HNDIT 2312- Principles of Software Engineering

Week 10: Software Testing

Topics Covered

- Development Testing
- Goals of testing
- Software testing methods
- Software testing vs. inspection
- Stages of testing
- Quality assurance
- Test Automation

Program testing

- Testing is intended to show that a program does what it is intended to do and to discover program defects before it is put into use.
- You check the results of the test run for errors, anomalies or information about the program's non-functional attributes.

Testing process goals

- Validation testing
  - To demonstrate to the developer and the system customer that the software meets its requirements

- Defect testing
  - To discover faults or defects in the software where its behavior is incorrect or not in conformance with its specification

Verification vs. validation

- Verification:
  - "Are we building the product right".
  - The software should conform to its specification.
- Validation:
  - "Are we building the right product".
 - The software should do what the user really requires.

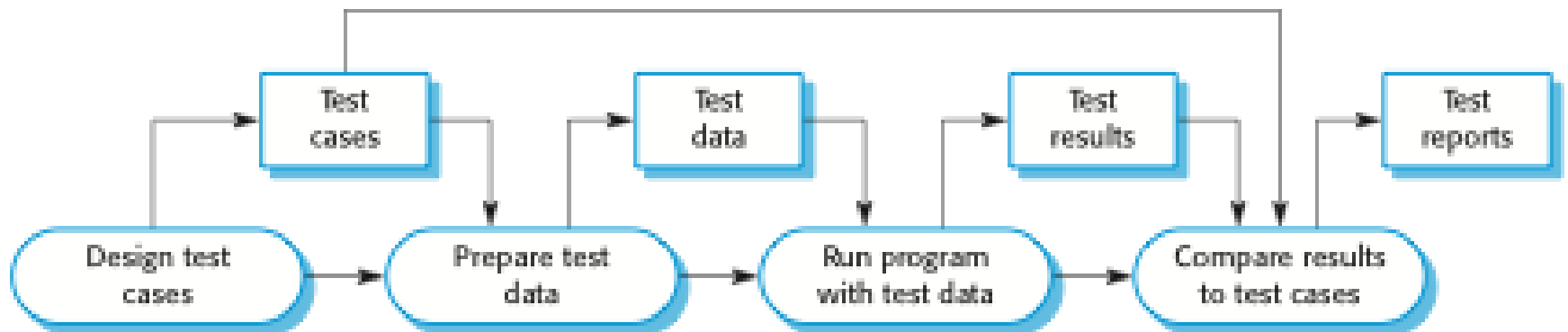# V Model
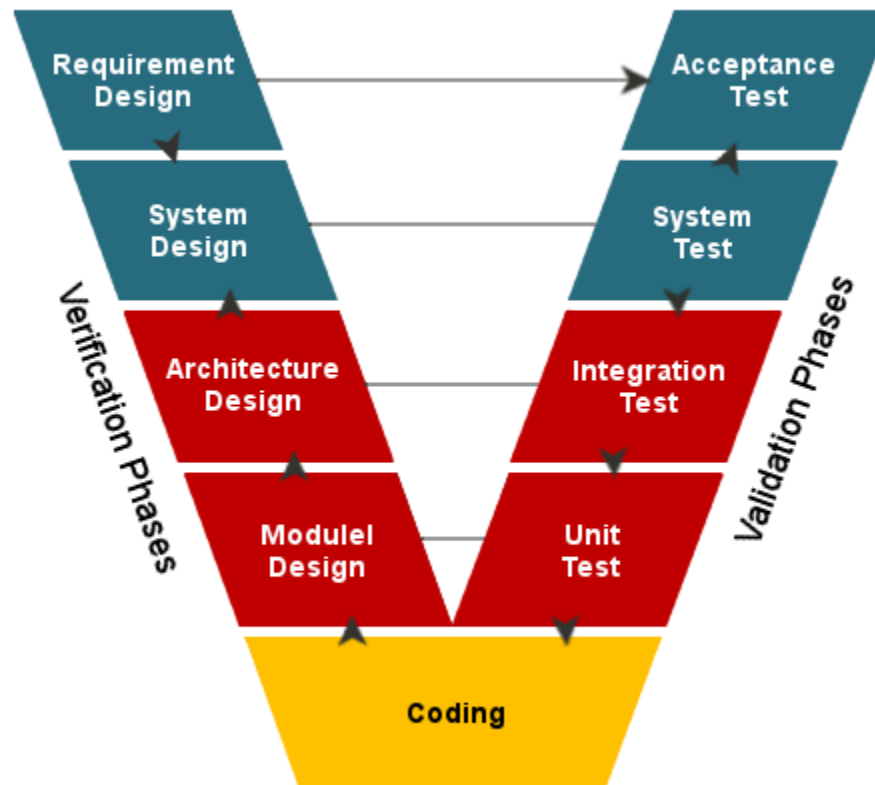
Inspections and testing

