Web Service Response Time Monitoring:
Architecture and Validation

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Abstract. Web services are used in many Web applications in order to save time and cost during software development process. To peruse Web service response time, a suitable tool is needed to automate the measurement of the response time. However, not many suitable tools are available for automatic measurement of response time. This research is carried out in the context of quality of Web services in order to measure and visualize Web service response time. The method proposed in this research for accomplishing this goal is based on creating a proxy for connecting to the required Web service, and then calculating the Web services response time via the proxy. A software tool is designed based on the proposed method in order to guide the implementation that is still in progress. The tool can be validated through empirical validation using three test cases for three different Web service access situations.

Keywords: Web Service, Web method, performance, response time.

1 Introduction

Nowadays, the Internet is an important phenomenon in human life and the number of its users is growing fast. It supports human interactions and connections with information and data in textual and graphical styles. It provides many services for its users. Web services are one of the recent important innovations in software that bring many consequences in software design and implementation. Web services are used in many Web applications that provide services such as searching and buying goods with the best quality and price, booking and coordinating plane tickets or hotel rooms, reading online newspapers and books, transferring files, and many more. The services are provided through Web sites and Web services. However, since quality is becoming an important issue in software, the Web sites and Web services should be monitored in order to provide high-quality services.

Monitoring is defined as the process of data extraction during program execution [1]. There are a number of tools for monitoring Web sites and Web services; some of them monitor hardware, others monitor software, and there are some tools that monitor both hardware and software (hybrid monitors) [2]. Monitoring Web sites and Web services enables users and developers to identify their features in order to compare them and select the best ones to use. Moreover, after monitoring, users can also recognize the current and potential problems of Web sites and Web services.
Then, these users will be able to solve/avoid these problems in order to produce higher-performance applications and reduce weaknesses of their products.

Measuring response time of Web services facilitates finding and correcting the cardinal and fundamental problems that affect response time. The ability to rectify problems quickly and improve Web services response time encourages Web developer to use these Web services. Monitoring Web service response time helps users to select better Web services in times of their response time.

2 Background

The Internet is an important and huge source of information that affects human lives. Different types of information on the Internet such as text, graphics, images and multimedia increase the attention of different kinds of users in order to work with the Internet. Such information is usually stored on servers. Software developers develop Web applications and Web services for users to access this information.

Web services and Web applications have similarities and differences between each other. Web applications are designed for browsers (standalone applications) while Web services are designed to be (re)used applications. Since Web services are always used by other applications, they do not need to have user interfaces [3]-[4]. As a result, when a Web application is designed to use a Web service to fulfill some of its functionalities, the Web application response time will be dependent on the Web service response time.

Response time of a Web service is defined as the sum of transmission time and processing time. Processing time is measured as the time for processing a request. In the context of Simple Object Access Protocol (SOAP), processing time is the period from the point where a SOAP message arrives at the engine, until a corresponding SOAP response message is sent using a reply activity [5]. Meanwhile, Transmission time is the time from when client sends the request until server receives it, plus the time from when the server sends the response until client receives it. As a result, response time is the time needed to process a query, from the moment of sending a request until receiving the response [6].

The performance of a Web service is considered as an important issue for its users [7]. If a user feels that the performance of the service he/she uses is poor (like long response time), then he/she will try to find another service with better performance. Since Web service monitoring, calculates the response time and analyzes its results, then users will be able to make suitable decisions about choosing the best Web service that conforms to their requirements.

One way to prove the abilities of Web services is using the tools for checking their performance, especially response time. This research presents a method to measure Web service response time, and a designed tool based on the presented method. This tool is useful for Web service providers to prove the ability and the performance (short response time) of their services to their existing customers, and encourage them to use or continue using these Web services. The tool will also enable potential customers (usually Web application designers) to select and use suitable Web service. Another benefit of the tool is that it facilitates testing Web services after they are implemented. It is useful for Web service designers, developers, and testers to find out the response time of the Web service in order to identify critical performance points.