SOFTWARE TESTING PROCESS IN IT INDUSTRY

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Abstract- Software testing is a process rather than a single activity .This paper covers the fundamental of the testing and the actual working process of testing the software in the companies. It elaborates the process stepwise in sequence and in detail. It explains the Software Testing Life Cycle and bug life cycle.

Index Terms- Bug life cycle, STLC, Testing process

I. INTRODUCTION

Testing is a process rather than a single activity. This process starts from test planning then designing test cases, preparing for execution and evaluating status till the test closure. So, the activities are divided within the fundamental test process into the following basic steps:

1) Planning and Control
2) Analysis and Design
3) Implementation and Execution
4) Evaluating exit criteria and Reporting
5) Test Closure activities
1) Planning and Control

Test planning has following major tasks:
i. To determine the scope and risks and identify the objectives of testing.
ii.To determine the test approach.
iii. To implement the test policy and/or the test strategy. (Test strategy is an outline that describes the testing portion of the software development cycle. It is created to inform Project Managers, testers and developers about some key issues of the testing process. This includes the testing objectives, method of testing, total time and resources required for the project and the testing environments.).
iv. To determine the required test resources like people, test environments, PCs, etc.
v. To schedule test analysis and design tasks, test implementation, execution and evaluation.
vi. To determine the Exit criteria there is need to set criteria such as Coverage criteria. (Coverage criteria are the percentage of statements in the software that must be executed during testing. This will help testers to track whether they are completing test activities correctly. They will show them which tasks and checks they must complete for a particular level of testing before they can say that testing is finished.)
 Test control has the following major tasks:
i. To measure and analyze the results of reviews and testing.
ii. To monitor and document progress, test coverage and exit criteria.
iii. To provide information on testing.
iv. To initiate corrective actions.
v. To make decisions.

2) Analysis and Design
Test analysis and Test Design has the following major tasks:
i. To review the test basis. (The test basis is the information testers need in order to start the test analysis and create test cases. Basically it's a documentation on which test cases are based, such as requirements, design specifications, product risk analysis, architecture and interfaces. Testing team can use the test basis documents to understand what the system should do once built.)

ii. To identify test conditions.
iii. To design the tests.
iv. To evaluate testability of the requirements and system.
v. To design the test environment set-up and identify and required infrastructure and tools.

3) Implementation and Execution
During test implementation and execution, testers 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. (Test cases is a set of conditions under which a tester will determine whether an application is working correctly or not.)

(Testware is a term for all utilities that serve in combination for testing a software like scripts, the test environment and any other test infrastructure for later reuse.)
Test implementation has the following major task:
i. To develop and prioritize the test cases by using techniques and create test data for those tests. (In order to test a software application there is need to enter some data for testing most of the features. Any such specifically identified data which is used in tests is known as test data.)

Testers also write some instructions for carrying out the tests which is known as test procedures.They may also need to automate some tests using test harness and automated tests scripts. (A test harness is a collection of software and test data for testing a program unit by running it under different conditions and monitoring its behavior and outputs.)

ii. To create test suites from the test cases for efficient test execution.
(Test suite is a collection of test cases that are used to test a software program to show that it has some specified set of behaviours.

A test suite often contains detailed instructions and information for each collection of test cases on the system configuration to be used during testing. Test suites are used to group similar test cases together.)

iii. To implement and verify the environment.

Test execution has the following major task:
i. To execute test suites and individual test cases following the test procedures.
ii. To re-execute the tests that previously failed in order to confirm a fix. This is known as confirmation testing or re-testing.
iii. To log the outcome of the test execution and record the identities and versions of the software under tests. The test log is used for the audit trial. (A test log is nothing but, what are the test cases that are executed, in what order they are executed, who executed that test cases and what is the status of the test case (pass/fail). These descriptions are documented and called as test log.).
iv. To Compare actual results with expected results.
v. Where there are differences between actual and expected results, it report discrepancies as Incidents.

4) Evaluating Exit criteria and Reporting
Based on the risk assessment of the project the criteria is set for each test level against which testers will measure the "enough testing". These criteria vary from project to project and are known as exit criteria.

Exit criteria come into picture, when:

– Maximum test cases are executed with certain pass percentage.

–Bug rate falls below certain level.

– When achieved the deadlines.

Evaluating exit criteria has the following major tasks:
i. To check the test logs against the exit criteria specified in test planning.
ii. To assess if more test are needed or if the exit criteria specified should be changed.
iii. To write a test summary report for stakeholders.

5) Test Closure activities
Test closure activities are done when software is delivered. The testing can be closed for the other reasons also like:
- When all the information has been gathered which are needed for the testing.
- When a project is cancelled.
- When some target is achieved.
- When a maintenance release or update is done.

