A Comparative Study of Web Service Testing Tool

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***Abstract*- Web services are continuous evolving technologies which are outcome of gradual improvement of internet services. Day by Day web services are getting more complex but publically accessible and usable. They are built using Extensible Markup Language (XML) and Simple Object Access Protocol (SOAP). Performance Testing of Web Services is different from other application testing. The performance of the real time network can be measured by QoS measurement, which can be facilitated by these tools. This paper describes three most popular open source tools and comparative study of web service testing tool is done for the parameter response time and throughput.**

***Keywords:* - Web services testing tools, Open-source software, Soap, Performance.**

I. INTRODUCTION

A web service is any piece of software that makes itself available over the internet and uses a standardized XML messaging system. Web services are XML-based information exchange systems that use the Internet for direct application-to-application interaction. These systems can include programs, objects, messages, or documents. The interface hides the implementation details of the service, allowing it to be used independently of the hardware or software platform on which it is implemented and also independently of the programming language in which it is written. Web services can be used to communicate within heterogeneous networks since the communication is handled by using Simple Object Access Protocol (SOAP) messages which is build up by using an XML schema that may be used to call remote services or exchange data.

A web service has been characterized by the W3C consortium using the following definition:"A web service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-process able format. other system interact with the web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other web –related standards

Fig.1: Web Service Roles, Operations and Artifacts

The web services architecture is based upon the interactions between three roles: service provider, service registry and service requestor and three operations: publish, find and bind. Together, these roles and operations act upon the web services artifacts. Figure 1 shows the major roles, operations and artifacts within the architecture of the web services.

Roles in Web Services Architecture

1) Service provider: From a business perspective, this is the owner of the service. From an architectural perspective, this is the platform that hosts access to the service.

2) Service requestor: From a business perspective, this is the business that requires certain functions to be satisfied. From an architectural perspective, this is the application that is looking for and invoking or initiating an interaction with a service. The service requestor role can be played by a browser driven by a person or a program without a user interface, for example another Web service.

3) Service registry: This is a searchable registry of service descriptions where service providers publish their service descriptions. Service requestors find services and obtain binding information (in the service descriptions) for services during development for static binding or during execution for dynamic binding.
For an application to take advantage of web services, these three operations are important. In "publish" operation a service description needs to be published so that the service requestor can find it. In the "find" operation, the service requestor retrieves a service description directly or queries the service registry for the type of service required. In the "bind" operation the service requestor invokes or initiates an interaction with the service at runtime using the binding details in the service description to locate, contact and invoke the service.

The Quality of Service (QoS) provided by each depends on various parameters such as response time, throughput etc. These parameters create a study which can be compared to evaluate the quality of product. Response time is the time in which the system responds for a particular transaction request. It is an interval between request and first response that is received by the user. The study in this paper is based on Simple Object Access Protocol (SOAP) web services. Simple Object Access Protocol (SOAP) defines a protocol specification which is used to exchange structural information over a computer network.
The organization of this paper consists of following sections: Section I Lays the Basis of The Study, Section II Provides an overview of Testing Tools considered for study, In Section III Comparative Study of the Selected Tools has been given. Section IV describes the result and discussion and Section V Concludes the study along with scope for future work.

II. Testing Tools: A Brief Overview

Software testing is an important to determine the quality of the software. The main aim of testing is verification, error detection and validation in order to find the problems and fix them to improve the quality of the software products. Quality of the product is evaluated by comparing the observed test results with expected results. Testing Tools automate the process of testing and are targeted to specific test environment. The environment may be functional, performance or exceptional testing etc. Functional testing tools are used to test the web application that involves the GUI. Various functional testing tools are available for testing the web application GUI object and functionality automatically. For this research four open source web service testing tools such as Apache Jmeter, Soapui Pro, and Wizdl have been used to evaluate and validate the testing tools.

A. Apache Jmeter

Apache Jmeter is developed by Apache Software Foundation (ASF). Project that can be used as a load testing tool for analyzing and measuring the performance of a variety of services, with a focus on web applications. Jmeter can be used as a unit test tool for JDBC database connections, FTP, LDAP, Web services, JMS, HTTP, generic TCP connections and OS Native processes. It can be used for some functional testing as well. Jmeter architecture is based on plug-in. Most of its "out of the box" features are implemented with plug-in. Off-site developers can easily extend Jmeter with custom plug-in.

B. Soapui Pro

Soapui Pro developed by Smart Bear under the General Public License (GNU) is an open source web service testing tool based on java work. It supports Mac, windows and UNIX operating system (cross platform). Its GUI is easy-to-use that makes it simple to work with Soap and Rest based web services. Soapui pro offers more usability and efficiency. It contained everything that existed in Soapui and added productivity and time saving features.

C. Wizdl

Wizdl that allows you to quickly import and test web services within the comfort of a Windows Forms GUI. The complex web services that take arrays and nested objects as parameters can be called by it easily. The tool provides the facility of storing data in XML file format which can be later used for regression testing.
Table 1 shows comparison of selected tools on the basis of application support, programming language, OS support, license etc.

TABLE 1
ANALYSIS OF SELECTED TOOLS ON THE BASIS OF PLATFORM, VERSION AND USAGES

Sr. No.	Tool Name	Application Support	Programming language / Framework	OS Support	License	Developer	Website
1	Apache Jmeter	Web services /Web applications	Java, JRE1.5+	Cross Platform	Apache License 2	Apache Software foundation	http://jmeter.apache.org/
2	Soapui pro	Web services	Java, .Net	Cross Platform	BSD	Eric Araojo	http://www.wcfstorm.com
3	wizdl	Web services	Java, .Net	Cross Platform	GPLv2	-----	www.wizdl.codplex.com

III. Comparative Study of the Selected Tools

This section represents the comparison of four open source web service testing tools along with their observed results. The comparison can add to help for the researcher to determine the efficiency of suitable test tool for their needs. Stock quote web service is used to compare the selected test tools.

