

IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

VOLUME : 2 ISSUE : 2 Print / Issue Publication Date: 27-Jan-2017

ISSN : 2455-2143

Indexed In

Google SCHOLAR OPEN ACCESS doi Crossref

WWW.IJEAST.COM

editor@ijeast.com

International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 2, Issue 2, ISSN No. 2455-2143, Pages 113-116
Published Online December-January 2016 in IJEAST (http://www.ijeast.com)



SOFTWARE TESTING TECHNIQUES AND STRATEGIES

Rajendra Kumar

Abstract— **Software Testing is a technique of finding errors while executing a program so that we will get a zero defect software. It's aimed to evaluating the usability of a program. Software testing is an important feature of accessing quality of software. Software testing provides a means to reduce errors, decrees maintenance and overall software costs. Most of the problems within software testing area is how to get a suitable set of cases to test a software system. Though a lot of advancements have been done in formal methods and verification techniques, until the software will need to be fully tested before it could be handling out from the customer side. Thus there are different type of techniques and tools made to accomplish the task. Software testing is most important area of research and development has been made in this field. In given paper, different type of testing techniques and tools described. Some latest researches have been summarized.**

Keywords— **Software testing, Software Testing Goals, Software testing strategies, Software testing principles, Software Testing Methodologies**.

I. INTRODUCTION

Software testing is more than just error detection; Testing software is operating the software under controlled conditions, to verify that it behaves "as specified"; to detect errors, and to validate that what has been specified is what the user actually wanted. Software testing evaluating the software with intention to find an error in it. Software testing is a process which aimed to evaluating capability of a program and determining to its meets quality. It is also used to test the software for other software quality factors like reliability, usability, integrity, security, capability, efficiency, portability, maintainability, compatibility etc. For much long time now we are still using the similar testing techniques .Few users are crafted method rather than good intelligent methods. Testing process is less costly than testing software. Software testing here we defined some techniques and goals.

II. SOFTWARE TESTING GOALS

Software testing has following goals.

Verification and validation: Verification is a review without actually executing the process while validation is checking the product with own execution. Then code review and syntax check is verification while actually running the product and checking the results is validation. Testing used for verifying that the product or the software works as desired and validate whether the software fulfills condition laid down.

Priority Coverage: Testing should be done in convenient and effective manner within the given budget and schedule limits.

Balanced: Testing process must balance the requirements of the users and the technical limitation and user expectation.

Traceable: Documents must be prepared of development and failures of testing process. So there is no need to test same thing again.

Deterministic: We should know about what we are doing, what we are targeting, what will be the possible outcome.

III. SOFTWARE TESTING STRATEGIES

A software testing strategy is collection of various software test case and design methods of well planned sequence of steps that result in successful testing of software. Software testing strategies are more important for testing. Software testing strategy is developed by specialist, project managers and different software engineer. There are four software testing strategies:

Unit testing: Unit is smallest collection of lines of code which can be tested. Software development companies' integration and system level testing. It should also complement code reviews and process of scanning code. Unit testing also subset of white box test class.

Benefits of Unit Testing:-

1) Unit testing is very cost effective than other type of testing process.

2) It provides a much sources expanded than system level testing.

3) To be able for test parts of a project without waiting hole project data.

4) To finding the parallelism in testing being able to test and fix problems by many engineers,

5) To detect and remove defects from stages of testing,

6) The advantage of a number of formal testing techniques available for unit testing,

A number of effective testing techniques are come in unit testing stage. The testing techniques may be broadly divided into three types:

1. Functional Testing
2. Structural Testing
3. Heuristic or Intuitive Testing

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Integration testing: Integration testing in a technique for constructing the program structure at same time conducting tests to detect errors associated with interfacing. The objective is to take unit tested components and build a program structure that has been dictated by design. Different Integration testing Strategies are discussed below:-

1) Top down Integration testing
2) Bottom up Integration testing

Top down Integration: It defines testing is an incremental approach for constructing program structure. Modules are integrated by moving from top to bottom through the structure, beginning with the root or head control module. Modules subordinate to head or root control module are incorporated in structure either a depth-first or breadth-first manner. The integration process is defines series of steps:

- The main control module use as test driver and stubs are substituted for all components directly subordinate to take control module.
- Integration approach depend upon the selected subordinate stubs are replaced once at a time with actual components.
- Testing processes are conducted as each component is integrated.
- Basis of the completion of every test sets; another stub is replaced with given the real component.
- Regression testing may ensure that there is no new errors have been introduced. It is not as relatively simple as it looks.

Bottom up Integration: Bottom-up integration testing, start with single module in the bottom phase of testing. A bottom-up integration strategy may be implemented with the following steps:

- Bottom-level elements are combined into a group or clusters that perform a specific software sub function.
- Software testing process to coordinate test case input and output.
- The groups or clusters are tested.
- Tester program removed and clusters are combined upward in the program structure.

Acceptance testing: Acceptance testing is carried out in order to verify if the product is developed according there standards and specified criteria and meets all the requirements specified by customer. This type of testing is used by a customer where the product is developed externally by another party. Acceptance testing comes under black box testing methodology. User acceptance testing is most important testing by user before the system is finally delivered to the end user. Acceptance testing is also known as validation testing, quality assurance testing, factory acceptance testing and application testing etc. And in software engineering, acceptance testing is two different levels; one at the system provider level and another at the end user level.

