Chapter 6

Modeling Services Using ISE Framework: Foundations and Extensions

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ABSTRACT

The Internet of services introduces new requirements for service engineering in terms of addressing both business and technical perspectives. The inherent complexity of the new wave of services that is emerging requires new approaches for an effective and efficient service design. In this chapter a novel service engineering framework is introduced: the Integrated Service Engineering (ISE) framework. With its ISE workbench, it can address the emerging requirements of Internet of services. The chapter presents the foundations on how the service engineering process can be conducted by applying the separation of concerns to model different service dimensions within various layers of abstraction. Additionally, three novel extensions are presented to the aforementioned ISE workbench in order to enrich the capabilities of the service modeling process.

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INTRODUCTION

Several advances have been made to describe and model Web services. Examples of proposed approaches include the use of ontologies to describe services and interfaces (Kerrigan, 2005) (Paolucci & Wagner, 2006), the semantic annotation of Web services (Paolucci & Wagner, 2006) (Cardoso & Sheth, 2003), and the use of UML and UML extensions for Web service modeling (Lopez-Sanz, Acuna, Cuesta, & Marcos, 2008) (Sadovykh, Hahn, Panfilenko, Shafiq, & Limyr, 2009) (Dumez, Gaber, & Wack, 2008). All these approaches targeted the modeling of a relatively simple artifact: a Web service interface which was composed of data inputs, data outputs, and operations names. While some approaches (e.g. (Paolucci & Wagner, 2006) (Kerrigan, 2005)) went a step further and have also modeled goals, precondition, participants, control, etc., their scope and technical orientation have delimited their use outside the research community.

Web services (such as WSDL or REST services) are seen as IT entities. Nevertheless, the Internet of Services (IoS) also embrace what we call IoS-based services (Cardoso, Voigt, & Winkler, 2009) and requires combining and correlating business and operational descriptions with existing IT-based descriptions. While Web services define the pipeline between two companies and semantics Web services look into and explain what goes down the pipeline, IoS-based services provide capabilities to describe the business added-value of the pipeline itself.

When contrasted to Web services, modeling IoS-based services is a more complex undertaking since they are multi-faceted and must account for aspects such as legal regulations, community rating, service level agreements, pricing models, and payment need to be factored in to design a tradable entities (Cardoso, Voigt, & Winkler, 2008).

Due to the multifaceted nature of IoS-based services, their design is inherently complex. To cope with this density of facets, we conceptualize and implement the Integrated Service Engineering (ISE) framework (Cardoso, Voigt, & Winkler, 2009) (Kett, Voigt, Scheithauer, & Cardoso, 2009) and its software workbench (Scheithauer, Voigt, Bicer, Heinrich, Strunk, & Winkler, 2009) to enable the modeling and design of IoS-based services. By covering business, operational and technical perspectives, ISE provides a structured approach for service engineering. The structuring is achieved by following a separation of concerns (inspired in the Zachman framework (Zachman, 1987)) and a model-driven design.

In this chapter we present the ISE framework as two main parts. In the first part, we discuss the main characteristics of IoS-based services as an underlying motivation for the approach. Mainly, it is derived from the service concept that spans the definitions in various domains such as marketing, operations research, and information technology. The service concept allows to a generic service provisioning process that involves the actors interacting to achieve a common service goal. Then, we present the basics of the ISE framework in terms of different service dimensions and aspects required in an engineering process. ISE workbench is introduced as an instantiation of ISE framework with specific model editors and model transformations.

In the second part, we present three advanced extensions for ISE with novel techniques to guide service engineering. In this part, our contributions include: (1) techniques to model service processes using pattern matching, (2) modeling of service context, and (3) Service Level Agreement (SLA) management of composite services. The process pattern matching approach allows generating these service compositions semi-automatically by aligning business and IT. Furthermore, the semantic context modeling and service description approach provides a mechanism to enable complex service descriptions to be specified and interpreted based on context since services are subject to a vast amount of contextual information emerging dynamically during service procure-
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