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Benchmarking of testing tools used for web services

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Abstract
The service oriented computing (SOC) is increasing the interaction between computer applications, operating system etc., through the use of service oriented architectures (SOA). It is observed that SOC allows composition of distributed applications which are platform independent and offered at a lower cost. However, the rise in SOA has given plenty of trends in fields of web services. Therefore, rise of challenges faced by the web service on a client side are discussed along with strengths and weakness of the current web service strategies. The testing tool provides functionality for testing functions, performance, reliability and accessibility etc. The effectiveness of the proposed solutions needs to be evaluated in comparison with other existing tools. This paper discusses the previous work undertaken in the field of testing and the different testing strategies used by testing tool along with their strengths and weakness of current web services and identifying issues for future. The various testing tools used for web service testing are discussed further thoroughly. The testing strategies used during the process of web service testing are explained. The review of the research have discussed about its types, different practices, trends and technologies but there is no specific benchmarking of the same available which explains its strength and weaknesses. This comparison further helps to identify the suitable tool for the specific application.

Keywords: SOC, SOA, Web service, testing tools

I. Introduction

A service-oriented architecture is a design pattern in computer software where in application components, with the help of communication protocol provide services to other components. These paper further summaries about the SOA and web services (Section II). The various testing tools used for web service testing are discussed in Section III. Section IV explains about different testing strategies used for Web Services. Section V shows study on benchmarking of tools used for Web Services based on Section III and IV. Finally, Section VI is devoted to conclusion.

II. Basic Concepts

Further section explains about SOA and web services in detail.

A) Service Oriented Architecture (SOA)

Service-oriented architecture (SOA) is application design pattern in which service or functions are explained in detail and they are explained with the help of description language and they have interfaces which we can invoke as and when needed [11]. Normally SOA is based on collection of services and which helps for communication. The communication will happen for passing the data from one remote location to other and also it could involve two or more services coordinating some task or activity. To understand the concept of SOA we need to understand the concept of Service. A service is a kind of mechanism or function that is well defined, self-contained and does not depend on the context or state of other services [6].

B) Web Services

A Web services is a congregations of open protocols and standards used for exchanging data between applications or systems. The web services are self-contained, modular, distributed, dynamic applications that can be described, published, located or invoked over a network, which helps to create products, processes and supply chains as per the requirement. This application may be local, distributed or web-based. Web services are built on top of few open standards i.e., TCP/IP, HTTP, Java, HTML and XML and depending upon the usage and need we need to select the open standards [7].
XML and HTTP are the primary components of web services and normally web service works with following components: [7].
SOAP (Simple Object Access Protocol)
UDDI (Universal Description, Discovery Integration)
WSDl (Web Service Description Language).

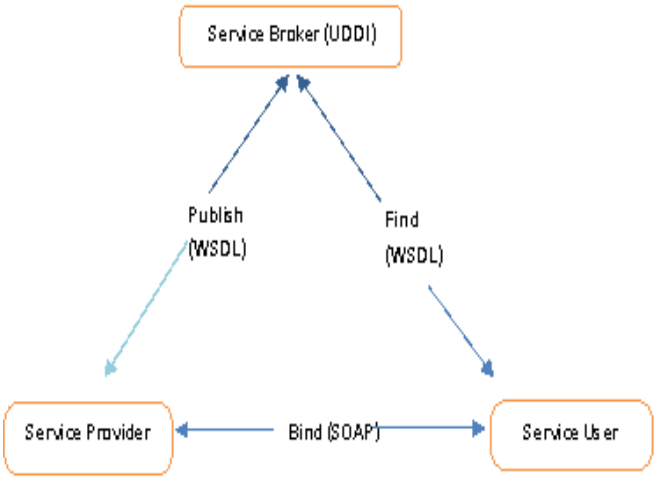

Fig 1: Web Service Architecture

i. Simple Object Access Protocol (SOAP) :

SOAP is an XML based protocol for exchanging information between any type of application and also with the support of different types of operating system. The communication between application and operating system is being achieved with the help of Hypertext Transfer Protocol and its Extended Markup Language. SOAP is language independent. SOAP has its own standards and it is being recommended by W3C.

ii. Universal Description, Discovery Integration (UDDI) :

UDDI was built into Microsoft.NET platform and is a platform independent framework for describing the services, finding and integrating by using Internet. It works as like a directory for saving information about the web services. It is a directory of web service interfaces described by WSDL. It communicates via SOAP. UDDI uses World Wide Web consortium (W3C) and Internet Engineering Task Force [8].

iii. Web Service Description Language (WSDL):

Web services description language is the standard format for describing a web service in a XML format. It also describes how the operations will be performed. WSDL acts as an integral part of UDDI. It outlines about how to interface with an XML based services. WSDL is recommended by W3C [10].

III. Testing tools for Web Services

In this section various testing tools used for web service testing are explained.

A. SoapSonar Personal

SoapSonar Personal is build by Crosscheck Networks. SoapSonar has 3 editions out of which Personal edition is available for free to the users but has certain limitations compared to the paid version of the tool. The tool provides simple testing support for SOAP, XML and REST based services. This tool is easy to use as well implement. No coding knowledge provides is required to use this tool. This also support for functional, performance as well security testing. Data can be stored in XML file format which further can be used for performing regression testing. In this tool reports can be generated efficiently [19].

B. Selenium

Selenium is another type of web service automation tool, it is used to automate browser. This tool is mainly used for testing web based applications. It is also assisted by the largest browser [20].The testing tool provides the same script to run on multiple browsers and gives an option to choose your programming skills making it cross platform [21].

