Three Stages for SOA and Service Governance

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A service oriented architecture (SOA), which realizes flexible and efficient construction of IT systems, has already been accepted in many companies. In this paper, we show three stages of SOA implementation and the governance required in each stage with the information to manage. CentraSite, the SOA registry and repository jointly developed by Fujitsu and Software AG, provides an appropriate governance mechanism, capable of centrally controlling different types of information. It supports the transition from a non-SOA environment to an SOA environment, the realization of service management processes within organizations and the optimization of IT systems from the viewpoint of service.

1. Introduction

An SOA has been accepted in many companies so that they can quickly respond to changes in their business environments. It allows flexible and efficient updates of IT systems through services, which can be reused or combined to produce a new business value. Companies speed up their response to new requirements with services, rather than individually extending and modifying the systems according to the requirements.

The state of implementation of an SOA varies depending on the company.   Some companies have built their own lifecycle model for services to maximize the benefits from an SOA, including both development and operational scenarios. Other companies are struggling with current IT systems, which have turned into black boxes in their long history, resulting in slow adoption of an SOA.

In this paper, the implementation of an SOA is classified into three stages with the data models and governance required for individual stages.   Examples of use and the software required for realizing the optimum governance are also described.

2. Three stages for SOA

SOA implementation at companies can be classified into the following three stages.
1)   SOA introduction—service utilization

Services to be used are defined and developed. The challenge companies could face at this stage is that it is often difficult to understand all the systems within companies and hence it is difficult to define appropriate services. Technologies vary from system to system, and new and old systems including legacy systems are managed by different departments in different manners.
2)   Building of service management processes

The focus shifts to service reuse and building of service management processes to pursue efficiency and flexibility of service development. Policy-based service development and service life cycle management become a focal point for prevention of redundancy in service development.
3)   Optimization of operational environment

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with service perspective

Once companies establish the development model of services, they explore further improvements in the operational environment as well. Optimization of the operational environment from the perspective of services is the key point in this stage. Companies go beyond simple service interface management and manage individual elements that constitute services (hardware, OS, middleware, etc.).

3. Governance and the information to manage

The types of information to manage depend on the progress of transition to an SOA in a company. The following sections describe the governance required at the individual stages of SOA implementation and the data model aligned with such governance.

3.1 SOA introduction—service utilization

In the SOA introduction stage, the strategy must be made clear in terms of where to start with and how to proceed with SOA. The information on the existing systems must be consolidated to define the scope of SOA across organizations in a company. Further, the possible impact of changes must be understood and such understanding
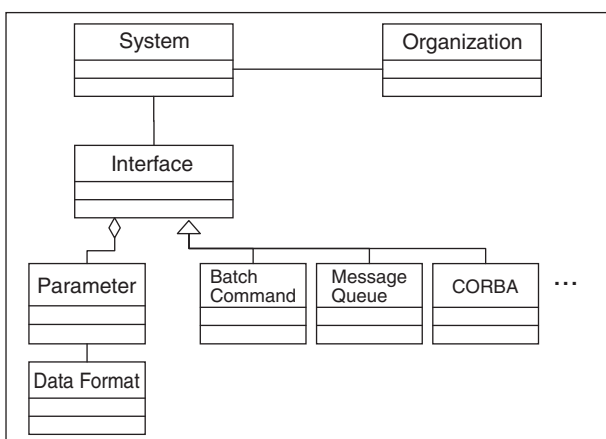

Figure 1
Example of data model at the stage of SOA introduction/separation into services.

must be reflected in the strategy; for example, if the company should adopt SOA at once or change current systems gradually.

The information to manage in this stage is the information on existing IT systems, including names, IDs, capabilities, managing departments, and interfaces between systems (protocols, source/destination systems and data formats).

Figure 1 shows an example of information to manage in this stage with Unified Modeling Language (UML). In this model, dependency among systems can be captured through their interfaces, such as batch operation and message queue. This is used for understanding the whole picture of the technologies used for the existing system and identifying the scope of impact of system modification, which allows well-planned implementation of an SOA.

3.2 Building of service management processes

Once companies start with SOA and services have been developed and maintained, it becomes important to manage the entire lifecycle of services, encouraging reuse of services as well as preventing unregulated service development and modification.

To encourage reuse of services, the specifications and service levels must be clear. When combining services to implement a new business process, for example, services to use are determined based on the specifications and service levels. An approval process to define specification and service levels is required for such purposes.

To avoid unnecessary investments, it is important to establish processes to verify whether there is any need to develop new services and whether the service content is appropriate. Not only are there cases where pre-created services can be reused, but there are also cases where existing interfaces can be used as services only by defining their service levels.
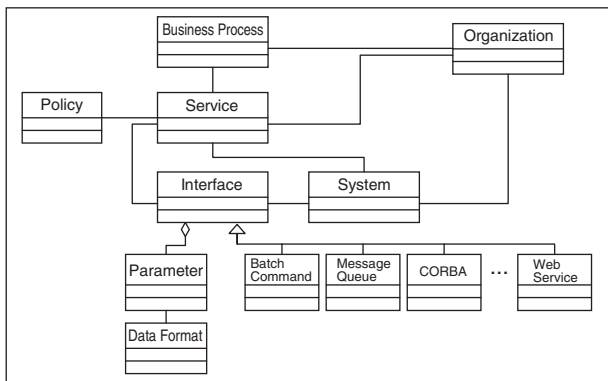
The information to manage at this stage is

Figure 2
Example of data model at the stage of service reuse/
building of management processes.

