A Safe Regression Testing Technique for Web Services Based on WSDL Specification

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Abstract. Specification-based regression testing of web services is an important activity which verifies the quality of web services. A major problem in web services is that only provider has the source code and both user and broker only have the XML based specification. So from the perspective of user and broker, specification based regression testing of web services is needed. The existing techniques are code based. Due to the dynamic behavior of web services, web services undergo maintenance and evolution process rapidly. Retesting of web services is required in order to verify the impact of changes. In this paper, we present an automated safe specification based regression testing approach that uses original and modified WSDL specifications for change identification. All the relevant test cases are selected as reusable hence our regression test selection approach is safe.

Keywords: Regression testing, web services, specification testing, test case selection.

1 Introduction

Web services have become center of attention during the past few years. It is a software system designed to support interoperable interaction between different applications and different platforms. A system in which web services are used is named as web services based system. Web services use standards such as Hypertext Transfer Protocol (HTTP), Simple Object Access Protocol (SOAP) [13], Universal Description, Discovery, and Integration (UDDI), Web Services Description Language (WSDL) and Extensible Markup Language (XML) [3] for communication between web services through internet [1].

Maintenance is the most cost and time consuming phase of software life cycle, it requires enhancement of previous version of software to deal with the new requirements or problems. As modifying software may incur faults to the old software, testing is required. It is very difficult for a programmer to find out the changes in software manually, this is done by making comparison of both previous test results
and current test results being run. Now the changed or modified software needs testing known as regression testing [2].

Regression testing is performed during and after the maintenance to ensure that the software as a whole is working correctly after changes have been made to it. Basic regression testing steps includes change identification in modified version of the system, impact of changes on other parts of the system, compatibility of both changed part and indirectly affected part with the baseline test suite, removing invalid test cases and selecting a subset of baseline test suite that is used for regression testing [2].

Significant research has been carried out on testing of web services [12] but there is limited amount of work on regression testing of web services. Most of the existing approaches for regression testing of web services are code based but no work is available on specification based regression testing of web services.

In web services, only web service provider has the source code and both web service broker and user only have the specification. Provider is not willing to share the source code [1]. So from the perspective of broker and user, specification based regression testing is needed. A change may occur in web service functionality or behavior with no interface change, specification will not change. But if a change occurs in interface, specification will also be changed [6]. Our focus is interface change. Further details about changes are explained in section III.

WSDL plays very important role in web services. It is an XML document used to describe web services. It has four major elements that are Types, Messages, PortType and Binding [8]. The main concern of our approach is Type element of WSDL specification [8]. WSDL specification uses an XML Schema [14], which is used to define types used by web service. XML schema defines simple types and complex types [14]. For simplicity, we will only consider higher level complex types. Complex type within a complex type is not considered because the depth of the tree increases.

We have applied boundary value analysis [10] on data type level changes and selected reusable test cases [11]. Test suite classification of Leung and white [11] is used in this paper. The proposed approach selects all the relevant test cases as reusable test cases which is explained by the help of an example. Safety is defined as all the relevant test cases are used [2].

The remaining paper is organized as follows: Section II includes related work in the area of regression testing of web services. Section III discusses the proposed approach for selective regression testing. In the end conclusion of the paper is presented in Section IV.

2 Related Work

Ruth, et al. [4] presented an approach to apply a safe regression test selection technique to Java web services. Their approach is based on Java-based control flow graph named as Java Interclass Graph (JIG). They have created JIG by performing static and dynamic analysis of code. They identified dangerous edges by comparing old and new JIG. Then they compared the table of edges covered by the tests with the set of dangerous edges to identify the tests to be performed. They provided a simulation tool.