Test closure activities have the following major tasks:
i. To check which planned deliverables are actually delivered and to ensure that all incident reports have been resolved.
ii. To finalize and archive testware such as scripts, test environments, etc. for later reuse.
iii. To handover the testware to the maintenance organization. They will give support to the software.
iv To evaluate how the testing went and learn lessons for future releases and projects.

II. SOFTWARE TESTING LIFE CYCLE (STLC)

Software Testing Life Cycle (STLC) defines the steps/stages/phases in testing of software.Although variations exist between organizations, there is a typical cycle for testing.

1. Requirements analysis
   Testing should begin in the requirements phase of the software development life cycle. During the design phase, testers work with developers in determining what aspects of a design are testable and with what parameters those tests work.
2. Test planning
   Test strategy, test plan, testbed creation. A lot of activities will be carried out during testing, so that a plan is needed.
3. Test development
   Test, test cases, test scripts to use in testing software.
4. Test execution
   Testers execute the software based on the plans and tests and report any errors found to the development team.
5. Test reporting

Once testing is completed, testers generate metrics and make final reports on their test effort and whether or not the software tested is ready for release.

6. Test result analysis or Defect Analysis
It is done by the development team usually along with the client, in order to decide what defects should be treated, fixed, rejected (i.e. found software working properly) or deferred to be dealt with at a later time.

7. Retesting the resolved defects
   Once a defect has been dealt with by the development team, it is retested by the testing team.

8. **Regression testing**
   It is common to have a small test program built of a subset of tests, for each integration of new, modified or fixed software, in order to ensure that the latest delivery has not ruined anything, and that the software product as a whole is still working correctly.

9. Test Closure
   Once the test meets the exit criteria, the activities such as capturing the key outputs, lessons learned, results, logs, documents related to the project are archived and used as a reference for future projects.

III. BUG LIFE CYCLE / DEFECT LIFE CYCLE
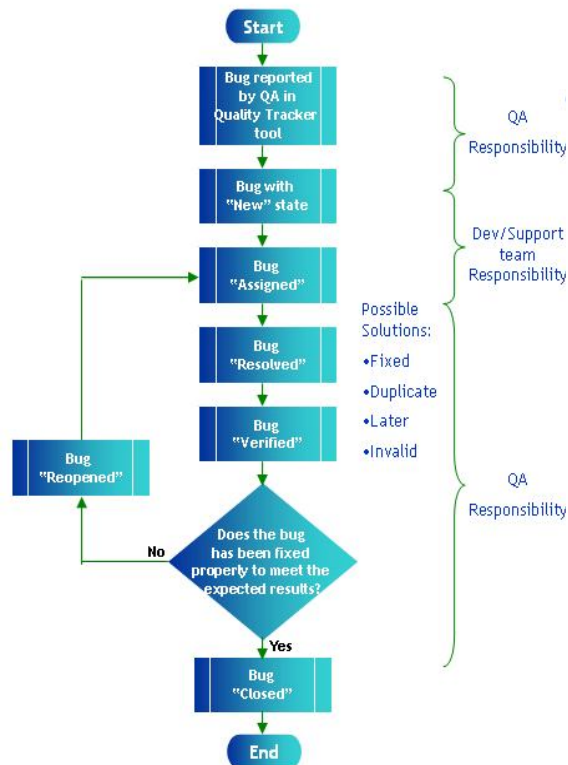
Bug Status:

- **NEW** – A new bug reported by Testing QA.
- **ASSIGNED** –then assign to the Development Team.
- **RESOLVED** – Development team resolved the bug with status Fixed/Later/Invalid.
- **VERIFIED** – QA Team verified the bug whether it is resolved.

IV. PROCESS OF TESTING

Here is detail of each step what testing exactly carried out in each software quality and testing life cycle specified by IEEE and ISO standards:

1. Review of the software requirement specifications
2. Objectives is set for the Major releases
3. Target Date planned for the Releases
4. Detailed Project Plan is build. This includes the decision on Design Specifications
5. Develop Test Plan based on Design Specifications
6. Test Plan - This includes Objectives, Methodology adopted while testing, Features to be tested and not to be tested, risk criteria, testing schedule, multi-platform support and the resource allocation for testing.
7. Test Specifications - This document includes technical details (Software requirements) required prior to the testing.
8. Writing of Test Cases
   Smoke(BVT) test cases
   Sanity Test cases
   Regression Test Cases
   Negative Test Cases
   Extended Test Cases
9. Development – Modules developed one by one
10. Installers Binding- Installers are build around the individual product.
11. Build procedure - A build includes Installers of the available products – multiple platforms.
12. Testing - Smoke Test (BVT) Basic application test to take decision on further testing. Testing of new features, Cross-platform testing, Stress testing and memory leakage testing.
13. Bug Reporting - Bug report is created
14. Development – Code freezing.No more new features are added at this point.
15. Testing - Builds and regression testing.
16. Decision to release the product
17. Post-release Scenario for further objectives.

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