

Integration Testing and Quality Assurance Aspects in Web-Applications

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I. Abstract:

Testing is one of the key procedures to accomplish and guarantee the nature of the products or Web based items. There are many trying difficulties required in Web-based applications. Quality assurance (QA) is a way of preventing mistakes or defects in manufactured products and avoiding problems when delivering solutions to customers. This paper presents an overview of integration testing approaches and quality assurance aspects for web applications. In programming industry diverse sort of testing methodologies are utilized by experts to settle the issues connected with incorporation which are because of continually expanding complexities of Web-based applications.

II. Keywords:

WSDL, SWS testing, SOAP (Simple Object Access Protocol) message

III. Introduction:

The systems based web is becoming more and more large and complex. A defeat of a web engineer would induce many problems. When this situation is happen, people maybe lost gradually the confidence for web and internet, which would bring on the web crisis. These crisis maybe more serious and more extensive than software crisis that software developers faced. How to improve the productivity of web system, and how to ensure the quality of web system is being the attention focus of software industry. At the same time, it is the difficulty of theoretical researched.

IV. Quality Assurance and Integration Testing Aspects in Web-Based Applications parameters in different scenarios

4.1 Analysis and Testing of Web Applications:

In this paper, UML model of Web applications is proposed for their high level representation. The proposed techniques were applied to several real world Web applications. Results suggest that an automatic support to the verification and validation activities can be extremely beneficial. In fact, all paths in the site are properly exercised before delivery.

4.2 Testing Web Applications:

This paper addressed some open issues in the context of Web Application testing, such as the problem of defining a test model, for representing the components of the application to be tested and

their inter-connections; a test strategy to create test cases from the test model; various testing levels, specifying the different scopes of the tests to be run; and a testing tool supporting the test engineer during test case design and execution.

4.3 Cooperative Agent Approach to Quality Assurance and Testing Web Software:

In this paper, it is discussed why testing web applications and quality assurance are difficult and an approach is proposed to overcome the problems. This paper applies Lehman's theory of software evolution to analyses the characteristics of web-based applications.

4.4 An Approach for Specification-based Test Case Generation for Web Services:

This paper has focused on the specification based test case generation for Web Services. A solution is proposed to this problem by providing a formal, specification-based approach for automatically generating test cases for Web Services based on the WSDL input messages parts' XML Schema data types. The role of the application builders and the brokers in using this approach to test Web Services is also described.

4.5 Research on Framework of Test Case Generation of Web Applications Based on Z Specification:

In this paper, features of Web applications, challenges faced by Web applications testing, formal methods and Z language, refinement of Z specification, a test case generation model of Web applications is proposed. In this paper, a test framework is produced through program slicing and Z specification refinement. Under this framework, test case can be generated and reduced by analyzing Z specification of Web applications.

4.6 Web Quality of Agile Web Development:

In this paper, we research several technologies of Agile WEB engineering quality. To develop efficiently the high-performance and high reliability WEB application system, it is inseparable from the quality assurance of WEB engineering. In this paper, we discuss the main difference between the traditional software engineering and WEB engineering, and define the quality of WEB engineering, user-centered and emphasized the user experience degree.

4.7 A Mobile Agent based General Model for Web Testing:

Mobile agent is a promising technology to face the problems raised by the increasing complexity and size of today's networks and web testing. In particular, in the area of web testing, mobile agent can lead to a fully distributed paradigm to overcome the limits of traditional web testing methods. Issues about web testing include load testing, stress testing, security testing, reliability testing will be studied.

4.8 Goal-based Testing of Semantic Web Services:

In this paper, an approach is proposed for SWS testing based on user goal specifications. The related work in this area and identified limitations and the research question is discussed in it. We have also discussed our proposed solution to that, including our scope and objectives. The research related to testing and quality assurance aspects of web services is not mature.

4.9 Standards-Based Middleware and Tools for Coastal Sensor Web Applications:

In this paper we adopt standardized data models based on the Open Geospatial Consortium (OGC) sensor web enablement framework for coastal sensor networks, which facilitates improved information retrieval on a variety of Spatial-temporal scales. The semantic enrichment is achieved in terms of conceptualization of selected sensor types and other terminology involved in the coastal domain in the form of Ontologies.

