

# Test Management

# Learning Objectives

- ☐ Test Planning and Estimation
  - Test Planning – Activities
  - Entry criteria, Exit criteria
  - Test Estimation
  - Test Strategy, Approach
- ☐ Test Progress Monitoring and Control
- ☐ Risk and Testing
- ☐ Incident management
  - ☐ Bug life cycle
  - ☐ Severity of Defect
  - ☐ Priority of Defect

# Test Planning & Estimation

# Test Planning

## Test Planning:

- The activity of establishing or updating a test plan.
- Test planning is a continuous activity and is performed in all life cycle processes and activities.
- Planning may be documented in a master test plan and in separate test plans for test levels such as system testing and acceptance testing.
- Planning is influenced by the test policy of the organization, the scope of testing, objectives, risks, constraints, criticality, testability and the availability of resources.

## Test Planning Activities

- ☐ Determining the scope and risks and identifying the objectives of testing.
- ☐ Defining the overall approach of testing, including the definition of the test levels and entry and exit criteria.
- ☐ Integrating and coordinating the testing activities into the software life cycle activities (acquisition, supply, development, operation and maintenance).
- ☐ Making decisions about what to test, what roles will perform the test activities, how the test activities should be done, and how the test results will be evaluated.
- ☐ Scheduling test analysis and design activities.
- ☐ Scheduling test implementation, execution and evaluation.
- ☐ Assigning resources for the different activities defined.
- ☐ Defining the amount, level of detail, structure and templates for the test documentation.
- ☐ Selecting metrics for monitoring and controlling test preparation and execution, defect resolution and risk issues.
- ☐ Setting the level of detail for test procedures in order to provide enough information to support reproducible test preparation and execution.

## Entry Criteria & Exit Criteria

- ☐ **Entry criteria define when to start testing such as at the beginning of a test level or when a set of tests is ready for execution.**
  - ☐ Typically entry criteria may cover the following:
    - ✓ Test environment availability and readiness.
    - ✓ Test tool readiness in the test environment.
    - ✓ Testable code availability.
    - ✓ Test data availability.
- ☐ **Exit criteria define when to stop testing such as at the end of a test level or when a set of tests has achieved specific goal.**
  - ☐ Typically exit criteria may cover the following:
    - ✓ Thoroughness measures, such as coverage of code, functionality or risk.
    - ✓ Estimates of defect density or reliability measures.
    - ✓ Cost.
    - ✓ Residual risks, such as defects not fixed or lack of test coverage in certain areas.
    - ✓ Schedules such as those based on time to market.

# Test Estimation

## ❑ Test Estimation:

- The calculated approximation of a result related to various aspects of testing (e.g. effort spent, completion date, costs involved, number of test cases, etc.) which is usable even if input data may be incomplete, uncertain, or noisy.

## ❑ Two approaches for the estimation of test effort are:

- **The metrics-based approach:** Estimating the testing effort based on metrics of former or similar projects or based on typical values.
- **The expert-based approach:** Estimating the tasks based on estimates made by the owner of the tasks or by experts.

- ❑ Once the test effort is estimated, resources can be identified and a schedule can be drawn up.

## Contd..

❑ **The testing effort may depend on a number of factors, including:**

➤ **Characteristics of the product:**

- The quality of the specification and other information used for test models (i.e. the test basis), the size of the product, the complexity of the problem domain, the requirements for reliability and security, and the requirements for documentation.

➤ **Characteristics of the development process:**

- The stability of the organization, tools used, test process, skills of the people involved, and time pressure.

➤ **The outcome of testing:**

- The number of defects and the amount of rework required.



# Test Strategy, Test Approach

## ❑ Test Strategy:

- A high-level description of the test levels to be performed and the testing within those levels for an organization or programme (one or more projects).

## ❑ Test Approach:

- The implementation of the test strategy for a specific project. It typically includes the decisions made that follow based on the (test) project's goal and the risk assessment carried out, starting points regarding the test process, the test design techniques to be applied, exit criteria and test types to be performed.