A. Environment used: All the tools are executed on an Intel Core i3, 2.7 GHz processor machine with 3GB RAM, Microsoft Windows 8 with the internet speed 2mbps. The comparison is made between three tools with the same script recorded with the tool itself. Testing of the tools require installation, setting up test environment, then selecting the parameters and analytical survey. The sample website delayed stock quote WSDL is tested on the selected tools.

B. Approach Followed: The tests were conducted at the same instance of time at a same network speed. All the tools are executed simultaneously to record the requests through the browser with the help of a proxy server. This recording will act as a script for tests. These tests are performed on the same site which acts as an input to the tool. When the tests are performed, different parameters like response time and throughput are retrieved. The performance of the tool was evaluated on the basis of performance parameter called response time. According to the response time best tool is selected from them.
The observed results showed that each tool had its own architecture and internal processes which form the basis of comparative study of tools in terms of response time. The observed response time of various tools is shown in Table 2 and 3.

Table 2. Presents the values of different parameters as obtained by the tools first time

Sr.no	Tool name	Response time	Throughput	Latency
1	Apache jmeter	1150	1.664/min	1148
2	Soapui	1120.45	-	-
3	Wizdl	1016.32	-	-

It can be observed from Table 2 that for Wizdl response time is minimum i.e.1016.32 ms as compared to soapui and
Apache jmeter while Apache Jmeter gives three parameters i.e. Response time, throughput and latency, wizdl and soapui only gives response time.

Table 3. Presents the values of different parameters as obtained by the tools second time

Sr.no	Tool name	Response time	Throughput	Latency
1	Apache jmeter	1461	1.655/min	1450
2	Soapui	1020	-	-
3	Wizdl	1015.36	-	-

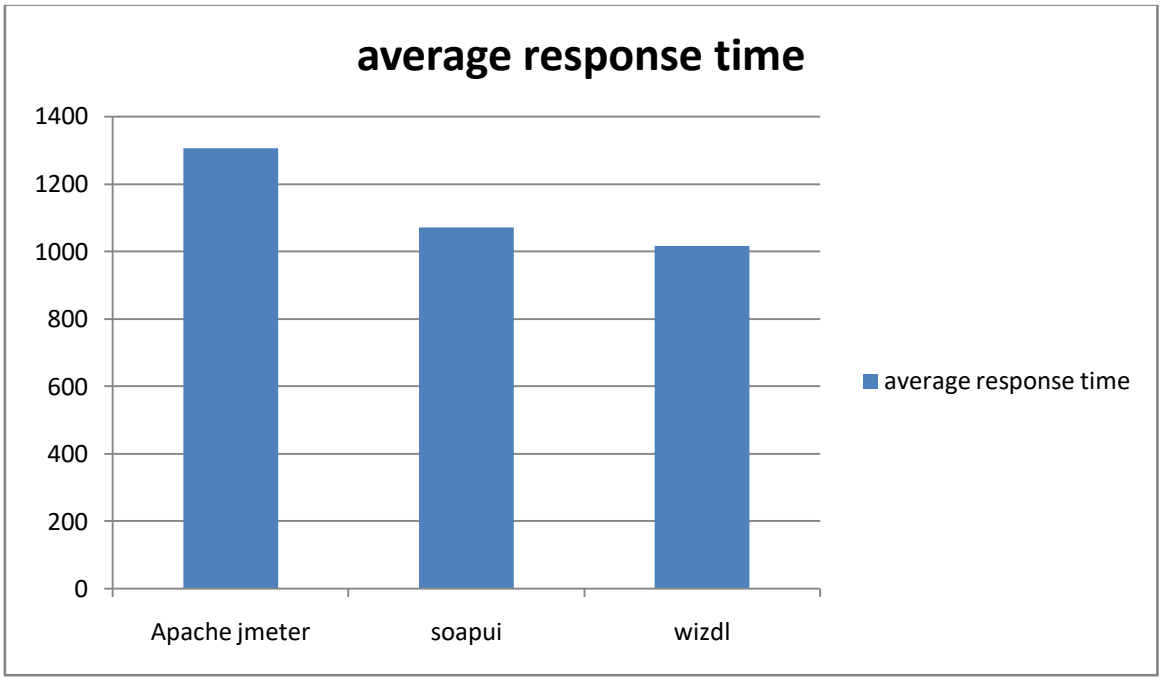
It can be observed from Table 3 that for wizdl response time is minimum i.e.1015.36 ms as compared to soapui and apache jmeter while Apache Jmeter gives three parameters i.e. Response time, throughput and latency, soapui and wizdl only gives response time.

IV. Results and Discussion

In open source web service tools i.e. Apache Jmeter, soapui, wizdl it is evident that each tool had its own architecture and internal processes which form the basis of comparison study of tools in terms of response time. The average response time observed for various tools is shown in Table 4

Table 4. Presents average response time for website

Tool name	Apache jmeter	Soapui	Wizdl
Averageresponsetime(ms)	1305.5	1070.225	1015.84



The analysis showed that response time for Apache Jmeter is better than (Soapui pro, Wizdl, Web) other tools which are used for observation.

V. Conclusions and Future Work

Web service technology has turn out to be the latest trend and provide a new model of web nowadays. Testing of web service is a challenging activity which includes many characteristics such as runtime discovery, multi organization integration, throughput, calculation of bytes and much more. The same web service has been tested for performance with these web service testing tools such as Apache Jmeter, soapui, wizdl and results has been compared. The Comparison helps in the selection of the best tool. This research work can be extended to more tools, more web services and different parameters to provide more realistic results.

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