4.10 Test Case Prioritization for Web Service Regression Testing:

In this paper, a dependence analysis based on test case prioritization technique for Web Service regression testing is proposed. A weighted dependence propagation model is proposed to facilitate prioritization process. It is discussed that why fake dependence may happen in BPEL process and present how to eliminate them. Therefore, test case prioritization technique is required to increase the efficiency of Web service application regression testing.

4.11 Using Abstraction and Web Applications to Teach Criteria-Based Test Design:

We use this approach at our university to teach software testing to two MS-level classes and one undergraduate class each year (around 200 students total). Most of our students are working professionals. Most find that using the criteria we teach, preferably with, but even without, high quality tool support, enables them to test more effectively and efficiently. They get more "bang for the buck" and produce better software, cheaper.

4.12 Towards Testing Future Web Applications:

In this paper, the testing challenges of future web applications is investigated and a testing methodology is proposed that addresses these challenges by the integration of search based testing, model-based testing, oracle learning, concurrency testing, combinatorial testing, regression testing, and coverage analysis. This paper also presents a testing Meta model that states testing concepts and their relationships, which are used as the theoretical basis of the proposed testing methodology.

4.13 Assurance Technology of System Tests based on Operators' Aspects:

This paper based on the process of tests of a system's change, processing a test on a running system (on-line test) will lead to reduction of the effect on the operators. From the operator's viewpoint, on-line test technologies and the assurance evaluation technologies are proposed. By reducing the effect on the operators through introducing proper on-line tests by using this evaluation technology, smooth changes of systems are enabled and improvement of assurance is achieved.

4.14 Waiting Times in Quality of Experience for Web-Based Services:

In this paper they outlined structure and content of our tutorial on waiting times in quality of experience for web based services. Our examples show, that the study of waiting times in the context of interactive applications is a timely and relevant topic that is addressed best in an interdisciplinary fashion. Like QoE, time perception is highly subjective and context-dependent, but also adheres to certain fundamental principles. In this respect, the logarithmic relationships between waiting times.

4.15 Web Application Testing in Fifteen Years of WSE:

This paper reported a survey of articles about the Web testing topic presented in the past editions of the WSE symposium. This survey showed that the WSE community gave itself an important contribution to this field. We are sure that these researchers will be able to provide further important insights in the future scenarios of Web application testing too. New paradigms, architectures, and technologies for developing Web-based systems continuously emerge and transform this specific context.

4.16 Optimizing Quality Assurance Strategies through an Integrated Quality Assurance Approach:

This paper presented the integrated quality assurance approach In QA, which aims at guiding quality assurance activities. Various QA techniques can be integrated to address different objectives, such as higher defect detection or improved efficiency. It is demonstrated the calibration of the approach by discussing seven scenarios that consider different pieces of information to predict which QA techniques to perform next.

4.17 Performance Evaluation of Web Based Automation Testing Tools:

In this paper it is discussed about the selenium suite. It provides testers with different framework for different test cases. The main objective of this paper is to find the best tool in selenium suite and then compare it with some other tool for same task.

4.18 Analysis for Cloud Testing of Web Application:

This paper discusses the benefits of testing based on cloud computing. And feasibility analysis is addressed for web applications to migrate software testing to the cloud. The problems associated with shift to the cloud include security, reliability, performance and manageability. Risk assessment and control due to the shift is still our concern in future work.

4.19 Web service discovery and Integration with QOS parameter using SOA based Repository:

This paper involves design and implementation of a UDDI with QOS parameter. It helps to find quality web services using SOAP (Simple Object Access Protocol) message. It serves two fold purposes; first to register quality web services. Second, find that service. A Software for the implementation of these aspects is contributed in this work.

4.20 Test Script Generation Based on Design Documents for Web Application Testing:

In this paper, an approach is proposed to generate test scripts for executing tests from design documents, and confirmed its effectiveness compared with an existing approach. Next challenge is to enhance test scripts to allow test results to be checked.

