middle (can only integrate single brand)	High	High
Real time of data	Middle	Low	High
Semantic consistency	Null	Middle	High
Expansibility	Low	Middle	High
Private capability	Middle	Low	High
Friendly	Middle	Middle	High
Main technology	XML	J2EE	XPMS & Web Service

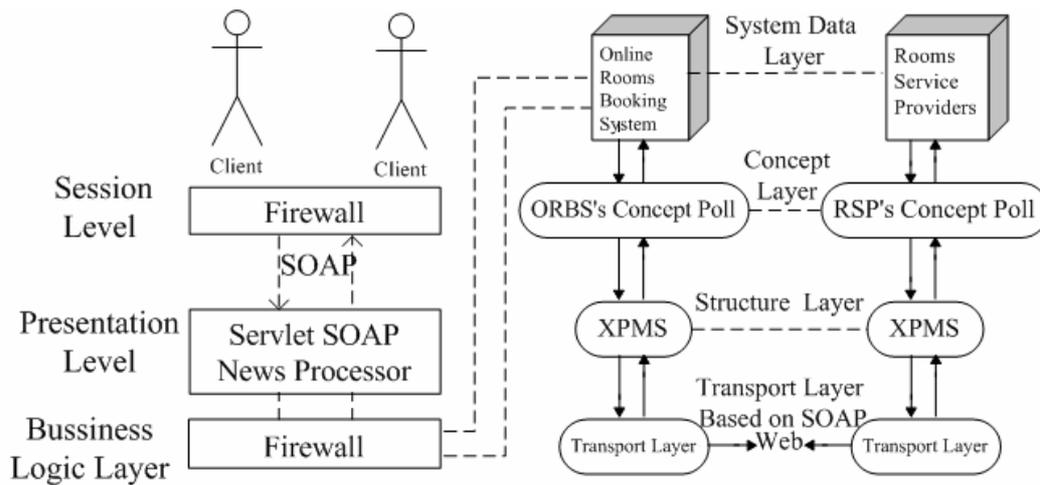


Figure 1. The Frame of On-line Room Reservation System Based on Web Service and XPMS

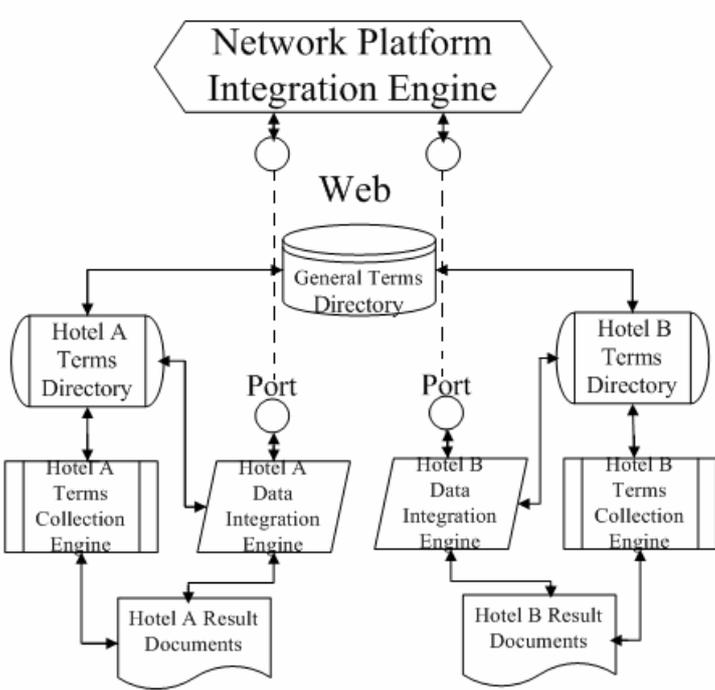


Figure 2. The Semantic Consistency Integration Process Based on XPMS in the Simulation Experiment