Research on Information Services Integrated Method Based on SOA

Jinfeng Li and Bingcheng Sun
Academy of Information & Communication National University of Defense Technology, Wuhan 430010, China
*Corresponding author: jinfengli@nudt.edu.cn

Abstract. The paper firstly analyze the current problems in the information services integration, then the architecture of information services integration based on SOA is designed. The paper also gives a integration method based on ESB and Web Service. Compare the differences between SOA and traditional integration methods. We know that the integration method based on SOA makes full advantage of the information services system. Results show that the method is scientific and easy to use.

1. Introduction
In order to defeat the enemy in the information-based technology environment, the primary goal is to seize the advantage of information, so as to gain the advantage of requirement decision-making and enemy action first. To seize the advantage of information, it is necessary to collect the information distributed in all fields, to generate a complete comprehensive situation of the efficient field, and to make barrier-free circulation and seamless sharing on demand among all information elements. Therefore, it is necessary to build a information service system to integrate all kinds of information services distributed in the environmentfield network and running in different software and hardware environments, realize the high integration and deep utilization of all kinds of information service resources, improve the system technology ability based on information system, and lay a foundation for seizing information superiority.

As an advanced method of software design and system integration, Service Oriented Architecture (SOA) has been widely used in e-commerce, enterprise informationization and e-government. SOA has the characteristics of cross-platform, loose coupling, coarse granularity, standardization and extensibility [1], which is especially suitable for integrating information services in the dynamic and changeable environmentfield information sharing environment.

According to the requirements of improving the technology capability of the system, this paper studies the SOA-based information service system service integration method, and uses ESB, Web Service and other technologies to build a service integration framework to eliminate "information islands" and realize information resources Integration of sharing and information systems.
2. SOA integration method and implementation approach

2.1. SOA
The W3C, an international standards organization, defines SOA as "an application architecture in which all functions are defined as independent services. These services have well-defined callable interfaces, which can be called in a well-defined order to form a business process "[2]. This definition shows that SOA is a service-based software architecture model, which adopts standardized service interfaces, integrates loosely coupled coarse-grained service components through the network according to requirements, and realizes distributed deployment, dynamic combination and on-demand use of information services. SOA service integration method has the characteristics of loose coupling, standardization, coarse granularity and reusability.

2.2. ESB
Enterprise Service Bus (ESB), as an intermediary to realize intelligent integration and management among services in SOA architecture, uses Web service standards and interfaces with recognized reliable message MOM protocol, and mainly solves the call and interaction problems between users and services, services and services in SOA. By transferring requests and information between service requesters and providers through ESB, tasks and instructions between systems can be sent or received, so as to solve the interoperability problems between existing systems.

After adopting ESB as the central technology in the information system integration scheme, the information service system can integrate all kinds of business information systems in the past, present and future into a unified information service framework, providing real-time and large-capacity information communication and real-time control, management and distribution of message transmission. This greatly improves the use efficiency of the whole network and information system, thus enhancing the system capabilities based on information system.

2.3. Web Service
There are many technical ways to realize SOA, such as CORBA, DCOM, RMI, Web Service, etc. Each method has its own unique features [3]. Among them, Web Service has become the most widely used and most promising way to realize SOA because of its independence of operating platform, openness of protocols and interfaces and convenience of development. This technology enables different systems to call each other in the way of "software-software dialogue", so that users distributed in different geographical locations and platforms on the network can obtain "Web-based" services.

The Web Service framework consists of three basic elements-service provider, service receiver (user) and service registration [4]. The Web Service architecture of information service system is shown in figure 1.

![Figure 1. Web Service architecture](image-url)
3. Service integration design of information service system

3.1. Requirement analysis of information service integration

Future technology activities are mainly carried out in the network-centered technology environment under the information conditions, which requires the information system to respond to various environmentfield situations in real time and provide leaders with complex and changeable environmentfield situations in time. In order to achieve the above objectives, it is necessary to ensure the unimpeded flow and sharing of information among all elements.

At present, there are a large number of business information systems (meteorology and hydrology, surveying and mapping navigation, intelligence reconnaissance, sea conditions and air conditions, etc.) which adopt different technical systems and run on different platforms in various services. Most of these information systems are constructed according to requirement level and support relationship, which can not meet the purpose of flat requirement. The internal components of the system are closely coupled, the interactive interfaces are basically dedicated, the reuse ability of components is weak, and the integration is very difficult. The application process has been determined at the time of system design, and it is difficult to realize task-based system reconfiguration because of its poor dynamic evolution ability. There is a lack of information sharing and exchange interfaces between systems, so information can not be distributed or requested on demand, and interoperability is difficult.

Therefore, it is necessary to adopt the integration method of SOA to build a information service system, and integrate all kinds of information services distributed in the environmentfield network and running in different software and hardware environments, so that it can not only meet the complex, heterogeneous and changeable application requirements in the field, but also make full use of the existing business information systems and meet the needs of future technology and application development.

3.2. General framework of information service system

The information service system based on SOA relies on the integrated information grid and is carried by the common information service infrastructure. Connect elements such as requirement posts and business departments through IP bearer network, and realize seamless sharing of information and on-demand acquisition of services.