4.21 Mutation Integration Testing:

In this paper, we propose a theory and a solution for generating mutants that specifically target integration tests. We formulate a fault model for integration bugs that uses static dataflow analysis to obtain information about how integrated components interact in an application. Integration mutants are generated by applying mutation operators to instructions that lie in dataflow paths among integrated components. We implemented our approach and evaluated it on five open-source applications. In comparison to μ Java, our approach reduces the number of generated mutants by up to approximately 19 times with a strong power to determine inadequacies in integration test suites.

4.22 Performance testing as a service for web applications:

In this paper, performance testing-as-a-service (TaaS) framework for web applications is introduced which provides all performance testing activities including automatic test case generation and test execution. In addition, the proposed framework addresses many issues as: maximize resource utilization and continuous monitoring to ensure system reliability.

4.23 ER diagram based web application testing:

This paper performs testing of database design for the application using the Entity Relationship diagram for various components used in the database, the model is generated from the relational database that represents various data, entities and the relationship among them. It generates the test data in the form of semantics of the prolog facts and the rules.

4.24 Test case generation from BPMN models for automated testing of Web-based BPM applications:

This article proposes an approach to generate test cases from BPMN models, for automated testing of Web applications implemented with the support of BPM suites. The work is primarily focused on functional testing. The approach was applied to processes from a public repository and was able to generate test scenarios from different BPMN models.

4.25 Quality assurance of web services: A systematic literature review:

This study is based on an investigation of testing approaches for web services, assessment of their working based on defined criteria and research questions which are eventually helpful in addressing what type of parameters are useful to provide the best quality web services. This provides new research areas for the researcher to achieve expertise in these identified areas too. This survey is based on such techniques which have a practical

implementation in real life scenarios. Moreover, this study also provides help for the software quality assurance team to understand the existing approaches, their advantages and limitations..

V. Analysis:

In [2], [5], [8] and [16],[10],[11], [16], [22] and [24], due to integration testing, systems are not fulfilling robustness parameter, but other handles the ambiguity with the help of testing techniques.

[2], [4], [6] and [11] and [21] doesn't fulfilling the flexibility requirement because these systems are designed just for one language solely and if need to modify the whole system should be changed. But other systems are mostly presented new abstract systems that handle language overall or these papers are flexible to be modified to some nearer testing.

[5], [15], [20], [25] and [24] doesn't fulfilling the compatibility, as these are designed only for one platform only. But others can be run on different platforms.

The technique suggested in the [2] has tool support, but is for large set of data and its flexible. [20] also doesn't have tool support.

All of the systems are reusable, as these systems are techniques proposed are not for single use, these will be used again and again. All the systems are efficient in term of hardware become so advanced that all types of language and speech synthesizer are now available. [7], [20], [13], [10] and [16] are not testable, but all other systems and techniques are tested or testable.

Scalability is in all of the systems, as all of the systems are able to incorporate the new functionalities and their functionalities can be extended but with some conditions and restrictions. [2], [23], [25] and [22] are unreliable because natural language is ambiguous and hold complications and larger commands can cause the system to be unreliable. All the other techniques are reliable to some extent as these are reliable for the defined domain and paradigm.

All of the systems are productive, as most of the new techniques are proposed and as this is a new domain and module to make natural language based web-based and uses the natural language processing technique along with the web-based quality assurance and integration testing techniques both together to make the desired product.

In [6], [10], [22], [25] and [13] data locality is not applicable as these techniques are not involving the data localization.[14], [16], [4], [1], and [14] doesn't fulfilling the data locality need. [2] and [16] deals with data locality and data quality assurance and integration testing. All the other techniques used data locality only for its own domain.

So, this analysis clarifies all of the parameters role in the research papers analyzed.

VI. Conclusion:

Integration testing is one the important phase in software testing life cycle (STLC). Quality assurance of these applications is becoming more crucial and important. There are many testing challenges involved in Web applications. But most importantly integration is the most critical testing associated with Web-based applications. There are number of challenging factors involved in integration testing efforts. These factors have almost 70 percent to 80 percent impact on overall quality of Web-based applications. In software industry different kind of testing approaches are used by practitioners to solve the issues associated with integration which are due to ever increasing complexities of Web-based applications.