C. ParaSoft

Parasoft SOA test is a testing tool developed by Parasoft Corporation that Automates total testing for business and security critical transactions. This testing tool provides solutions for API testing and API integrity for enterprise applications. Application test consist in the tool provides supports for REST and Web services [22]. It follows a full life-cycle platform based on quality which delivers a consistent quality support for verifying protected, trustworthy, business process.[23].

D. SOAPUI

SOAPUI is a based on Java which is open source tool. With the help of Java Virtual Machine (JVM), itt can work under any platform. Web Services such as SOAP, REST, HTTP, JMS and other based services are mainly tested using this tool. SoapUI tests for performance, interoperability, and regression testing but mainly focuses on the functionality part.[24]

E. HP QuickTest Professional:

This software is developed by HP that helps for Automation Testing of applications and that is more specific to functional and regression testing. It comes with a user interface which can be considered as an Integrated Development environment (IDE) for the test itself. The IDE comes with a different feature which helps tester to develop a complete script that yield in successful validation of the test. Some of the features [24] have been collated in the further section.

IV. Testing Strategies for Web Services

This section explains about different testing strategies used for Web Services.

A. Black Box Testing :

In this type of testing only the functionality of an application is being testing without knowing internal working. This type of testing is applied at all level of software testing that is unit, integration, system and acceptance level [12]

B. White Box Testing :

In this type of testing internal structure of an application is tested. Internal programming steps are tested and tests are designed based on those steps only. Each path is tested separately. For each path testing separate tests are designed and executed for testing[13].This kind of testing is also called as clear testing, transparent box testing, and structural testing.

C. Functional testing :

Functional testing is a type of black box testing which focuses on a quality assurance process Testing of functions is performed by providing them input and verifying the output, hardly considering the internal structure of the program. This type of testing usually identifies about, what the system does. Regression testing is considered as a part of functional testing discussed further [14].

D. Regression Testing :

Regression testing helps to rectify new software bugs (or regression), in existing functional and non-functional areas of a system. These errors are identified once changes such as enhancement, patches or configuration changes, have been made in the software. Basically the purpose of regression testing is to look into the aspect i.e., old issues once resolved should not lead to new faults. Change in one part of the software affects other parts of the software due to this reason; we need to go for impact analysis. [15].

E. Unit Testing :

A small unit of application such as function, class, procedure or interface is tested in unit testing. Unit testing is a method by which individual units of source code can be tested and to decide part of the code is useful for further usage [16]. Drivers and stubs require to be written for unit testing. The driver simulates a calling unit and the stub simulates a called unit. [17].

F. Automation testing :

Automation testing uses a special software for controlling the execution of tests and the comparison of actual outcome with predicted outcome. In Test automation few things can be automated as a part of repetitive task in a formalized testing process which is already in place or additional testing that would be difficult to perform manually [18].

V. Benchmarking of Testing Tools for Web Services

In this section, benchmarking of testing tools used for Web Services based is explained based on the study done in Section III and IV. Here, we shall discuss and compare on the software tools used for web services. The main goal is comparison is to figure out the strengths and weakness of each tool. The descriptive study is put into a tabular form given below.

TABLE.1. Benchmarking of testing tools

Sr. No.	Tool Names	Operating System				Purpose	Drawback/Weakness	Strength
		Linux	Windows	Mac	Others			
1	SOAP Sonar	×	✓	×	-	• It allows users to perform functional and load testing and also vulnerability assessment to point out that the Web Services are reliable and robust before they are deployed. • The SOAP Sonar testing Framework is easy to deploy and helpful to do testing for functional, performance, compliance and security testing.	1. The Soap Sonar is limited to one project in the free edition software.	Unit testing & Automation tests, performance, Compliance and Security testing.
2	Parasoft SOAtest (Ver 4.5)	✓	✓	✓	✓	Its primary function is to test web services. In a variety of ways and also uses automated defect prevention technologies.	Since it is a proprietary tool it is quite expensive.	Automates web application testing, message/protocol testing, cloud testing, security testing, and behavior virtualization.
3	SOAP UI	✓	✓	✓	✓	SOAP UI is an application and framework which helps for testing of web applications and web services through automation techniques.	The major disadvantage would be that it requires knowledge of scripting language hence a non – programmer shall commit mistakes.	SOAP UI allows you to rapidly create and execute automated functional, regression and load test in a single test environment.
4	HP Quick Test	✓	✓	✓ **(B e t a)**	-	QTP is primarily used for functional and regression automated testing.	It is a commercial tool, the licensing cost is very high.	Functional and regression testing will happen through a user interface such as native GUI or web interface and automation of test cases.
5	Selenium (Web Driver)	✓	✓	✓	-	Selenium is used for automating web applications.	Expertise required in particular programming language.	Automating web applications and web based administration.

VI. Conclusion

This paper initially focuses on general concept of web services in terms of need, usage, types and testing strategies were discussed independently. As far as our objective is concerned we have taken into consideration few tools for benchmarking that includes SOAP sonar, Parasoft SOA test, SOAP UI, HP Quick Test and Selenium. Benchmarking criteria is based on few parameters like strength of the evaluated tool, it's drawbacks and respective tool used for that is mentioned under the heading of strength in Table 1.

It is observed from the evaluation of the tool that every tool has its own merits and demerits, positive and negative points. But its strength reflects through their usage which supports for varieties of testing strategies i.e, functional test, regression test, automation test, compliance test, security test etc. Normally, proprietary tools are very expensive and difficult to purchase for small scale industry personnel. Also drawback of tool may highlight the issues of language dependency and integration issues along with suitable software application.

A tool which helps to cater the need of testing team is the primary requirement in conjunction with web services and also having minimum cost, that is the need of the day.

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