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The Study on Service-oriented Encapsulating Methods of Legacy Systems

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***Abstract*—**At present, web Service is the first choice to reuse the legacy system for the implementation of SOA. According to the status of the implementation of SOA and the status of the legacy systems, we propose four encapsulating strategies. Base on the strategies, we proposal the service-oriented encapsulating framework, the legacy system can be encapsulated by the service-oriented encapsulating layer in three aspects, communication protocols, data and program. The reuse rate of the legacy systems can be increased by using this framework.

***Keywords*—**Legacy system, service-oriented encapsulating, SOA.

I. Introduction

SOA can provide the mobile IT infrastructure for the enterprises by the way of loosely coupled services. In the process of implementation of SOA, because some business-critical data, functions and business is running on the legacy systems, directly replacing these legacy systems with new services is not only risky, but also unacceptable because the big cost. However, the legacy systems were developed by different programmer with different languages, and usually developed on different platform, so the heterogeneity between the legacy systems is very serious. How to reuse and integrate these legacy systems into the new SOA architecture is a very important job. Web Service is the first choice to the implementation of SOA [1], so in order to reuse and integrate these legacy systems, our research focus on how to encapsulate the legacy systems into Web Service [1].

II. Legacy Systems Service-Oriented Encapsulating

Simply tearing down the original business system reconstruction is not a good method for an enterprise to implement SOA. The ideal approach is to choice reusable, high-value business sections in the enterprise applications, systems and assets that are being used currently. And then standardize these sections with the principles, methods and technologies of SOA; reuse them within the new system of the enterprise. The reuse of legacy systems is a very wise decision. The reuse can reduce the investment input in the implementation of SOA. And it can not bring up great impact on the new system. So the risk of the implementation of SOA is significantly reduced.

Legacy systems have been running for a long period. And for enterprises, they are the most valuable and time-tested asset. The reuse of Legacy systems can accelerate the implementation of the SOA greatly. And the cost of the maintenance will be reduced. According to the status of the implementation of SOA and the status of the legacy systems, we proposal four strategies to encapsulate the legacy systems [1][2][3].

ⅰ) The code service-oriented

The source code of the legacy system is encapsulated directly by SOA technical, and released as a service, so the source code can be reused in the new architecture. The benefit of the code service-oriented is that the developers need not design the interface specification, and the service interfaces are defined by the legacy system. Since the new encapsulated service runs on the same platform as the legacy system runs on, there is no need to add new infrastructure. And the interface definition and analysis can be omitted. So the deployment cycle will be shorter, the risk of the implementation of SOA will be lower.

ⅱ) The system architecture service-oriented

In this system architecture upgrade process, we introduced the component layer between the legacy system and the service of SOA, all the legacy systems that need to be service-oriented, must be component-oriented first, and then be service-oriented. The component layer encapsulates all the operations of the legacy systems, then assembles and orchestrates the function modular to reach the new business requirement of the implementation of SOA. All these operation is transparent for the users. In this way the system design and development become more complex than the code service-oriented.

ⅲ) The coarse-grained service-oriented

To reuse legacy systems through the coarse-grained service-oriented strategy, legacy systems must exist independently as a service provider. The services provided by the legacy system are integrated into the new SOA technology architecture. The main advantage of the coarse-grained service-oriented is that the program developers need not spend much time to define the services, and the service provider provides the service and the interfaces itself. So the implementation time SOA can be greatly reduced.

ⅳ) The legacy systems partition

In the legacy systems, there are some very independent subsystems which disconnect with other systems. The legacy systems partition strategy is a good choice. You can reuse the subsystems through the partition of legacy systems. The main advantage of the legacy systems partition strategy is that the service developer need not spend a lot of time to define the services and interfaces, only split the legacy systems into

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smaller subsystems, and reuse them. This can reduce the implementation time of SOA.

For a legacy system, the encapsulate strategies are used in combination to effectively reduce the cost and risk of the implementation of SOA, and then shorten the cycle of the implementation SOA in the enterprises. That is, the subsystems in a legacy system can use different strategies respectively. The companies can more quickly and more secure in the process of the implementation of SOA.