Table 1: Evaluation Criteria
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Evaluation Parameters	Meaning	Possible Values
Compatibility	System is compatible with the other elements.	Yes, No
Reusability	Proposed technique is reusable or not.	Yes, No
Testability	Proposed design tested or not.	Yes, No
Portability	Software can run on different platform or system can run for different language.	Yes, No
Efficiency	System is efficient in terms of hardware resources or not.	Yes, No
Scalability	New functionality can be added to the system or not.	Yes, No
Tool support	Tools are available for the proposed model or not.	Yes, No
Security	The proposed technique is able to detect and correct errors or not.	Yes, No
Reliability	System is working or not till the time line is given.	Yes, No
Productivity	The proposed technique increases productivity or not	Yes, No
Data Locality	System do the memory quality assurance and integration testing for data storage or not	Yes, No
Flexibility	System is able to accept change or not.	Yes, No
Robustness	System is able to handle erroneous inputs.	Yes, No

Table 2: Parameter Evaluation for quality assurance and integration testing in web-based applications

S#	Authors	Compatibility	Reusability	Testability	Portability	Efficiency	Scalability	Robustness
1	Yan Zhou and Haitian Xie	Yes	Yes	Yes	No	Yes	Yes	Yes
2	F. Ricca and P. Tonella	Yes	Yes	Yes	Yes	Yes	Yes	No
3	Hong Zhu	Yes	Yes	Yes	No	Yes	Yes	Yes
4	S.Hanna And M.Munro	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	M. Youxin, W. Dafa and D. Junwei	No	Yes	Yes	No	Yes	Yes	No
6	R. Hu, Z. Wang, J. Hu, J. Xu and J. Xie	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	H. r. Wang, Y. Li and X. j. Li	Yes	Yes	No	Yes	Yes	Yes	Yes
8	M. S. Jokhio	Yes	Yes	Yes	No	Yes	Yes	No
9	S. S. Durbha	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	L. Chen, Z. Wang, L. Xu, H. Lu and B. Xu	Yes	Yes	No	No	Yes	Yes	No

11	M. Matsumoto	Yes	Yes	Yes	Yes	Yes	Yes	No
12	J. Offutt, N. Li, P. Ammann and W. Xu	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	S. Egger, T. Hossfeld, R. Schatz Fiedler	Yes	Yes	No	No	Yes	Yes	Yes
14	L. Xiao, C. K. Chang, H. I. Yang, K. S. Lu and H. y. Jiang	Yes	Yes	Yes	No	Yes	Yes	Yes
15	A. R. Fasolino, D. Amalfitano and P. Tramontana	No	Yes	Yes	Yes	Yes	Yes	Yes
16	L. Xiao, C. K. Chang, H. I. Yang, K. S. Lu and H. Jiang	Yes	Yes	No	No	Yes	Yes	No
17	R. Angmo and M. Sharma	Yes	Yes	Yes	No	Yes	Yes	Yes
18	J. Cai and Q. Hu	No	Yes	Yes	Yes	Yes	Yes	Yes
19	V. K. Tiwari, A. K. Gautam and S. Diwaker	Yes	Yes	Yes	Yes	Yes	Yes	Yes
20	H. Tanno and X. Zhang	No	Yes	No	No	Yes	No	Yes
21	Mark Grechanik	Yes	Yes	Yes	No	Yes	Yes	Yes
22	A. Ali and N. Badr	Yes	Yes	Yes	Yes	Yes	Yes	No
23	S. Begum and C. P. Indumathi	Yes	Yes	Yes	Yes	Yes	Yes	Yes
24	J. L. de Moura, A. S. Charão, J. C. D. Lima and B. de Oliveira Stein	No	Yes	Yes	No	Yes	Yes	No
25	G. Saleem, F. Azam, M. U. Younus, N. Ahmed and Li Yong	No	Yes	Yes	Yes	Yes	Yes	Yes

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