## ❑ Typical approaches include:

- ❖ **Analytical approaches**, such as risk-based testing where testing is directed to areas of greatest risk
- ❖ **Model-based approaches**, such as stochastic testing using statistical information about failure rates (such as reliability growth models) or usage (such as operational profiles).

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- ❖ **Methodical approaches**, such as failure-based (including error guessing and fault-attacks), experienced-based, check-list based, and quality characteristic based.
- ❖ **Process- or standard-compliant approaches**, such as those specified by industry-specific standards or the various agile methodologies.
- ❖ **Dynamic and heuristic approaches**, such as exploratory testing where testing is more reactive to events than pre-planned, and where execution and evaluation are concurrent tasks.
- ❖ **Consultative approaches**, such as those where test coverage is driven primarily by the advice and guidance of technology and/or business domain experts outside the test team.
- ❖ **Regression-averse approaches**, such as those that include reuse of existing test material, extensive automation of functional regression tests, and standard test suites.
- ❑ The selection of approach depends on the context and may consider risks, hazards and safety, available resources and skills, the technology, the nature of the system, test objectives and regulations.

# Test Progress Monitoring & Control

# Test Progress Monitoring

- ❑ **Test Monitoring:** A test management task that deals with the activities related to periodically checking the status of a test project. Reports are prepared that compare the actuals to that which was planned.
- ❑ The purpose of test monitoring is to provide feedback and visibility about test activities.
- ❑ Metrics also used to assess progress against the planned schedule and budget.
- ❑ **Common test metrics include:**
  - ✓ Percentage of work done in test case preparation (or percentage of planned test cases prepared).
  - ✓ Percentage of work done in test environment preparation.
  - ✓ Test case execution (e.g. number of test cases run/not run, and test cases passed/failed).
  - ✓ Defect information (e.g. defect density, defects found and fixed, failure rate, and re-test results).
  - ✓ Test coverage of requirements, risks or code.
  - ✓ Subjective confidence of testers in the product.
  - ✓ Dates of test milestones.
  - ✓ Testing costs, including the cost compared to the benefit of finding the next defect or to run the next test.

# Test Reporting

Test reporting is concerned with summarizing information about the testing endeavor, including..

- What happened during a period of testing, such as dates when exit criteria were met.
- Analyzed information and metrics to support recommendations and decisions about future actions, such as an assessment of defects remaining, the economic benefit of continued testing, outstanding risks, and the level of confidence in the tested software.

Metrics should be collected during and at the end of a test level in order to assess:

- The adequacy of the test objectives for that test level.
- The adequacy of the test approaches taken.
- The effectiveness of the testing with respect to the objectives.

# Test Control

- ❑ **Test Control:** A test management task that deals with developing and applying a set of corrective actions to get a test project on track when monitoring shows a deviation from what was planned.
- ❑ Test control describes any guiding or corrective actions taken as a result of information and metrics gathered and reported.
- ❑ Actions may cover any test activity and may affect any other software life cycle activity or task.
- ❑ **Examples of test control actions are:**
  - ✓ Making decisions based on information from test monitoring.
  - ✓ Re-prioritize tests when an identified risk occurs (e.g. software delivered late).
  - ✓ Change the test schedule due to availability or unavailability of a test environment.
  - ✓ Setting an entry criterion requiring fixes to have been re-tested by a developer before accepting them into a build.

# Risk and Testing

Risk can be defined as the chance of an event, hazard, threat or situation occurring and resulting in undesirable consequences or a potential problem.

The level of risk will be determined by the likelihood of an adverse event happening and the impact(the harm resulting from that event).

## Risk Types:

- **Project Risk**
- **Product Risk**

Risks are used to decide where to start testing and where to test more.

Testing is used to reduce the risk of an adverse effect occurring, or to reduce the impact of an adverse effect.

