Chapter 14
Functional Components Specification in the Semantic SOA-Based Model

Tariq Mahmoud
Carl von Ossietzky University of Oldenburg, Germany

Jorge Marx Gómez
Carl von Ossietzky University of Oldenburg, Germany

Timo von der Dovenmühle
Carl von Ossietzky University of Oldenburg, Germany

ABSTRACT

Semantic Web Services are providing means for (semi-) automatic discovery, composition, and execution of Web Services. However, these new emerging semantic techniques seem to be inaccurate to be used in terms of semanticizing the capabilities of Web Services and the requests of Web Services consumers. This comes from the blurred representation of their involved ontologies. This chapter presents a semantic Web-Service-based reference model that is mainly relying on the idea of applying lightweight semantics to Web Services in order to have an efficient solution for different business domains. The model advances the reusability of its components and reduces the necessity of data transformation functions in business process descriptions. Furthermore, technical aspects about the core prototypical implementation are described.

INTRODUCTION

Nowadays, it becomes more and more critical and essential for the vendors in the business-related markets to tailor their products and software to suit the Small and Medium Enterprises (SME) needs since their market share has been enormously raised. The issues related to Business-to-Business (B2B) environment (Bussler, 2003) are becoming important challenges to be considered in such area as well.

Talking about integration within B2B markets, Web Services seem to be one of the powerful techniques to solve the integration problems.

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Enterprises' Service Oriented Architecture (SOA) (Bieberstein, Bose, Fiammante, Jones, & Shah, 2005) solutions are accorded the killing applications to be utilized in the SME market (Armario, Ruiz, & Armario, 2008). However, SOA-based solutions lack (semi)-automatic support in both service discovery and invocation phases. (Semi)-automatic service composition among Web Services supplied by service providers and the queries provided by the consumers together with data and process interoperability, information sharing, finding, extraction, interpreting, maintaining and representation are also not fully considered. This means that nowadays the existing architecture of the enterprise Web has many defects such as lack of interoperability, massive unstructured data and increasing number of various systems that are waiting to be linked (Hu, Sun, Wei, & Yang, 2008). Moreover, SOA solutions also lack the semantic documentation of the Web Services interfaces.

After this brief analysis and to address such problems, new approaches are being proposed and developed. Semantic Web (Berners-Lee, 1998) and in particular Semantic Web Services (Cardoso & Sheth, 2004) seem to be one of the soundest solutions.

Semantic Web Services (Burstein et al., 2005) are one of the promising techniques that emerge from the Semantic Web. They are providing means for (semi-) automatic discovery, composition and execution of Web Services. However, on the one side the new emerging technologies in the world of Semantic Web makes the techniques used in semantic-enabled SOA solutions being inaccurate to be used in terms of semanticizing the capabilities of Web Services (WS) and the requests of WS consumers because of the blurred representation of their involved ontologies. On the other side, traditional SOA-based solutions lack semantic documentation of the Web Service's interfaces (Mahmoud & Marx Gómez, 2008), and that will return inaccurate information to their consumers.

Based on that, our proposed lightweight semantic SOA-based solution tries to overcome the problems of the traditional SOA solutions and the complexity of the semantic ones by being responsible of splitting the semantic annotation from the core services. This is done in a way where both normal and Semantic Web Services (Studer, Grimm, & Abecker, 2007) can be validated (Maximilien & Munindar, 2004), evaluated, and used. The system will also provide a second level of Web Services classification by grouping these Web Services in higher-level categories named "Web Service assemblages (WS-assemblage)". These assemblages represent the areas of interests (domains) within an enterprise or business. The assemblages will include all the validated Web Services provided by different service providers as registered members. These assemblages entail their concepts from a predefined "WS-assemblage ontology" that represents the whole aspects regarding Web Services. The WS-assemblages are created by semantic Web-Service-based system within the proposed reference model. Their main role is to represent a second level of Web Service classification to enhance the search results within the service discovery phase. Detailed explanation about these WS-assemblages and the underlying ontology will be described later in section three.

In this chapter, we describe the main aspects of our model and initially present the above-mentioned ideas in the following sections. The main aspects and description of the semantic SOA-based reference model components and design aspects are explicated in the second section. In section three we show the Web Service's assemblage ontology specification with the Web Service registration scenario. Moreover, literature review and related work are presented in section four. Section five includes the potential future research directions and the concepts of how this model should be applied in practice. Finally, we conclude the chapter with the main outcomes from using this model and conclusion that summarizes this chapter.