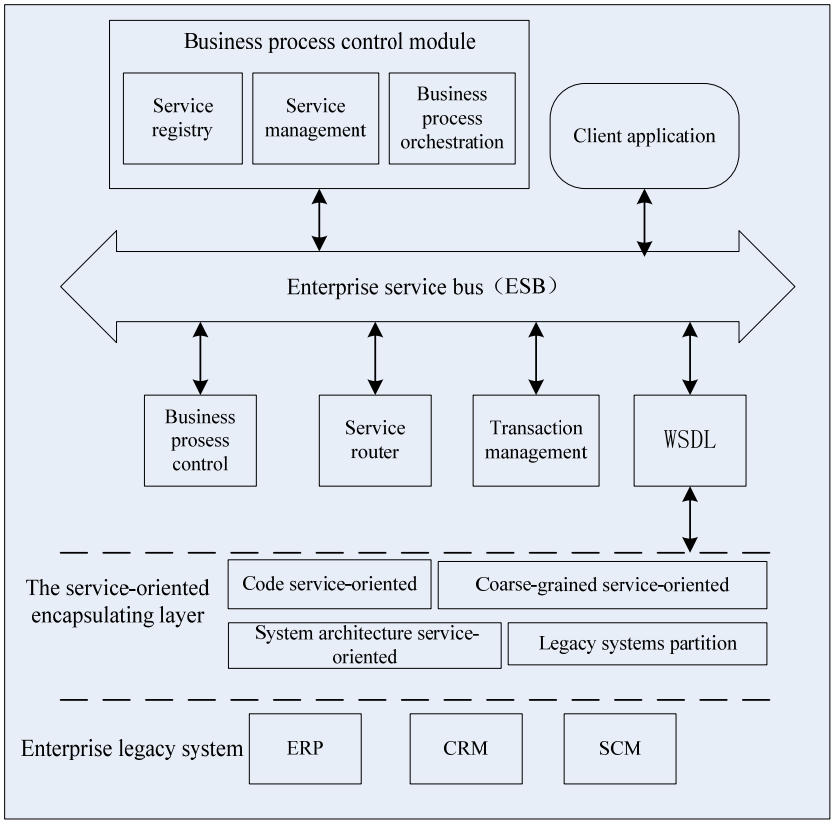

Fig. 1 The service-oriented encapsulating framework of legacy system

III. The Service-Oriented Encapsulating Framework of Legacy Systems

The legacy system is looked as the services, and is encapsulated and defined in accordance with the Web Services standards, so the legacy system can have no affects to the new SOA system, and can achieve a seamless integration to the new SOA system. That is the nature of service-oriented encapsulation of legacy system. Therefore, when the encapsulating strategies proposed in the section Ⅱ are used to encapsulate the legacy systems, there are three aspects [3][4] that must be solved properly.

ⅰ) The communication of different communication protocols.

ⅱ) The seamless transition between the non-XML format data and the XML format data.

ⅲ) The service-oriented encapsulating of the legacy system, from the functions to the business services.

According to the analysis above, we propose a service-oriented legacy system encapsulating framework. The service-oriented encapsulating layer is added in the traditional SOA [5][6]. It can encapsulate the legacy systems, and publish them as the business services. Through the service dynamic composition in SOA, the plug-and-play of the legacy systems can be realized in SOA. The main function of the service-oriented encapsulation layer includes three aspects.

ⅰ) The converting between the underlying messages and SOAP messages. First it converts the SOAP message send from the service requester to an underlying message that can be handled by the legacy system, and then returns the response message which is packaged into a SOAP message to the service requester.

ⅱ) The converting between the XML format and non-XML format. The request of the XML format is converted to the format which can be handled by the legacy system application, at the same time, the result returned by the legacy system is converted to a XML format request, and then the request can be passed to the enterprise service bus (ESB).

ⅲ) Encapsulating the legacy systems as the business service. The WSDL file for the business services is generated, and then the business service is registered and published in the service registration center.

The role of business process control module is composing the single service to the business services that can reach the

business process request. After the legacy systems applications are encapsulated as the business services, a number of business services can be integrated into a business process, and each business service is realized by the different legacy systems. Business process control can adjust and implement a sequence of steps flexibly to complete to the business activities needed by the service requester.

Service router module is used to support the business process control module. For a business process request, the service control module obtains its process and context, and passed to the service router. The service router sends the request to the service-oriented encapsulating layer. The service-oriented encapsulation layer returns the result that is packaged to the service router, and complete the entire service request and response process after the result of the whole business process is returned.

Transaction management module is to ensure the system run smoothly and enhance the reliability of the system. The request sent by the service requestor may be failure at any stage. In order to maintain the data consistency, as a whole, the transaction should fail.

The service-oriented encapsulating layer provides an abstraction layer to shield complexity and heterogeneity of the legacy systems, and separate the functional services provided by the legacy systems from the underlying mechanism of the legacy systems. So the new SOA system can access the legacy system and obtain the services easily, though the internal implementation method of the legacy system is unknown to the new SOA system.

IV. Summary

At present, web Service is the first choice to reuse the legacy system for the implementation of SOA. According to the status of the implementation of SOA in the enterprise and the status of the legacy systems, we proposal four encapsulating strategies, the code service-oriented, the system architecture service-oriented, the coarse-grained service-oriented, the legacy systems partition. Base on the strategies, we proposal the service-oriented encapsulating framework, the legacy system can be encapsulated by the service-oriented encapsulating layer in three aspects, communication protocols, data and program. The reuse rate of the legacy systems can be increased by using this framework. Our future study will be the encapsulating process of the four strategies.

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