Enterprise Information Exchange Platform Based on ESB for Research and Design

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Abstract— **In solving the problem of heterogeneous systems in enterprise, this paper brings forward information exchange solutions of service-oriented architecture based on ESB centralized management to services, the scenario adopts services gateway interface design patterns and introduces efficient service scheduling algorithm, it achieves the decoupling between service packages and service communication, and it realizes efficient delivery of various information in the interactive process. At last, the practice show that it has greater flexibility, scalability and real-time.**

Keywords- enterprise service bus (ESB); service-oriented architecture(SOA); service gateway interface; service scheduling algorithm

I. INTRODUCTION

Enterprise information construction has achieved initial results, however, because of different technologies and standards, making various departments within the enterprise can not guarantee data consistency,it is difficult to achieve information shared and resources can not be fully utilized. To completely solve this problem, it needs an interactive mechanism based on flexible, reliable and fast response to meet the needs of business development [1].

Traditional technologies which implement distributed architecture have CORBA, DCOM, COM +, RMI [2] and so on,but they have a common flaw that ask tightly coupled between service clients and the services provided by system, thus reduce system scalability and maintainability. SOA (service oriented architecture, SOA) is software architecture, it is service-based and its services are interoperable, independent, modular, place transparency and loosely coupled. ESB (enterprise service bus, ESB) is basis of implement SOA architecture, it is combining result of between traditional middleware technology , XML and Web services,which can centralized manage services in SOA,the message bus based on open standards achieved interoperability between components and program through standard adapters and interfaces [3]. ESB [4] is believed to a information transmission medium based on SOA architecture, so that third-party program components can "insert" to the platforms for a standard manner, each components can interact by standard message communication manner [5]. In service-oriented development environment, design patterns describe how to construct development services approach of custom, design patterns can be used to improve system maintainability and scalability.In paper, the solution combined with design patterns of services gateway interface, discussed enterprise information exchange platform based on ESB under SOA [6] framework in great depth, and enhanced information exchange real-time through service scheduling algorithm.

II. SERVICE GATEWAY INTERFACE DESIGN PATTERNS

The research is based on that ESB have centralized management [7] to services of SOA, this paper presents a service gateway interface mode based on service-oriented,it is model that separate between service encapsulation and interoperability of service. In service-oriented architecture, each application will be packaged as services, each service have a service interface,to make communicate with each other,finally,achieved completely separate between the application's business logic and the details of service implement. For service users,who call the service through service gateway and package the partial code of achieve contract users to their own service gateway component, when access services, the service gateway is similar to the function of the data access components to access the application database.

The implementation details of services gateway interface mode are as follows.

Communications, service gateway interface is not only package all low-level communication functions which communicate with service, but also package all protocol about communicate between users and service, makes the communication technique of service implementation, service users and service interface independent.

Data format, service gateway interface mode builds mapping between the inner information format in each application and the format which seted by communication contract, and then mutual conversion between these formats, so form a unified data format to easy to carry out information exchange in platform.

Service discovery, service gateway interface package the process of finding the required services, including find the network address in the configuration file.

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Services security, different users may have different security requirements, service gateway interface should meet the specific requirements of users.

III. ENTERPRISE INFORMATION EXCHANGE PLATFORM BASED ON SOA AND ESB

A. The architecture of enterprise information exchange platform based on SOA and ESB

SOA is a service-oriented software design method,it can provide services for end-user application through published or found interface. Compared with other architectures, SOA is more retractility,it can make a quick response to applications changes, and ensure the stability of the entire communication process,thus provide an ideal framework for dynamic, heterogeneous enterprise information interactive system.

Enterprise information exchange platform based on SOA and ESB,which process message synchronous and asynchronous,XML is description language for information,provide reliable, high-performance operating environment for each service components to form loosely coupled connections between different application,achieve data exchange, sharing, conversion and so on. Using SOA architecture, the whole system is divided into three layers: data layer, component layer, web layer. Its structure is as follows:

