Enterprise Application Rebuilding Framework based on Semantic SOA and Workflow

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***Abstract*—In this paper, we proposed a framework integrated Semantic SOA (Service-Oriented Architecture) and Workflow to solve the problem of enterprise application rebuilding, and described the function of the main units of the framework. At last, we discussed the aspects of the future studies that we will address.**

Keywords-Semantic SOA; WorkFlow; Enterprise Application Rebuilding

I. INTRODUCTION

In recent years, Web Service techniques and Service-Oriented Architecture (SOA) have been extensively applied in the domain of Enterprise Application Integration (EAI). Somewhat, they indeed solved some problem encountered while implemented the EAI, such as heterogeneity, interoperability, and so on. However, for lack of semantic information essentially Web Service and SOA, enterprise applications are built still in the style of hard coding. Those applications are not flexible and resilient enough yet while the business requirement changed. The modification of those applications will still need enormous efforts that system developers do [1-5].

We propose a framework integrated Semantic Web Service, SOA and Workflow techniques for the problem of enterprise applications rebuilding in EAI. This framework has some fundamental advantages over traditional EAI methods, and the gained advantages are:

- relying on Semantic SOA provides further accuracy and automation of business web services discovery, matchmaking, composition and invoking;
- Workflow techniques make a higher degree of business process customization and reduce the demand of programming knowledge for business functions reconstructing.

This paper is organized in the following order. In section II, the related research efforts are discussed. In section III, the technique description of the framework presents. Finally in section IV, conclusions will be made along with our plans for future studies.

II. RELATED WORK

In [2], an EAI framework was proposed which combines SOA and Web Service technology. Their research work is similar to ours, but lack of supporting to the services' semantic information. Thus, the EAI framework they designed can't implement the exact business services discovering, matchmaking and composing.

[3] showed a new term: Semantic Service Oriented Architecture (SSOA), and described how the SSOA architecture could solve EAI scenarios. But they didn't discuss it deeply, especially about Enterprise business process rebuilding based on the Workflow technique. This is just our works distinct with theirs.

[5] presented an ontological knowledge framework and the use of the framework in an adaptive workflow medical system. The framework implements the combination of the ontology and business process automation management. But the framework doesn't adopt a semantic rule engine. So the ontological knowledge retrieval and reasoning is weak.

Dimka, et al. in [6] indicated the disadvantages of the traditional ESB, such as the lack of semantic information about Web service, data transformation by hard coding, and so on. In order to deal with above problems, they proposed the concept of Semantic Service Bus (SSB) and presented a conceptual architecture of SSB. Subsequently, Antonio, et al. analyzed the necessity of ESB as the infrastructure when the Semantic Web Services technology was used in the field of EAI. At the same time, they also proposed the concept of Semantic ESB (SESB) and discussed two possible ways to implement the SESB [7]. These productions will provide good reference value for the later researching work.

III. TECHNICAL DESCRIPTION

The fundamental structure units of our framework are depicted in Fig.1. The function of the main units is described below.

- Business Process Orchestration: Basing on the supporting of the Enterprise Application GUI, let users rebuild (such as create the new processes, modify the old processes) business processes in a visual and

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flexible way. At the same time, the evolvement of the whole process needs to interact with the Workflow Engine.

- BPEL/SWS Translator: implements the translation of the description of business process in between BPEL and OWL-S (the Semantic Web Service description language that W3C recommends).
- Semantic Enterprise Service Bus: as the core of the whole framework, the mainly function is to provide the semantic support for Web Services discovering, invoking, composing, and so on. It includes three composing units: Enterprise Service Bus, SWS Matchmaking Engine and SWS Compositor, the role of each unit plays is individually described as the following:
  - Enterprise Service Bus: controls the entire enterprise services invoking, routing, and mediating; is the central part of the SOA in the domain of EAI.
  - SWS Matchmaking Engine: is responsible for discovering and matchmaking the service from the Enterprise Business Service Repository to meet the users' requirement.
  - SWS Compositor: is mainly used to achieve the semantic integration of enterprise application services. To further fulfill the users' request by composing the existent services when there are no any services matching the request in the Enterprise Business Service Repository. Of course, it needs to communicate with the SWS Matchmaking Engine in order to finding the special atomic service or composite service. In addition, SWS Compositor will register the composite service into the Enterprise Business Service Repository for improving the opportunity of reusing.
- Enterprise Business Service Repository: stores all kinds of services providing implementation of atomic, composite and common processes abstracted from the whole enterprise productive business process.
- Domain Ontology Base: is used to save the domain ontology knowledge and support the semantic integration of enterprise applications.

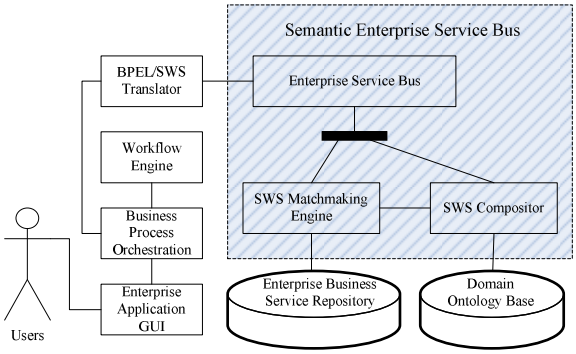

Figure 1. The Framework of Enterprise Application Rebuilding

The interaction process of every unit the framework includes is described as the following:

- Firstly, Users start up the interaction process when they need to rebuild the actual productive business process. They will use the Business Process Orchestration component in graphical mode to customize the process. The framework can guide users to split the business process into a series of activities and then to assemble the activities into the business process by designating the pre- and postconditions of every activity in a visual way just like playing toy bricks.
- When users finish the rebuilding job, Business Process Orchestration unit will interact with Workflow Engine to make the process constitute a real work flow.
- Then, the work flow will be transmitted to the BPEL/SWS Translator unit. After the BPEL/SWS Translator received the request, it will communicate with Workflow Engine and carry out the translation which is the business process description from BPEL to OWL-S. When the translation was done, the service produced by the translation will be handed to the Enterprise Service Bus.
- The Enterprise Service Bus will face two cases. At first, it invokes the SWS Matchmaking Engine to discover the service from the Enterprise Business Service Repository meeting the requirement. If the result is true, the Enterprise Service Bus will end up the whole procedure. If the returned value is false, the Enterprise Service Bus will invoke the SWS Compositor to meet the request. The SWS Compositor will achieve the new composite business service integration task and save the new service into the Enterprise Business Service Repository for using or reusing. As soon as the Enterprise Service Bus received the notice that the SWS Compositor had finished the composition, it will make the whole interaction process end.

IV. CONCLUSION AND FUTURE WORK

In this paper we proposed an EAI framework combining Semantic SOA and Workflow, and introduced the functions of the main parts of the framework. In the future work, we will do from several aspects as below.

- Applying the SOA to provide the solution to EAI, the most important and difficult tasks are the abstraction of atomic and common business processes from kinds of enterprise applications. Thus, how to find an efficient and effective approach to complete that job will be the focus of our future studies.
- We will try to make a resilient and semantic EAI system basing on the framework in the domain of electric power production, and check the feasibility of our theory.
- With the emerging of Software as a Service (SaaS) business model [8], new integration challenges are introduced. At the same time, the concept of Virtual

Enterprise (VE) has also been discussed. Those will inspire our interest.

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