Chapter VIII

Three-Point Service-Oriented Design and Modeling Methodology for Web Services Composition

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Abstract

In this chapter we present a three-point service-oriented conceptual design and modeling methodology for Web-service composition based on the object-oriented research results in model driven, existence dependency relation, object-oriented development (MERODE) method. Thus, on the concept level, we first clarify the research issue on the semantic consistency of Web-services composition, and on the logic level, we precisely define and demonstrate the semantic consistency of Web-services composition using some standard schemes of an order-handling system. Afterward, we establish a service model using formal techniques, and define the formal semantics of services interactions and formal historical semantic conform-
ances within Web-services interactions and composition on the conceptual system level. These aspects of research results can effectively and significantly tackle one big inhibitor of Web-services adoption: the lack of semantic consistency in business processes within Web-services interactions and composition.

Introduction

Web services have emerged as a new paradigm for loosely coupled distributed computing on the World Wide Web. This new paradigm aims at spanning organizational boundaries and interacts over the open Internet through the use of standard protocols. These standards include messaging formats (SOAP, simple object access protocol); interaction definitions (WSDL, Web service description language); and universal description, discovery, and integration (UDDI), which provide rudimentary mechanisms for defining interactions amongst services that may be located in different organizations. In order for Web services to realize their full potential and become widely accepted, researchers must tackle a number of important challenges and solve some major research issues, which include various aspects of Web-services composition. Web-services composition allows us to combine some existing Web services into a new, value-added Web service. During the Web-services composition, if we have two Web services that do not know each other in the open Web environment, but we prefer or need them to be combined into an advanced value-added Web service, then we will meet at least two apparently simple but profound research issues: The first one is how to combine these two Web services, and second one is how to deal with the semantic consistency between the two Web services, which means how to keep two Web services consistent when the involved Web service has changed. These two research issues are interesting and important in the field of Web-services composition. These aspects of research results can effectively and significantly tackle one of the three main inhibitors of Web-services adoption and acceptance: the lack of semantic consistency in business processes such as ordering, shipping, or billing within Web-services interactions (Shirky, 2002). Correspondingly, three research questions may be raised.

• **Question 1**: Does there exist a kind of semantic consistent relationship (or semantic constraints) within Web-services interactions in addition to the semantic consistency in terms of uniform data interpretation (we call this uniform data interpretation the first layer of semantic consistency within Web-services interactions)?

• **Question 2**: What is this semantic consistency in the context of Web-services interactions?