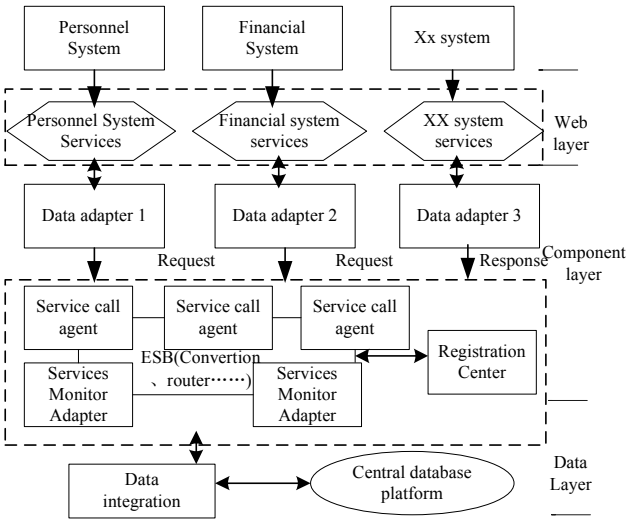

Figure 1. architecture of enterprise information exchange platform based on SOA and ESB

Shown in Figure 1, the platform includes mainly the following components.

Data extraction. Data extraction is reflected for service-oriented concept, all applications will be packaged as web services through front end processor extraction to information exchange with platform independence.

Connector. Connector is consist of a series of data adapter,it is driver program to achieve ESB standard interface,take esch applications access to ESB bus,and maintain the local database, record the operation on local data.

Enterprise Service Bus. Enterprise service bus is the data flow control center, it includes mainly route controller, data conversion adapter, service scheduling components.The data route controller is mainly responsible for the control of data flow within the system; data conversion adapter is responsible for convert the data as a platform for standard data formats; service scheduling components is responsible for order for request service to improve the real-time of information exchange.

Registration center. It is services exchange market, manage the release, registration and search of the service, according to the header information of service message, return the appropriate service to the service requester.

B. Service Gateway Design Patterns for application in Enterprise information exchange platform

According to information exchange needs of each system in enterprise, it takes effective data of each system to central database. For example, sales system ask the basic information of guest system, it can obtain available data through access and query central database.

This article introduces mainly data inquiries service. The design of the service consider how to decoupling the called interface and business logic to improve the flexibility of the module. According to the service gateway Interface design patterns, the service can be divided into three layers, the interface layer, component layer, data access layer. The interface layer is mainly to implement the independence between business logic and service calls; component layer is mainly built the details of how to implement the query; data layer is mainly access center database. It is easy to add the new application to the platform and changes the implementation of basic application.

Data query service is shown in figure 2:

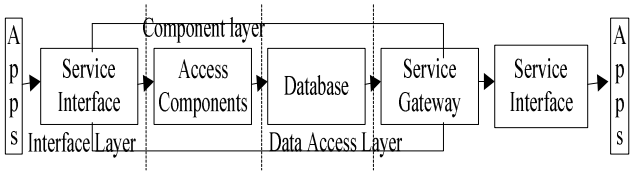

Figure 2. data query service under service gateway interface

C. Platform information exchange real-time for design

The design of the platform enhance the real time of information exchange by using service scheduling algorithm.,provide further assurance for the validity of the information.

1) Service Scheduling Algorithm

Service scheduling algorithm is to solve Web services scheduling options based on QOS,it attributes to Qos parameters of Web services is input, the optimal Web services is output.

The algorithm described as follows:

```
/*****************************************/
Algorithm name : Web services scheduling options
                 based on QoS
 Input  : Qos property parameters of Web services
Output  : The optimal Web services
/*****************************************/
int Web service scheduling options based on QoS ()
{
    //  N Web services ,N attributes of each service
    T[N][n]
    //  QoS attribute values after normalization
    Q[N][n]
    //  Corresponds to the weight of each attribute
    V[n]
    //  Each property type is cost or benefit type
     P[n]
    // Record the maximum weight
     Max
    // Record the highest priority service scheduling
    index
   // Attribute normalization stage
   for(i=0;i<N;i++)
   {
    // get the maximum or minimum value of a property
     Temp=GetMaxOrMin(T[i],P[i]);
     for(j=0;j<n;j++)
    {
        //  compute according to cost or benefit formula
        Q[i][j]=T[i][j]/temp(Q[i][i]= temp /T[i]][j]);
    }
   }
//  Obtain the optimal value
for(i=0;i<N;i++)
{
   for(j=0;j<n;j++)
   {
      Temp=0;   //Temporary weight
     Temp=Temp+Q[i][j]*V[j];
   }
   If(Temp>Max){Max=Temp;index=i;break;}
}
   // the first index is the first service of scheduling
  return index;
}
```

2) implementation process of service scheduling component based on service scheduling algorithm

It is shown in figure 3,each adapter accept the request of service call,according to router to the service scheduling component. When service scheduling component receives service request,gets the service QoS information from registry, re-computing QoS value,then re-queue according to the above scheduling algorithm,and returns to the service queue, calls the service according to the order queue.