## Contd..

- ❑ **Project Risks** -Project risks are the risks that surround the project's capability to deliver its objectives, such as:
  - ❑ **Organizational Factors:**
    - Skill, training and staff shortages
    - Personal issues
    - Political issues, such as:
      - Problems with testers communicating their needs and test results
      - Failure by the team to follow up on information found in testing and reviews (e.g. not improving development and testing practices)
    - Improper attitude toward or expectations of testing (e.g. not appreciating the value of finding defects during testing)
  - ❑ **Technical Issues:**
    - Problems in defining the right requirements
    - The extent to which requirements cannot be met given existing constraints
    - Test environment not ready on time
    - Late data conversion, migration planning and development and testing data conversion/migration tools.
    - Low quality of the design, code, configuration data. Test data and tests
  - ❑ **Supplier Issues:**
    - Failure of a third party
    - Contractual issues.



## Contd..

- ☐ **Product Risks** -Potential failure areas (adverse future events or hazards) in the software or system are known as product risks, as they are a risk to the quality of the product, these include:
  - ✓ Failure-prone software delivered.
  - ✓ The potential that the software/hardware could cause harm to an individual or company.
  - ✓ Poor software characteristics (e.g. functionality, reliability, usability and performance).
  - ✓ Poor data integrity and quality (e.g. data migration issues, data conversion problems, data transport problems, violation of data standards)
  - ✓ Software that does not perform its intended functions.
- ☐ Product risks are a special type of risk to the success of a project.
- ☐ Testing as a risk-control activity provides feedback about the residual risk by measuring the effectiveness of critical defect removal and of contingency plans.

# Incident Management

# Incident Management

- ❑ **Incident Management:** The process of recognizing, investigating, taking action and disposing of incidents. It involves logging incidents, classifying them and identifying the impact. [After IEEE 1044]
- ❑ One of the objectives of testing is to find defects, the discrepancies between actual and expected outcomes need to be logged as incidents.
- ❑ Incidents may be raised during development, review, testing or use of a software product.
- ❑ **Incident reports have the following objectives:**
  - ✓ Provide developers and other parties with feedback about the problem to enable identification, isolation and correction as necessary.
  - ✓ Provide test leaders a means of tracking the quality of the system under test and the progress of the testing.
  - ✓ Provide ideas for test process improvement.

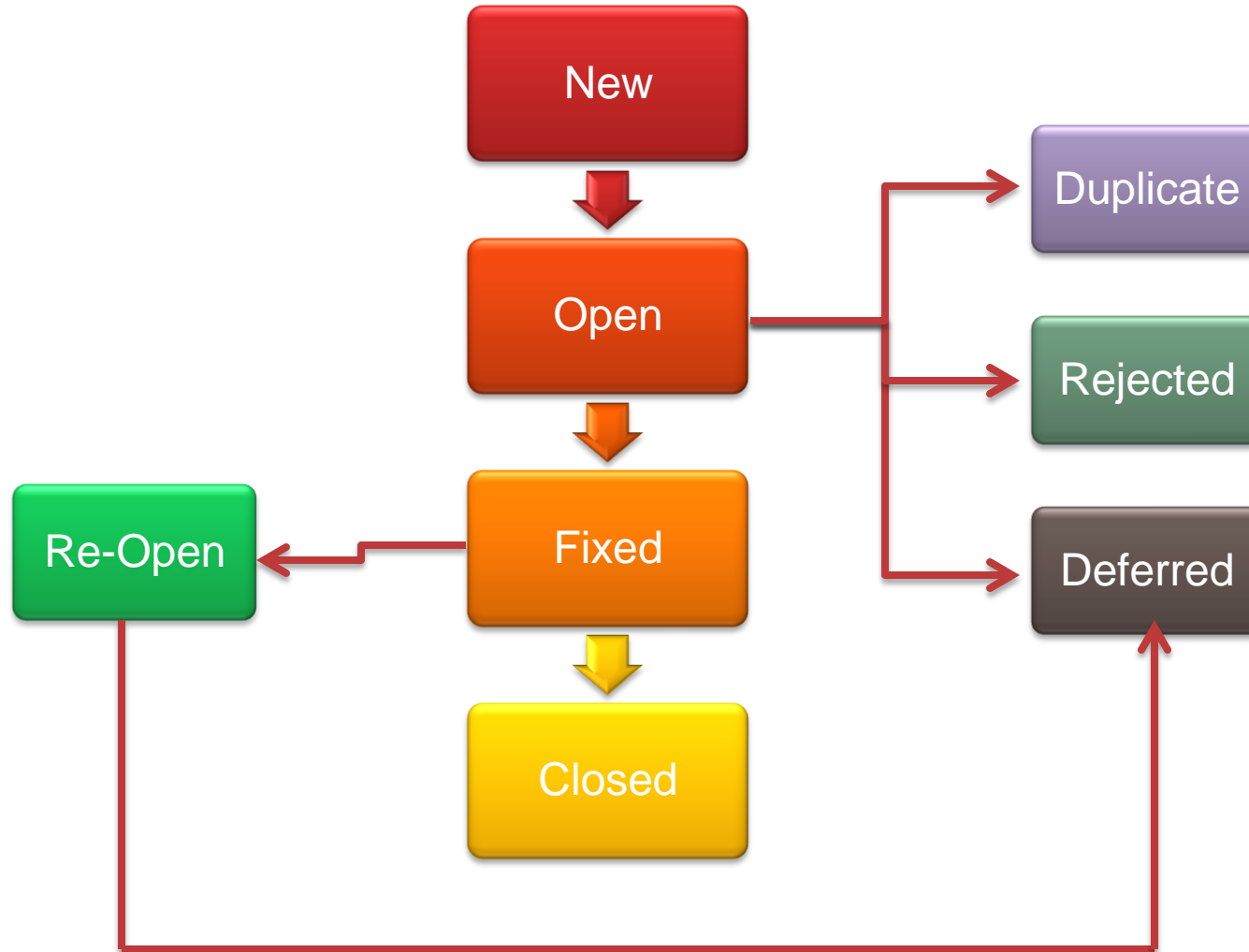
## Contd..

