

Software Testing Fundamentals

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Abstract - In this paper we will discuss about attempts to provide a comprehensive view to field of software testing. Nowadays software has become an important part of human life. It makes human life so smooth. Many difficult and complex problems are easily handled by using software. So we must ensure that the software we are using must be free of any error or a bug. For developing a reliable, flexible and efficient software an organization must perform what we call is “Software Testing” which remains one of the most studied approaches for improving software quality.

Index terms- Bug , Assurance , Specifications , Alpha, Beta, testware

I. INTRODUCTION

Software testing is the process of execution of program and system which identify the quality and correctness of software. In software testing each module is tested under many conditions. This testing is not carried by only developers and experts but also by the customers. Every software is tested under some positive and negative conditions by automatically or manually. Here, we check for the specification, functionality and performance of the software. Testing includes its various type of levels. At each level modules of a software are tested with different set of criteria.

Software testing is essential activity in Software Development Life Cycle model. Software testing is the process of assessing the functionality and correctness of a program through analysis or execution. The testing is an important means of assessing the software to determine its quality. Since it consumes 40-50% of development efforts and consumes much more effort that require higher levels of reliability, it is a considered a significant part in software engineering.

II. WHO DOES TESTING?

• **Test Manager** : The functioning of test manager is to manage and control the software project. Test manager is the head of a testing team because

he/she supervises his/her testing team. A test manager decides the schedule and specify the test plans with his/her team.

• **Software testing engineers**: A testing engineer's job includes designing, building and implementing effective testing strategies They define the various test cases, write the required test specifications and run the desired tests.

• **Developer Engineers** : The function of developer engineers is to done first two levels of testing i.e. unit testing and integration testing. All the tests taken under unit testing and integration testing are supervised by the developer. It means the developer engineer is present at the time of testing.

• **Quality Assurance Group** : The functioning of quality assurance group is to define software testing standards and assure the quality of the software.

III. SOFTWARE TESTING ACTIVITIES

The major role of software testing involves that there should be no discrepancy in the software development process. So starting activities early means we can catch small problems before they become big problems later on. Starting testing activities early also provides the chance to review requirements for important quality attributes, to ask questions and to resolve issues.

• **Requirements study** :

1) Testing Cycle initiates with the study of client's requirements.

2) Thorough understanding of the requirements is vital for testing the product.

• **Test planning** : In software test planning , we define and prepare a brief test plan to :

1) To determine the scope and risks and identify the objectives of testing.

2) Prepare a list of items and software required for testing.

3) To implement the test policy or the test strategy

4) To determine the required test resources like people, test environments, systems, etc.

5) To schedule test analysis and design tasks, test implementation, execution and evaluation.

• **Test Design Specification** : In test design we use the test basis documents:

- 1) To identify test conditions.
- 2) To design the tests.
- 3) To evaluate testability of the requirements and system.
- 4) To design the test environment set-up and identify and required infrastructure and tools.

• **Test Operation and Execution** : In test operation and execution we take the test conditions into **test cases** and procedures and other testware such as scripts for automation, the test environment and any other test infrastructure.

• **Reporting problem** : In problem reporting we report about the problem faced during software testing when:

- 1) Maximum test cases are executed without certain pass percentage.
- 2) Bug rate falls above certain level.
- 3) When target is not achieved on the deadlines.

IV. LEVELS OF TESTING

There are four levels of testing which is shown in figure below.

A. Unit Testing

The first level of testing is called unit testing or micro scale of testing .In this we consider the Tests done on particular functions or code modules. The smallest component of software is tested. The unit testing is done in supervision of developers or we say that unit testing are carried by Programmers because it requires knowledge of the internal program design and code.

✓ Unit test procedure:

In unit test procedure each test cases are linked with set of anticipated results. to test exception conditions & error handling . Each module stands with drivers. The term drivers means “main program” that accept data and passes that data to the component and gives desired results

B. Integration Testing:

The second level of testing is called integration testing. In integration testing all the modules are integrated which involves building a system from its components and testing it for problems that arise from component interactions. It is necessary because 30% to 40% error occur due to integration

problem. The integration testing is done in supervision of developers.

1) Various Approaches Of Integration Testing:

- Incremental Approach
- Big Bang Approach
- Regression Testing
- Top down Approach
- Bottom up Approach

C. System Testing:

The third level of testing is called system testing. In system testing the software is tested as a whole by the scope of the development project or product. The System testing builds on the previous levels of testing namely unit testing and Integration Testing. System testing of the application is done on complete application software to determine software's overall compliance with the end-user requirements. So, the knowledge of internal design or structure or code is not required for this type of software testing. System testing is carried out by specialists or independent testers.