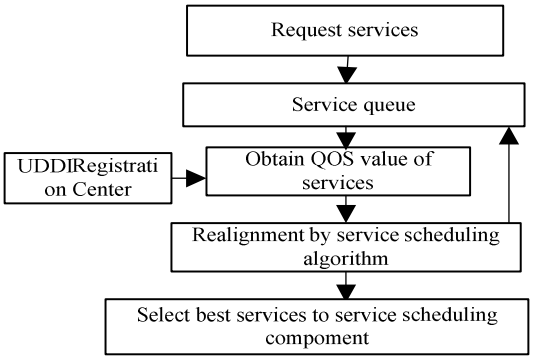

Figure 3. the implementation process of service scheduling component

D. Information exchange platform functions and enforcement mechanisms based on ESB

1) Basic functions

The platform support data transmission with XML format, achieve conversion between XML documents of each system and standard XML document; support the accessment of various communication protocols,such as HTTP, JMS, MQ and so on, support content-based route.

2) Enforcement mechanisms

Service request process is shown in figure 4:

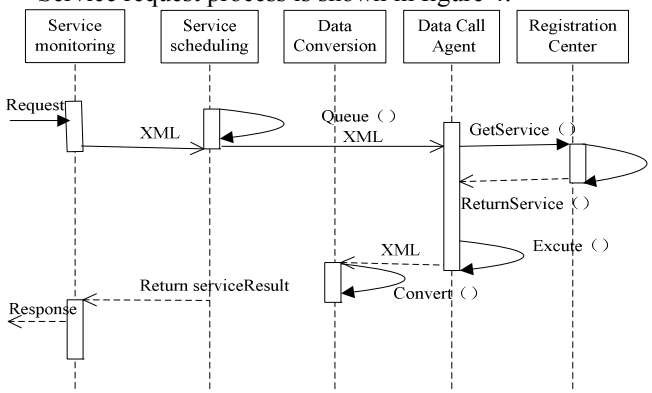

Figure 4. The basic operation flow chart of platform

Figure 4 describes the overall process: firstly, the service provider utilize data extraction module to deploy Web services to the local Web server,,and service descriptions is published to data services registry to called by service requester. The requester requests services through the enterprise information exchange platform, service monitoring adapter accept service request and send it to service scheduling component. Service scheduling component make a queue for request service by service QOS,and call service call agent. Service call agent inquiry service from registration, according to published rules, match the appropriate Web service;then under the

service's WSDL document address (URL),access and resolve WSDL documents, pick up the endpoint,operation interface about Web services, call the data service, the called result will be standarded and return to the caller.

IV. ANALYSIS OF EXAMPLE

This solution have application in drug sales system, it has encapsulation for drugs query and customer query operation using the Service Gateway interface design patterns, makes drugs management system and customer management systems information exchange with the way of service, and increases their flexibility and security. When salespeople need customer information from drug management system, firstly, the salespeople send request services and the request services will be accessed to the ESB platform through drugs adapter, then through monitoring, message analysis and other operations, in the registry to find the best service and deal with services according to the scheduling algorithm, the result returns to requester, service request optimization is completed.

This solution compare with the traditional method with heterogeneous system information exchange, which is more flexible, scalable and real-time, it breaks interactive mode of point to point, makes service choice more flexible, this scheme adopt ESB as intermediate platform, conduct effective management to services, reduce the load of flow of data streams in platform, have real time filtration for services to make that the requester get best services with fast and efficient, and thus achieve the real time of enterprise applications information exchange ,and provide further assurance for the validity of the information.

V. CONCLUSION

In the paper, platform design logic has effectively improved by using service gateway interface design patterns, it takes convenience to developers. In the platform design, scheduling algorithm is introduced and effectively solve the real-time of information exchange.ESB is defined as the basic of SOA system implement, ESB characteristics is fully used, it have overall design to platform and form a loosely coupled model, improve the overall system scalability and maintainability.

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