Chapter 17

A Presentation–Preserved Compositional Approach for Integrating Heterogeneous Systems:
Using E–Learning as an Example

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ABSTRACT

In traditional SCW environments, related web services are integrated into business processes. Web service still brings less than expected benefits to small corporations and end-users for two reasons: 1) the web service only focuses on data level and is difficult to implement the presentation-centric business contexts. 2) The small corporations and end-users usually do not have enough IT competences to write a client or user interface to interact with web service(s). In order to solve these problems, the author proposes a presentation-preserved compositional approach for service-oriented architecture (PCSOA), which extends the existing data-oriented compositional approaches for web services to provide a more flexible methodology to orchestrate both data level and presentation level services during the workflow integration. A prototype is also built to validate the feasibility of the approach.

1. INTRODUCTION

Software developments of online business have adopted component-based distributed services and web services (W3C, 2002) as better system integration solutions (Stanford University, 2002; Blake & Gomaa, 2005; Medjahed & Bouguettaya,

2005; Tsalgatidou et al., 2006; Zhao, 2006; Wang, 2006). To realize complete commercial processes, particular services often need to be further incorporated and composed with other processes to achieve complete end-to-end business activities. Flexible and solid frameworks for the services-based cross-organizational workflow (SCW) (Blake & Gomaa, 2005) are becoming critical and indispensable.

The term so called virtual enterprise (Camarinha-Matos & Afsarmanesh, 1999; Gijsen et al., 2002) describes a business task consisting of multiple services from different third-party organizations. The workflow coordination in the virtual enterprise is responsible for controlling the execution sequence of each service, mediating messages passed throughout the services, and ultimately returning the aggregated data to the upper presentation layer to perform the result for end-users. Each service is only responsible for sending and receiving the data, hence the service consumer (the service-integrated organization) must implement GUIs (graphic user interfaces) such as web pages, in order to present the result and interact with end-users. In this typical service-oriented architecture, we use the term, data-oriented compositional approaches, to describe the workflow compositional approaches which employ standard web service technologies adhere to the W3C specifications (W3C, 2002).

Without considering the interaction with end users, data-oriented web services have been successful. In fact, this is also the original intension of SOA to separate GUI out of the service. However, without any mechanism to reuse the required presentation and interaction with users within the data-oriented workflow composition, the data-oriented compositional approaches usually demand additional implementation cost on the presentation and interaction management. In these data-oriented approaches, service consumers often need to program and implement the presentation level interfaces to display the retrieved data. In the real world, not all business organizations can finish these missions by themselves, especially for the companies with no IT departments and technicians. Due to the nature of data-based service, separate presentation-layer interfaces are remained to be implemented by each service consumer respectively without proper reuse. In some business environments where the providers and consumers have asymmetrical IT competences, these problems will make the service-

based cross-organizational workflow integration to be infeasible and unrealistic. Therefore, the web service's original intension to completely separate GUI from data should be amended with certain mechanism that promotes the reuse of GUI works to make SOA a more efficient distributed architecture.

Moreover, the presentation level integration has been more and more important to the next generation software as developed in the concept of Web 2.0 (O'Reilly, 2005). One of the key points in Web 2.0 is to generate the synergy of small sites to make up the bulk of the web's content. For example, the video files hosted on Youtube (www.youtube.com, a web platform which provides web users to upload and perform their own movies) can easily be reused and plugged into any web site with only simple codes and configurations. This web site can then reuse Youtube's video clip to produce related multimedia content and programs on a new web page without worrying the source video. Combining this observation of Web 2.0 and our aforementioned shortcomings of data-centric SOA, we believe SOA should be further extended to treat diverse web resources (esp., presentation-based services) as reusable components to makes these services and resources manageable and assembled in an easy and efficient way.

In this article, we propose a presentation-preserved compositional approach for service-oriented architecture (called PCSOA) to show that, in many cases, the reuse and integration of presentation-based resources is also necessary in addition to the data level integration within the enterprise service compositional environments. For example, in applying SCW technologies to coordinate various product catalogue and material resources in the product design processes (Hou & Su, 2006; Richardson & Midwinter, 2006). Other frequently occurred examples are to compose diverse learning services into e-learning environments (Fuji & Tanigawa, 2002; Gaeta et al., 2002; Liao & Ou Yang, 2004; Liao et al., 2005). In the traditional SCW approaches, the functionality of

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