UNIT III

System and Acceptance Testing: System Testing Overview – Why is System Testing done – Functional versus Non-functional Testing – Functional system Testing - Non-Functional Testing – Acceptance Testing – Summary of Testing Phases.

TEXT BOOK: “SOFTWARE TESTING Principles and Practices”-Srinivasan Desikan & Gopalswamy Ramesh, 2006, Pearson Education

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System and Acceptance Testing

- System Testing Overview
- Why is System Testing done?
- Functional versus Non-Functional Testing
- Functional System Testing
- Non-Functional Testing
- Acceptance Testing
- Summary of Testing Phases

System Testing Overview

- System Testing is defined as a testing phase conducted on the complete integrated system, to evaluate the system compliance with its specified requirements.
- It is done after unit, component, and integration testing phases.

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The testing conducted on the complete integrated products and solutions to evaluate system compliance with specified requirements on functional and non-functional aspects is called system testing.

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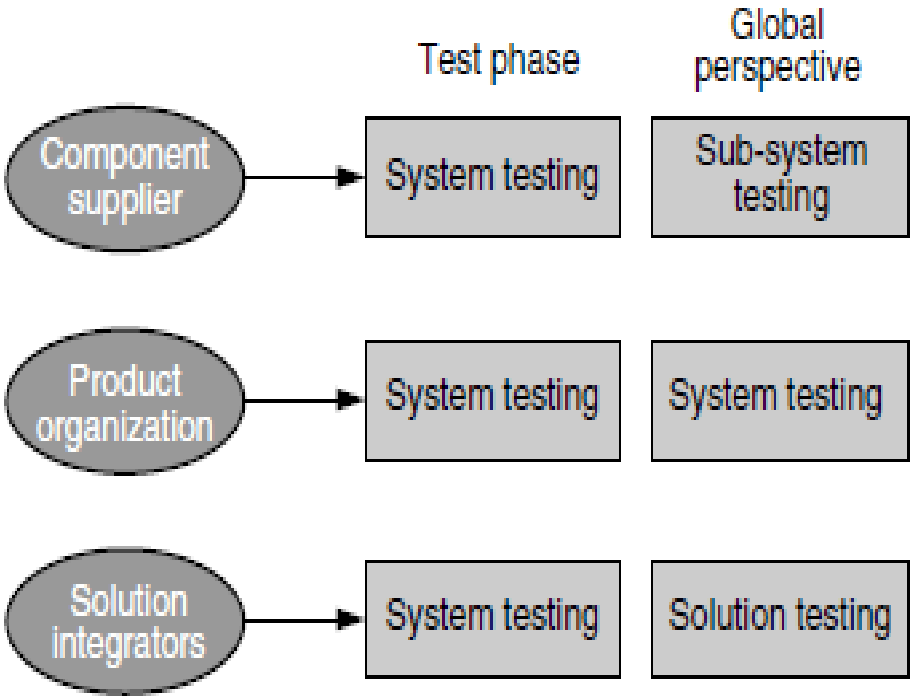
On the non-functional side, system brings in different testing types (also called quality factors), some of which are as follows.

- **Performance/Load testing**
- **Scalability testing**
- **Reliability testing**
- **Stress testing**
- **Interoperability testing**
- **Localization testing**

Different perspectives of system testing.



WHY IS SYSTEM TESTING DONE?

To summarize, system testing is done for the following reason

- Provide independent perspective in testing
- Bring in customer perspective in testing
- Provide a “fresh pair of eyes” to discover defects not found earlier by testing
- Test product behavior in a holistic, complete, and realistic environment
- Test both functional and non-functional aspects of the product
- Build confidence in the product
- Analyze and reduce the risk of releasing the product
- Ensure all requirements are met and ready the product for acceptance testing.

FUNCTIONAL VERSUS NON-FUNCTIONAL TESTING

- Functional testing involves testing a product's functionality and features.
- Non-functional testing involves testing the product's quality factors.
- System testing comprises both functional and non-functional test verification.

FUNCTIONAL TESTING VERSUS NON-FUNCTIONAL TESTING

Testing aspects	Functional testing	Non-functional testing
Involves	Product features and functionality	Quality factors
Tests	Product behavior	Behavior and experience
Result conclusion	Simple steps written to check expected results	Huge data collected and analyzed
Results varies due to	Product implementation	Product implementation, resources, and configurations
Testing focus	Defect detection	Qualification of product
Knowledge required	Product and domain	Product, domain, design, architecture, statistical skills
Failures normally due to	Code	Architecture, design, and code
Testing phase	Unit, component, integration, system	System
Test case repeatability	Repeated many times	Repeated only in case of failures and for different configurations
Configuration	One-time setup for a set of test cases	Configuration changes for each test case

FUNCTIONAL SYSTEM TESTING

- Functional testing is performed at different phases and the focus is on product level features.
- As functional testing is performed at various testing phases, there are two obvious problems. One is *duplication* and other one is *gray area*.

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- There are multiple ways system functional testing is performed.
- There are also many ways product level test cases are derived for functional testing.
- Some of the common techniques are given below.
    - Design/architecture verification
    - Business vertical testing
    - Deployment testing
    - Beta testing
    - Certification, Standards, and Testing for compliance.