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Software Testing Principles:

There are some different testing principles are as follows:

Test a program so as to make it fail: Testing is the process of executing a program to finding bugs and errors. Testing realized more important when failures are exposed.
Start testing early: This process helps to finding and fixing errors in the early stages of development, thus reduces the rework and time of finding the errors in the later stages.
Test Plan: Test Plan is the process of software testing to test strategy, test scope, test objectives, test environment, methods and tools to be used. Test plan should accurately meet the needs of an organization and customer.
Effective Test cases: Effective test cases must be designed to clear test results are produced. Test valid as well as invalid Conditions. This form of testing is sometimes specified as regression testing.
Test at different levels: Different testing must be done at different people and different level.
End of Testing: Testing has to be stopped somewhere. It is stopped when risks are under limit.

IV. Software Testing Methodology

Correctness testing will tells the right behavior from the wrong one. The software tester may not know the inside details of the software module under test. Therefore by taking white box testing or black box testing can be used.
Correctness testing has following three forms

1) White box testing
2) Black box testing
3) Grey box testing

Black box: it is testing strategy process based on requirements and specifications. Black box testing requires there is not any type of knowledge of internal paths, structures, or implementation of the software being tested.

White box: testing is a testing strategy based on internal paths, code structures of the software being tested. White box testing manly requires detailed programming skills.

Gray box testing: It is the combination of white box and black box testing process. This type of testing fulfills all the requirements of user.

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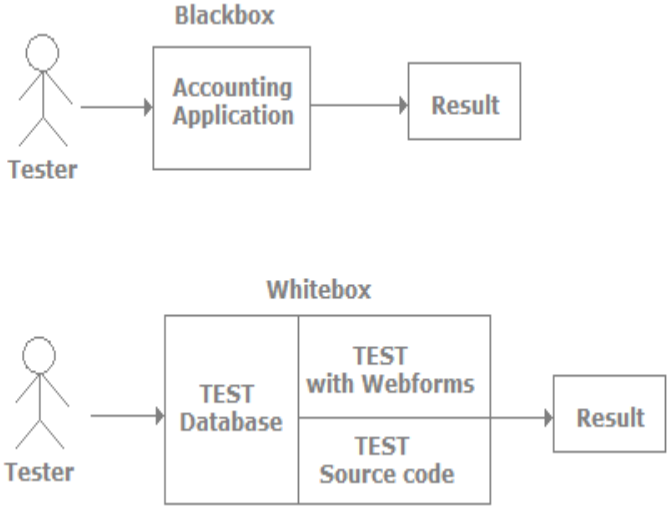


Fig.1

The above figure shows the basic function of the black box and white box testing. Black box testers view the basic of the there accounting application. While during white box testing the software tester will also knows the internal structure of the application. In most of the cases, white box testing is done by developers as they know the internals details of the application. In black box testing tester check the overall functionality of the application while in white box testing tester do code reviews, view the architecture, remove unusefull code and do component level testing. There are a number of tools available in market for software testing. Here, we are going to discuss some tools that are used for automated testing:

Ranorex: It is cost effective tool used for automatic testing. It is a better alternative in comparison to other testing tools because it tests applications from a user's demands, using standard language and common programming techniques like C# and VB.net. It does not require to understanding any type of scripting language, because it is coded in pure .net code. Any one of the three languages, VB.net, C# and Iron Python can be used. It used lot of commercial software companies and enterprises around the globe.

Rational Functional Tester: It is an object-oriented programming based automated software testing tool. It includes regression and functional testing tools with the results of black box tests in well defined scripted format. Once captured, these scripts will executed against future script builds of any application to verify that new functionalities. With the help of this tool, black box tests code can be run as well as white box tests for code bottlenecks, memory leaks or measuring code coverage.

Janova: This tool is much similar to the testing tools to others as it enables some users to automate software testing solutions and with the help of this tool it is done in a cloud too. This tool does not require any scripts to be written and are used that simplify the task of software implementation with efficient and easy to use tools. Other advantage of this tool is that its very cost effective such as $10 per month. There is no need of any type of such software to download and thus no infrastructural investment is required. Since it is used in the cloud, it has a very quick and easy setup that includes no install. This cloud based software has an easy navigation to home page.

V. Conclusion

This paper on Software testing describes in detail about software testing, need of software testing, Software testing goals and principles. . Software testing is often less required and rigorous than it should, and a main reason for that is because we have struggled to define best practices, methodologies, principles, standards for optimal software testing. To perform testing effectively and efficiently, everyone involved with testing should be familiar with basic software testing goals and principles, limitations, concepts. We further explains different Software testing techniques such as Correctness testing, Performance testing, Reliability testing, Security testing. Further we have discussed the basic principles of black box testing, white box testing and gray box testing. We have surveyed some of the strategies supporting these paradigms, and have discussed their pros and cons.

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INTERNATIONAL JOURNAL OF ENGINEERING APPLIED SCIENCE AND TECHNOLOGY

AUTHORS

Rajendra Kumar

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33	154	9,647 (IJEAST CITATIONS)	PUBLISHED MONTHLY

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