### ☐ **Details of the incident report may include:**

- ✓ Date of issue, issuing organization, and author.
- ✓ Expected and actual results.
- ✓ Identification of the test item (configuration item) and environment.
- ✓ Software or system life cycle process in which the incident was observed.
- ✓ Description of the incident to enable reproduction and resolution, including logs, database dumps or screenshots.
- ✓ Scope or degree of impact on stakeholder(s) interests.
- ✓ Severity of the impact on the system.
- ✓ Urgency/priority to fix.
- ✓ Status of the incident (e.g. Open, duplicate, fixed, re-open, closed, deferred).
- ✓ Conclusions, recommendations and approvals.
- ✓ Global issues, such as other areas that may be affected by a change resulting from the incident.
- ✓ Change history, such as the sequence of actions taken by project team members with respect to the incident to isolate, repair, and confirm it as fixed.
- ✓ References, including the identity of the test case specification that revealed the problem.

# Defect/ Bug Life Cycle

# BUG Life Cycle



# Bug Status

## New

- When the bug is posted for the first time, its state will be “**New**”. This means that the bug is identified but not yet approved.

## Open

- After a tester has posted a bug, the lead of the tester approves that the bug is genuine and he changes the state as “**Open**”.
- The lead assigns the bug to the PM or Developer.

## Fixed

- Developer verifies the defect and fixes the bug, and will assign the bug to the testing team for next round of testing. Before he releases the software with bug fixed, he changes the state of bug to “**Fixed**”. It specifies that the bug has been fixed and is released to testing team.

## Closed

- Once the bug is fixed, it is tested by the tester. If the tester feels that the bug no longer exists in the software, he changes the status of the bug to “**Closed**”. This state means that the bug is fixed, tested and closed.

## Contd..

### Duplicate

- If the bug is repeated twice or the two bugs mention the same concept of the bug, then one bug status is changed to **“Duplicate”**.

### Rejected

- If the developer feels that the bug is not genuine, he rejects the bug. Then the state of the bug is changed to **“Rejected”**.

### Deferred

- If development team decided to fix the bug in the next release then defect status is changed to **“Deferred”**.
- Reasons for changing the bug to this state have many factors, including:
  - Priority of the bug may be low
  - Lack of time for the release or the bug may not have major effect on the software.