The system adopts four layers: presentation layer, service layer, business layer and data layer, which realizes the loose coupling between users and systems, and between systems. The layers are independent of each other and realized independently, which facilitates the unified deployment and management of software and hardware resources, reduces the deployment and maintenance expenses, and improves the flexibility and scalability. Service users can use B/S, C/S and embedded client to obtain services to meet the needs of different technology users. The information service framework controls and dispatches the service resources distributed on each application system through the service bus and service management module, realizes the control of service deployment, registration, publishing, query, binding/calling, and monitors the service operation. The application system is packaged as a service through a standard interface and integrated with the information service framework. The database no longer keeps a connection with every active user, but the application component is responsible for dealing with the database, which reduces the database access burden and improves the data access performance. The general framework of information service system is shown in Figure 2.
3.3. Information service integration method

For the existing business information systems and services, such as information systems of various services, support information systems, air information services, etc. It needs shared data and functions and integrates them through interface transformation. The specific implementation method is that a certain function, information or service is encapsulated into a unified Web service through interface conversion, and the encapsulated system is used as a service provider to register and publish in the service management function module in the information service framework of the information service system, and provide services to service users through the service bus.

For new information systems and services in the future, SOA architecture should be directly adopted and integrated with the information service framework according to the requirements of relevant laws and regulations. As an information service provider, the system or service directly registers and publishes its own Web service in the service management function module of the service framework, and directly connects with the service bus to provide services for service users.

Service users include users and user systems. Users can use terminals through various services, directly access the service bus by adopting standard protocols, and obtain the required information.
services. The user system can transform the standardized service into the form required by its own call through the service interface transformation, and use the information service as required.

The integration of various business information systems, information services and user systems with the information service framework of information service system is shown in Figure 3.

4. Integration effectiveness analysis

The information service system can achieve the following effects by adopting the integration method of SOA:

(1) The decoupling of information system is realized. By encapsulating existing heterogeneous systems into standard services, services are presented to service users in a unified way. Service interface and service implementation are relatively independent, which decouples the tight coupling relationship between users and systems, so that users can flexibly combine one or more services to form the required information resources according to the needs of their own technology missions without understanding the underlying implementation of services. At the same time, service providers can modify and update services as needed without affecting users, thus greatly improving the flexibility and usability of the system.

(2) Independent encapsulation of information resources is realized. Information reconnaissance, meteorological surveying and mapping, support and other business or public information resource providers can package each kind of information to be shared into a single independent service, and catalog and register according to unified rules to form a shared directory of information resources. The large number and variety of technology information resources on the environment field are organized in an orderly manner through the shared information service system, which realizes the visibility and accessibility of information resources, enables users to dynamically organize various information
resources and service functions according to different tasks, and meets the environmentfield needs of
dynamic and diverse technology tasks and network-centered information access.

(3) Service interface standardization is realized. By adopting standardized service interface, the
shared information service system ensures the platform independence of the service, makes it convenient
to deploy and makes the system more flexible. At the same time, due to the adoption of standardized
and accurate interfaces, users can use different means such as thin clients or smart mobile terminals, and
flexibly use B/S, C/S and embedded systems to access services to meet the access needs of different

technology users.

(4) Coarse granularity of service level is realized. The shared information service system combines
services through the information service framework, hides the details of service implementation, and
realizes coarse-grained services centered on user needs, thus reducing the communication burden of
users and the response overhead of the system, and improving the efficiency of information sharing.
In this paper, the information service system using SOA integration method is compared with a efficient
operation requirement software and a Web-based information service system, and the results are shown
in Table 1.

| Table 1. Comparison of information service system effectiveness |
|---------------------------------------------------------------|
| System coupling | XX efficient requirement software | XX information service system | information service system |
| Tight coupling | Loose coupling | Loose coupling |
| Service interface | Special purpose | Currency | Currency |
| Service composition | Nothing | Weak | Strong |
| User access mode | C/S | B/S | B/S, C/S and embedded |
| Compatibility | Weak | Medium | Strong |
| System extensibility | Poor | Medium | Strong |
| Service granularity | —— | Fine | Thick |
| Business process organization | Fixed organization | Fixed organization | Dynamic organization |
| System reconfiguration ability | Weak | Medium | Strong |
| System modifiability | Poor | Strong | Strong |
| Information resource sharing ability | Poor | Medium | Strong |
| Reusability of functional modules | Poor | Strong | Strong |
| Complexity of development | Complex | General | Easy |

5. Summary
After adopting SOA as the method of information service integration, information service provides a
means to integrate all kinds of heterogeneous information services and systems distributed in different
space of environmentfield. Through the information service framework, various information services
and systems are integrated with open and flexible Web services, thus realizing the flexible call and
arrangement of services and the reuse of services without affecting the existing business logic of existing
information systems. It breaks down the information barriers between systems, realizes information
sharing and interoperability among information systems, makes information services and systems easier
to maintain and expand, and can effectively adjust the structure of services and systems to meet changing
needs. In a word, SOA integration method provides an idea for service integration of information service
system, and is a feasible way to make full use of existing resources to realize service and system integration.

References
[1] Nicolai M. Josuttis. SOA in Practice: The Art of Distributed System Design[M].2008.
[2] Hark D. Hansen. SOA Using java Web Services, 2007:57-134.
[3] Yin Hongli et al. Comparative research on the main implementation technologies of service-oriented architecture [J]. Computer Science, 2009, 36(1):282-285.
[4] Meng Fanxin et al. Research on SOA application based on AOP and Web Services [J]. Computer Applications and Software, 2010, 27(2): 133-136.
[5] Zhang Xiaojuan, etc. Enterprise Integration Architecture and Implementation Based on Cloud Computing and SOA [J]. Computer System Applications, 2011, 20(9): 1-6.
[6] Liu Xuemei. Requirement automation system integration based on SOA[J]. Navigation and Requirement Automation, 2009, (3): 31-32.
[7] Zheng Hefeng. Research on Integration of Information Integrated System Based on SOA[J]. Requirement Control, 2010, 35(1):81-83.