Preface

The rapid adoption of Web services is motivating a paradigm shift in enterprise structure from the traditional single entity to a collaboration of Web services. Such enterprises will open the door of entrepreneurship to all Web users by facilitating functionality outsourcing on the Web. Required functionality may be outsourced to third party Web-based providers through service composition. A *composed* Web service is an on-demand and dynamic collaboration between autonomous Web services that collectively provide a value added service. Each autonomous service specializes in a core competency,which reduces cost with increased quality and efficiency for the business entity and its consumers.

A Long term Composed service (LCS) has a long term business objective and commitment to its customers. It has attracted significant attentions since it empowers a business to offer value-added and customized services to its customers. To realizing LCSs, it is essential to deal with changes during their lifetime. Due to the dynamic nature of Web service infrastructure, changes should be considered as the *rule* and managed in a structured and systematic way. Changes can be classified into two categories: *top-down* and *bottom-up* changes. Top-down changes are initiated by the business entity. They are usually the result of business policies, business regulations, or laws. Bottom-up changes are initiated by the outsourced service providers. They are usually the result of an error, an exception, or an alteration in a Web service. Web services may change their features independently without the consent or knowledge of the LCS that utilizes their functionality. Once a change occurs, a LCS must react in a reasonable time and realign itself to deal with the change. This alignment must be performed in an automatic manner considering the frequent occurrence of the changes to an LCS. By doing this, the LCS can not only deal with unanticipated changes to the underlying services and infrastructure, but also maximize its market value, optimize functionality outsourcing, and maintain competitiveness.

In this book, we propose an end-to-end framework that manages both top-down and bottom-up changes. We first define semantic support that provides

the necessary grounding semantics to support the automation of change management. We then propose a supporting infrastructure for a LCS, which is based on a so-called LCS schema. The LCS schema gives a high-level overview of a LCS's key features. It allows a structured and disciplined way to manage changes. For top-down changes, we propose a change management language, SCML, to specify the changes in a formal, declarative, unambiguous, and complete way. We then propose a process of change enactment which implements the change language. We also propose a process to verify the process of change enactment which ensures that the correctness of a LCS has been maintained. Considering that there may be multiple candidates for the result of change management, we propose an optimizing process to achieve the "best" result. For bottom-up changes, we propose a petri net based change model. We first propose a taxonomy of bottom-up changes, which classifies them into different categories. Based on this taxonomy, different change functions are then defined. These changes are then mapped using petri nets. Since bottom-up changes are usually disruptive and unplanned, we propose a change detection process. Detection involves a service agent that monitors the member Web service. Each change type has an associated set of rules for detection. Once a bottom-up change is detected, it will be promptly and accurately propagated through the LCS for reaction. All affected components of the LCS will be informed of the change within a reasonable time frame. Every change that is communicated to the LCS initiates a reactive process. We propose a set of reaction rules to support this process. The reaction rules specify the course of action for the LCS to manage the change.

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