Test and Analysis of Web Services

Luciano Baresi · Elisabetta Di Nitto (Eds.)

# Test and Analysis of Web Services

With 140 Figures and 15 Tables

Springer

*Editors*

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To the contributors of this monograph
and to our super heros

# Preface

Web services provide a well-known and language-independent infrastructure for integrating heterogeneous components. Their neutral XML-based standards, along with supporting technology, help us federate components implemented using different programming languages and running on different platforms into a single, coherent system. Web services are a key breakthrough to support the openness, heterogeneity, and flexibility of modern software systems, but there is still a big gap between the underpinnings of the architectural style and its supporting technology. The architectural style embodies dynamism and flexibility, while supporting technologies are still static and rigid. If we concentrate on the main standards proposed to implement the service oriented paradigm, they tend to emphasize interoperability rather than the capability to accommodate seamless changes at runtime. In contrast, many research initiatives are pushing toward the runtime discovery of services and then their dynamic selection. These approaches assume that service discovery—maybe based on some ontologies—can happen while the application executes and thus any possible fault or need to change the intermediaries can be dealt with while the system evolves. These ideas move toward the concept of *self-healing* systems, but also pose new and challenging requirements for the validation of applications heavily based on Web services.

In this monograph, we thoroughly analyze this problem and we try to address its many facets. First of all, since Web service compositions are inherently distributed systems, their validation must not only consider the functional correctness of the different elements, but also tackle the usual problems behind distribution. The composition (of Web services) must not only be fast enough, to properly support users, but also be trustable, secure, and reliable. All these aspects, just to mention the most important ones, tend to widen the usual idea of validation where *functional* and *non-functional* quality dimensions have the same importance for the actual use of the application. Some problems, which were usually addressed before releasing the application, must now be considered while the application executes. The design-time validation of these applications in most cases can only provide some necessary conditions

for the actual correctness of the application, while the sufficient conditions must in many cases be studied at runtime.

Given this wide spectrum, and also the relative novelty of the field (i.e., the testing and analysis of Web services), we have tried to conceive a monograph that addresses the different aspects of the field by presenting some state-of-the-art analyses and some interesting approaches proposed by significant research groups—both from industry and academia—worldwide. The different contributions are organized around three main dimensions: (1) static analysis, to acquire significant insights on how the system is supposed to behave, (2) conventional testing techniques, to sample the actual behavior of the system, (3) monitoring, to probe how the system behaves in operation and recovers from anomalous situations if needed. The final part emphasizes specifically the importance of non-functional cross-cutting aspects in the context of web service compositions.

We invite the reader to see this book as a first attempt to provide an organized presentation of what web service validation means in these days. We did our best to cover all the different dimensions, but we are also aware that the novelty and freshness of the field may have produced new and further approaches during the elaboration of this volume. We do hope, indeed, that this initial contribution will pave the road for a more complete and organic book on the subject.

Finally, we warmly thank all the contributors, whose work and ideas are the contents of this volume, the reviewers, who contributed to improve the quality of the different chapters by providing fundamental and constructive advices, and, last but not least, Springer, for their support to the project and for trusting us.

Milan,
March 2007

*Luciano Baresi*
*Elisabetta Di Nitto*

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