NON-FUNCTIONAL TESTING

- The process followed by non-functional testing is similar to that of functional testing but differs from the aspects of complexity, knowledge requirement, effort needed, and number of times the test cases are repeated.
- Since repeating non-functional test cases involves more time, effort, and resources, the process for non-functional testing has to be more robust stronger than functional testing to minimize the need for repetition.

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- Setting Up the Configuration
- Coming up with Entry/Exit Criteria
- Balancing Key Resources
- Scalability Testing
- Reliability Testing
- Stress Testing
- Interoperability Testing

TYPICAL ENTRY/EXIT CRITERIA FOR NON-FUNCTIONAL TESTS

Type of test	Parameters	Sample entry criteria	Sample exit criteria
Scalability	Maximum limits	Product should scale up to one million records or 1000 users	Product should scale up to 10 million records or 5000 users
Performance test	• Response time • Throughput • Latency	Query for 1000 records should have a response time less than 3 seconds	Query for 10,000 records should have response time less than 3 seconds
Reliability	• Failures per iteration • Failures per test duration	There should be less than 2% failures when queries are run on 1000 records for 24 hours	There should be less than 0.1% failures when queries are run on 1000 records for 48 hours
Stress	System when stressed beyond the limits	Product should be able to withstand 25 clients login happening simultaneously for 5 hours in a configuration that can take only 20 clients	Product should be able to withstand 100 clients login simultaneously for 5 hours in a configuration that can take only 100 clients

ACCEPTANCE TESTING

- Acceptance testing is a phase after system testing that is normally done by the customers or representatives of the customer.
- The customer defines a set of test cases that will be executed to qualify and accept the product.
- These test cases are executed by the customers themselves to quickly judge the quality of the product before deciding to buy the product.
- Acceptance test cases are normally small in number and are not written with the intention of finding defects.

Acceptance Criteria

- Acceptance criteria-Product acceptance
- Acceptance criteria—Procedure acceptance
- Acceptance criteria–Service level agreements

SELECTING TEST CASES FOR ACCEPTANCE TESTING

- The test cases for acceptance testing are selected from the existing set of test cases from different phases of testing.
- **End-to-end functionality verification**
- **Domain tests**
- **User scenario tests**
- **Basic sanity tests**
- **New functionality**

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- **A few non-functional tests**
- **Tests pertaining to legal obligations and service level agreements**
- **Acceptance test data**

EXECUTING ACCEPTANCE TESTS

Acceptance testing is done by the customer or by the representative of the customer to check whether the product is ready for use in the real-life environment.

SUMMARY OF TESTING PHASES

- Multiphase Testing Model
- Working Across Multiple Releases
- Who Does What and When

SAMPLE ENTRY AND EXIT CRITERIA FOR COMPONENT TESTING

Entry criteria	Exit criteria
Component testing Periodic unit test progress report showing 70% completion rate	No extreme and critical outstanding defects in features
stable build (installable) with basic features working	All 100% component test cases executed with at least 98% pass ratio
Component test cases ready for execution	Component test progress report (periodic) and defect trend sorted based on features and analyzed.
	Component level performance and load testing report and analysis of the same.

SAMPLE ENTRY AND EXIT CRITERIA FOR INTEGRATION TESTING.

Entry criteria	Exit criteria
Integration testing Periodic component test progress report (with at least 50% completion ratio) with at least 70% pass rate	No extreme and critical defects outstanding to be fixed
Stable build (installable/upgradeable) with all features integrated	All 100% integration test cases executed with at least 98% pass ratio
Defect arrival showing downward trend	Integration test progress report showing good progress and defects showing consistent downward trend
	Performance, load test report for all critical features within acceptable range
	Product in release format (including documents, media, and so on)

SAMPLE ENTRY AND EXIT CRITERIA FOR SYSTEM AND ACCEPTANCE TESTING.

Entry criteria	Exit criteria
Acceptance testing Periodic integration test progress report with at least 50% pass rate for starting system testing, 90% pass rate for starting acceptance testing	All 100% system test cases executed with at least 98% pass ratio All 100% acceptance test cases executed with 100% pass rate
Stable build (production format) with all features integrated	Test summary report all phases consolidated (periodic) and they are analyzed and defect trend showing downward trend for last four weeks
Defect arrival trend showing downward movement	Metrics (quality and progress metrics) showing product readiness for release
No extreme and critical defects outstanding	Performance, load test report for all critical features, system

THE WHEN AND WHAT OF TESTS.

Type of testing	Unit testing	Component testing	Integration testing	System and acceptance testing
Static analysis/memory leak/code complexity	☑	✓		
Internationalization	☑	✓		
Compatibility (Forward/backward)		☑		
Localization testing				☑
Interoperability			✓	☑
API/interface testing			☑	
Performance testing				☑
Load testing				☑
Reliability				☑

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Functionality/usability	✓	☑	✓	✓
White box testing	☑	✓		
Black box testing	✓	☑	✓	✓
Daily build and smoke testing	☑			
Buddy testing	☑			
Defect bash			☑	
Scenario testing			☑	✓
Acceptance testing				☑
Regression testing		☑		☑
Exploratory testing	☑	☑		☑
Pair testing	☑	☑		
Ad hoc testing	☑	☑	☑	☑
Scalability testing				☑