

## Chapter 7.13

# Profiling of Web Services to Measure and Verify their Non-Functional Properties

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### ABSTRACT

The following chapter focuses on the problem of the proper definition of non-functional properties and methods that may be applied in order to estimate their values. First of all, a reader is familiarized with the concept of non-functional properties and different views on the quality of Web services. Then, selected approaches to obtain values of non-functional properties are presented. The focus of attention is Web services profiling that seems to be one of the most promising methods to perform this task. The framework presented in this chapter was implemented and tested within the EU Adaptive Services Grid project.

DOI: 10.4018/978-1-60566-042-4.ch005

### INTRODUCTION

The paradigm of service-oriented architecture (SOA) is currently one of the most popular approaches followed by modellers and IT developers in order to build IT systems. The potential of SOA is being strengthened by the growing popularity of Web services technology. Web services allow for encapsulation of business functionalities provided using IT infrastructure and easy integration with other systems via standard communication protocols. Globalization, along with a tendency to outsource some activities, boosts the exploitation of Web services in enterprise applications.

One of the essential elements needed to ensure the success of Web services (as well as Semantic

Web services) technology is a proper Web service description to be used not only in order to invoke a Web service, but also to discover it and perform composition. The common agreement is that a Web service should be represented by its surrogate, describing its functional, non-functional, and behavioural characteristics. The functional features focus on what a Web service does, the non-functional ones on how it does it, and the behavioural ones inform us which parties are involved in the process of service provisioning. Whereas, there seems to exist a common agreement on how the description of the functional and behavioural properties of a service should look like and its role in Web services' interactions; there is still an ongoing discussion about the scope and the methods that should be used to express the non-functional side of a Web service.

Within the last few years, a number of different approaches to define non-functional properties and quality of service (QoS) models for Web services have been proposed. Each of them defines a different set and understanding of non-functional properties as well as QoS features. Yet, as shown in this chapter, these initiatives are still not mature enough as they focus mostly on the technical aspects of a Web service and, in most cases, disregard the business ones. Another problem that appears, once the model of non-functional properties is defined, relates to the methods that can be utilized in order to obtain values of defined properties. Various techniques to carry out this task were proposed. They differ in terms of reliability, trustworthiness, as well as the issue of continuous provisioning of up-to-date values of parameters.

The following chapter focuses on the problem of definition of non-functional properties and methods to estimate their values. The special focus is assigned to the Web services profiling, being, in our opinion, one of the most promising methods to perform this task. The chapter is organized as follows. First, we present our understanding of non-functional properties and quality of service.

In the following section, the methods to compute values of non-functional properties are discussed. The following section outlines current methods to compute values of non-functional properties. Then, the concepts of service profiling, service profile, and its elements are presented. Moreover, in this section we also describe the technical details of service profiling system implemented within the Adaptive Services Grid project. Finally, the summary follows.

## **NON-FUNCTIONAL PROPERTIES OF WEB SERVICES**

To fully exploit the advantages of Web services technology, as indicated in the introduction section, their proper description is required. The common agreement is that a Web service should be represented by its surrogate, providing information on its functional (what a Web service does), non-functional (how it does it), and behavioural characteristics (which parties are involved in the process of service provisioning). However, before the initiatives in the area of Web services description are presented, differences between a service and a Web service, being crucial for our further discussion, need to be mentioned.

A service is usually defined as a provision of value in some domain (Preist, 2004) or seen as a business activity that often results in intangible outcomes or benefits (Baida, Gordijn, Omelayenko, & Akkermans, 2004). Let us consider an example of a person who wants to buy a book on knowledge representation published by Springer. The service this person is looking for is the provisioning of books with the specified constraints. A provision is in fact independent on how the supplier and provider interact (Lara & Olmedilla, 2005), that is, it does not really matter at this point whether the requester goes to a bookshop or uses the Amazon.com portal to buy the book of interest.

A Web service in turn may be defined as a computational entity accessible over the Internet

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