D. Acceptance Testing:

The fourth and final level of testing is called acceptance testing. In acceptance testing a formal test is conducted to evaluate that whether a software fulfils the requirement of a user. Performance testing is in general testing performed to determine how a system performs in terms of responsiveness and stability under every condition. The acceptance test satisfy customers that they were using right software and it had all the requirements that they needed. The goal of application performance testing is to appraise any user experience in realtime scenarios on our given target application.

- Various type of testing carried under Acceptance testing:

A. Alpha Testing:

Alpha testing is one of the most commonly used software testing strategy. It is specially used by product development organisations. This testing is conducted at the developer's site. This process is usually performed by the end user. It is carried out when the code is roughly ready. The software programmers have made initial check to ensure that the specifications have been fully met. The code then goes to the testing team that have the task of formally checking that code. Alpha testing is final testing before the software is released to the public.

B. Beta Testing:

It is also known as field testing. It takes place at customer’s site. It is the second final testing before releasing an application for commercial purpose. The aim of beta testing is to grant your application into the hands of real users to discover any flaws/ issues from the user’s perspective.

V. TESTING METHODOLOGIES

Here, the two testing methodologies are as follows:

A. Black Box Testing:

No knowledge of internal design required. There is no need to examine the code . This is purely based upon customer’s point of view .Only the tester knows the set of inputs and predictable outputs which are based on requirements and functionality. It is least exhaustive and time consuming. Not suited for algorithm type of testing. Performed by end users , tester and developers.

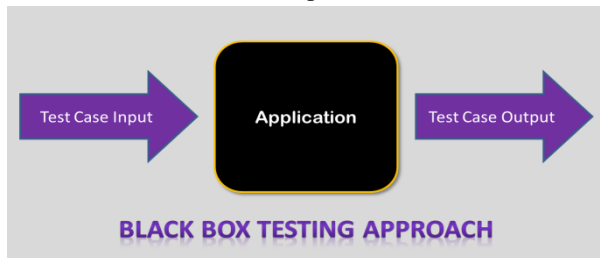


Fig. 1 Black Box Testing

Advantages:

1. Testers need not have to knowledge on specific programming language.
2. Testing is done from user’s perspective.
3. It helps to expose any inconsistencies in the requirement specifications.
4. Tester and Programmer both are independent of each other.
5. Test cases can be designed after the specifications are complete.

Disadvantages:

1. Only a small number of inputs can be tested and many program paths will be left untested.
2. Without clear specifications, test cases will be very difficult to design.
3. Tests can be unnecessary if the software designer/ developer has already run a test case.
4. Some parts of back end are not tested at all.

B. White Box Testing:

Knowledge of the internal program design and code required. Potentially, it is the most exhaustive and time consuming testing .Tests are based upon coverage of code statements, branches, paths and conditions. It is suited for all algorithm testing. It is performed by developers and testers.

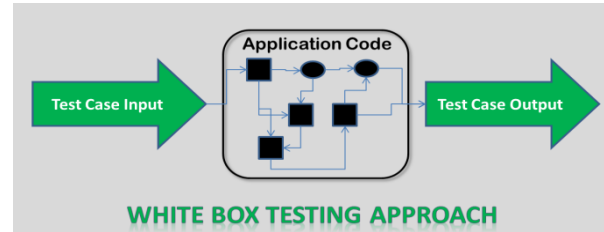


Fig. 1 White Box Testing

Advantages:

1. It reveals error in hidden code by removing extra lines of code.
2. Maximum coverage is achieved during test scenario writing.
3. Developer carefully gives explanation about implementation.

Disadvantages:

1. A skilled tester is required because knowledge of internal structure is needed.
2. Many paths will remain untested as it is very difficult to look into every corner to find out unknown hidden errors.
3. Test script maintenance can be a load if the implementation changes very frequently.

VI. CONCLUSION

Software testing is the activity that executes software with an intention of finding errors in it. It is done to improve the functionality and performance of software. More is the testing more the accuracy is in a software. To remove the bugs from the software it goes through many levels of testing but after that we are not sure whether a software is completely free from errors and bugs. Test automation reduces testing costs by supporting the test process with a range of software tools. Software testing can provide an independent view of the software to allow the enterprise to appreciate and understand the risk of software implementation.

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