### Re-Open

- If the bug still exists even after the bug is fixed by the developer, the tester changes the status to **“Re-Open”**. The bug traverses the life cycle once again.



# Severity of Defect

**Severity:** The degree of impact that a defect has on the development or operation of a component or system. [After IEEE 610]

Following are the classification of severity of defect:

- **Critical/ Show Stopper**
- **Major**
- **Minor**
- **Cosmetic**

## Critical/ Show Stopper

- An item that prevents/ stopped further testing of the product or business function.
- No workaround is possible.
- **Examples:**
  - Missing menu option.
  - The software application refuses to run or stops in-between;
  - Corruption of data
  - Serious impact on customer operations for which the customers is aware of the consequences.

## Contd..

### Major

- A defect that does not function as expected or cause other functionality to fail to meet requirements.
- Which have not halted the system, but have seriously degraded the performance of some business function.
- **Examples:** inaccurate calculations; the wrong field being updated, etc.

### Minor

- The defects which do not conform to standards and conventions.
- Which can or have caused a low-level disruption of the system or the business operation.
- Workaround is possible.
- **Examples:** matching visual and text links which lead to different end points.

### Cosmetic:

- Which does not affect the functionality of the system.
- Which are primarily related to the presentation or the layout of the data.
- **Examples:** Headings, Banners, Labels, or Colors are absent or badly chosen.

# Priority of Defect

**Priority :** The level of importance assigned to an item.

- It is an indication of the urgency with which the defect must be fixed.
- Generally, defects of the greatest severity will be assigned the highest priority. However, due some overriding factors, a high priority may sometimes be allocated to even a minor or a cosmetic defect.
- For example a cosmetic defect in a presentation by the company's CEO can be assigned a high priority. Or sometimes, it is wise to club many easily resolvable, but low severity defects before undertaking fixing of a higher severity defect.

## Different Levels of Priority:

- **Very High**
- **High**
- **Medium**
- **Low**

## Contd..

### Very High

- This priority is allocated to a defect that must be attended with immediate effect.

### High

- This priority is allocated to a defect that must be attended to as early as possible generally at the next convenient break e.g. overnight or at the weekend.

### Medium

- This priority is allocated to a defect, fixing of which is scheduled by the next or some particular release of the software.

### Low

- This priority is allocated to a defect that may be rectified whenever it is convenient.

# Example

- **Defect ID:** 2012
- **Summary/ Title:** The list of flights is given even when past date set as departing date
- **Detected By:** alice\_raja
- **Assigned To:** james\_john
- **Status:** New
- **Severity:** Major
- **Priority:** High
- **Detected in Release:** Release 10.5
- **Detected in Version:** Mercury Tours Web Site 10.0
- **Detected on Date:** 25/1/2012
- **Description/ Steps to Reproduce:**
  - Step 1: Open "Mercury Tours Web Site" and login
  - Step 2. Select the One Way option.
  - Step 3. For the departing flight, select any past date.
    - Check each of the following possibilities:
      - Previous month, any date selected.
      - Past date, current month selected.
  - Step 4. Click the Continue button.
- **Expected Result:** The list of flights should not be given. You should be requested to insert valid departing date.
- **Actual Result:** The list of flights is given even when past date or today's date set as departing date.”

# Thank you

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### **Safe Harbor**

This document contains forward-looking statements within the meaning of section 27A of Securities Act of 1933, as amended, and section 21E of the Securities Exchange Act of 1934, as amended. The forward-looking statements contained herein are subject to certain risks and uncertainties that could cause actual results to differ materially from those reflected in the forward-looking statements. Satyam undertakes no duty to update any forward-looking statements. For a discussion of the risks associated with our business, please see the discussions under the heading “Risk Factors” in our report on Form 6-K concerning the quarter ended September 30, 2008, furnished to the Securities and Exchange Commission on 07 November, 2008, and the other reports filed with the Securities and Exchange Commission from time to time. These filings are available at <http://www.sec.gov>