Figure 3
Example of data model at the stage of improvement of
efficiency of service operation.

wide-ranging and described in different formats, related to various middleware products.[1] Such formats include, for example, Web Service Definition Language (WSDL) for describing service specifications, Business Process Execution Language (BPEL) for describing business processes that use services and Web Services Policy (WS-Policy), which describes service policies. The perspective of management shifts from centering on systems to centering on services and business processes.

Figure 2 shows the relationships between services and business processes as well as the policies assigned to the individual services, in addition to system information. This model allows, for example, the analysis of the business processes influenced by changes in specific services or the confirmation of whether or not the same policies are applied to all services used by a business process.

3.3 Optimization of operational environment from a service perspective

The more the full-scale operation of SOA-based IT systems expands, the more important it becomes to manage the individual elements that constitute services. In an environment in which services are reused from various business processes and the business processes themselves are in turn reused as services, not only services
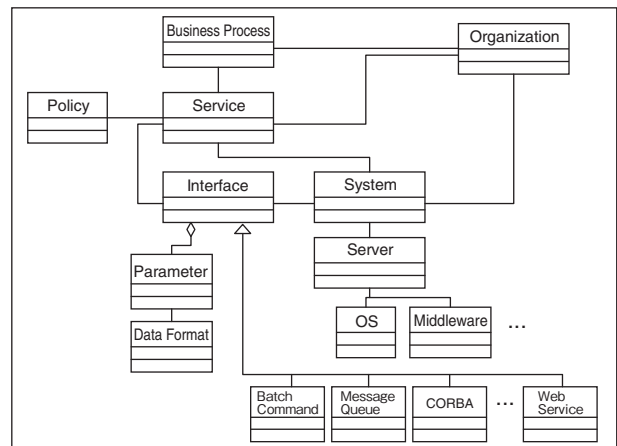
but also the IT assets that constitute them must be managed since they could have a significant impact on business processes.

For example, a critical problem might be caused in multiple business processes when an updated module is applied to a component constituting a service. There could also be the case that a patch for operating systems could influence the behavior of services and hence business processes. Thus, when changing any constituents of a service, the impact of such change should be estimated.

The information to manage in this stage includes, beyond the information on services and business processes, the information about servers, OS and middleware that constitute services (**Figure 3**). The operation management division should be able to manage IT systems from the perspective of services as well.

IT Infrastructure Library (ITIL) is in wide use as the best practice of operations management.[2] The types of information above are often stored in a Configuration Management Database (CMDB) in such environment and services must be appropriately managed by utilizing the information in CMDB.

4. Technologies required for supporting the three stages for SOA

There is a desire to have software support all these three stages of SOA implementation and to use it to help smooth the transition between these stages. Such software should be capable of managing the information used at each stage and give appropriate governance for each stage.

What is important for such software is, first of all, data extensibility. It must be capable of flexible data model design for aggregating and managing the information on IT systems, which are wide-ranging among companies. Standard technologies such as WSDL, BPEL and WS-Policy must be supported to increase service reusability and transparency.

Second, such software should give report and search capabilities which are independent from the types of information to store. This is especially important when companies have a heterogeneous environment, for example, with a co-existence of services and other system interfaces.

Finally, it should be able to interact with other types of repositories such as CMDB. A federation with different repositories allows management of services from more diversified perspectives.

5. CentraSite for SOA governance

CentraSite, an SOA registry and repository jointly developed by Fujitsu and Software AG, accelerates the implementation of SOA. It is capable of handling the various types of information mentioned above. It also has a wide variety of functions to utilize the information stored, which allows appropriate governance in each stage of SOA implementation.

The following describes three of the functions.

1) Flexible data models

CentraSite supports WSDL and BPEL. It has predefined information models of Web services and business processes based on the JAXR specification, which is published as an open specification and used as a Java standard API. The JAXR specification itself has basic models such as Organization, User, Service, ServiceBinding, SpecificationLink and Association,[3] which are highly compatible as models for managing services and their providers. Addition of user-defined data models is also possible, allowing information on existing systems to be handled flexibly. To access these data stored in CentraSite, CentraSite provides open APIs, such as UDDI, WebDAV and JAXR.

2) Integrated search/report

The information on both legacy IT systems and SOA-based systems can be handled in the same way and the information across the systems can be analyzed using the same methods as with CentraSite. XQuery is supported as a search language, which allows data extraction with join conditions, value aggregation and conversion with multiple data sources.

CentraSite's customizable reports can be used for statistical analysis and summarizing the system information with rich presentation. Reports can be designed easily with graphs and tables by its GUI definition tools. Such reports can be used, for example, to detect and list all the services which are not in use in a company or to show statistically the progress of transition of interfaces of a legacy system to services.

It is also possible to analyze the impact of changes on a particular service through reports. The impact can be analyzed from various perspectives, for example, the data type, relevancy and depth of analysis, the results of which are visualized in a network diagram. This allows prior understanding of the influence of interface changes and the estimation of what happens if a service is disabled.

3) Federation with external repositories

CentraSite can be federated with external UDDI repositories as well as other types

of repositories. Simple configuring allows extraction and storage of information to and from external UDDI repositories and the federation function can be extended to incorporate a variety of repositories such as CMDB, which allows even more advanced management of services.

6. Conclusion

It is important to manage system information and give governance appropriate to each stage of SOA implementation. The statuses of companies can be classified into three stages from the perspective of SOA: 1) SOA introduction stage—service utilization, 2) Building of service management processes and 3) Optimization of operational environment with service perspective. To meet the requirements at each stage of SOA implementation, it is important to handle a variety of types of system information in an integrated manner, interacting with other repositories when it is necessary. CentraSite features a highly flexible data model, integrated reporting and federation for SOA governance and helps companies to realize optimum SOA environments.

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