

Chapter 6

CSMA:

Context-Based, Service-Oriented Modeling and Analysis Method for Modern Enterprise Applications

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ABSTRACT

Since the beginning of the Service-Oriented Architecture (SOA) paradigm, with its various implementation technologies such as Web services, the focus of industrial communities has been on providing tools that would allow seamless and flexible application integration within and across enterprises' boundaries. In this paper, the authors present a Context-based, Service-oriented Modeling and Analysis (CSMA) method that guides service engineers in their choices of identifying, defining, and analyzing adaptable business services. The proposed method is business centric and comprises a set of structured steps grouped in two phases. Besides, the CSMA embraces Model-Driven Architecture (MDA) principles to model and refine adaptable business services models in the PIM level. The results from a pilot validation of CSMA for SOA enablement of a realistic enterprise training solutions are also presented.

INTRODUCTION

Service-Oriented Architecture (SOA) paradigm has a major role to play in the development of modern enterprise application systems. Other design paradigms like object-oriented and component-based have tied up such systems to some architectural solutions. By doing so, the

capacity of these systems to smoothly accommodate changes in business requirements and regulations has seriously been limited (Nuffel, 2007). SOA promotes system flexibility using independent, reusable automated business services. Each service can through the “possible” help of other peers implement complex business processes and system functions as well. Business services are, also, defined as units of work that are performed in response to some consumers’

DOI: 10.4018/978-1-4666-1577-9.ch006

needs satisfaction (Erl, 2005). This paradigm shift in enterprise architectural solutions from traditional single entity to service collaboration is fueling intense debates among IT practitioners. Despite the benefits of this shift such as business process reusability and spreadability cross organizational boundaries, enterprises are still reluctant to abandon the traditional ways of designing business processes in order to embrace an entirely new paradigm based on services. Several SOA-related limitations undermine these benefits. Industry definitions for service principles and standardized frameworks for modeling business services are still in progress and several proposals and thoughts are still unsettled (Arsanjani, 2004; Heuvel, Hasselbring, & Papazoglou, 2000; Erradi, Anand, & Kulkarni, 2006a). A comprehensive framework that would set guidelines for service-oriented modeling and analysis is required. Many enterprises in their early use of SOA simply thought of wrapping their existing components in compliance with services' standards. Deploying large-scale, modern SOA-based applications goes beyond component wrapping. An effective approach for identifying, modeling, and analyzing services is crucial to achieve SOA benefits (Papazoglou & Heuvel, 2006). Our extensive literature review reveals that a few methods exist and lessons learnt from previous experiences along with best practices are almost inexistent. Works like (Arsanjani, 2004) and (Papazoglou & Heuvel, 2006) propose methods for designing and modeling services in enterprise. However, these methods are very aligned to the particular technology of Web services. In addition, critical issues (e.g., non-functional-requirements, context-aware, etc.) that concern delivering high-quality services are barely touched. A method that promotes the use of SOA at a high level of abstraction and specifically tackles the issue of service adaptability to context changes during the design stage is still missing.

In this paper, we propose a method that guides service engineers in their choices of identifying, defining, and analyzing adaptable business services. Our method called Context-based, Service-oriented Modeling and Analysis (CSMA) is adaptable-business-service centric and provides appropriate guidance for SOA analysis and modeling. In CSMA, business services are designed in a way that their behavior is fine tuned according to today's markets' needs. Issues such as reusability, customizability, manageability, and context-awareness of service development need to be considered early in service-system development. Moreover, CSMA describes the service-oriented development process at a high level of abstraction regardless of implementation details. To this end, CSMA embraces Model-Driven Architecture (MDA) principles to facilitate and improve SOA development (Lopez-Sanz, Cuesta, & Marcos, 2008). Within MDA, models are used as core class elements during system design and implementation. MDA separates a system development process into three abstraction levels known as Computational Independent Model (CIM), Platform Independent Model (PIM), and Platform Specific Model (PSM) (OMG, 2003). Our contributions are twofold: business service description at a higher level of abstraction by using UML profiles so that concerns of high-quality and context-aware services are captured and then, tackled; and the CSMA method that eases SOA adoption in enterprises. The remainder of this paper is organized as follows. In Section 2, the Model Driven Architecture (MDA), the context and the service oriented architecture are outlined. Section 3 details some related work. The CSMA meta-model as well as our UML profiles defined to support the representation of adaptable business SOA concepts are presented in section 4. Section 5 details the CSMA key phases validated with the enterprise training solutions case study. Finally, a conclusion and possible further research is discussed.

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