- Software inspections(Static Verification)
  - Concerned with analysis of
    the static system representation to discover problems.
  - Code analysis
- Software testing (Dynamic Verification)
  - The system is executed with test data and its operational behavior is observed.

Inspections and testing
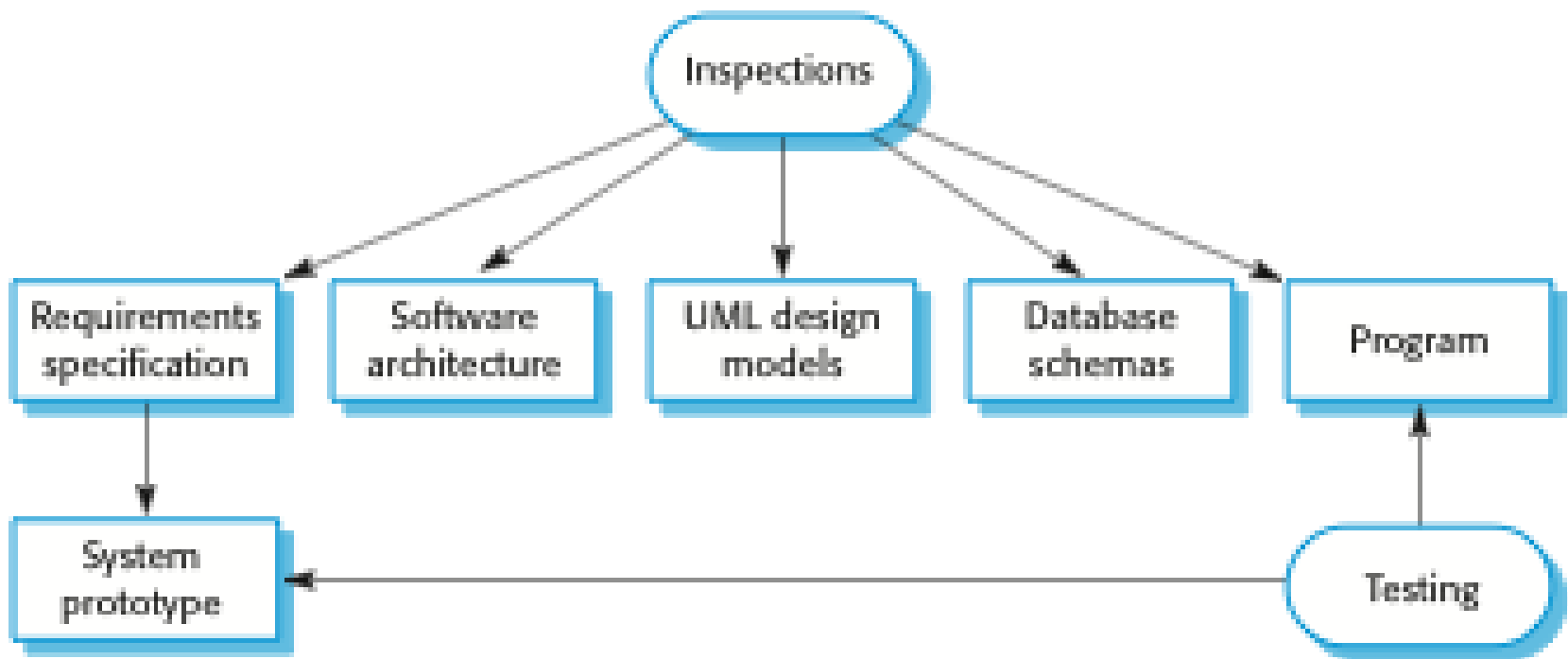
# A model of the software testing process

Software Testing - Methods

- Black box testing
  - The technique of testing without having any knowledge of the interior workings of the application is called black-box testing.

- White box testing
  - White-box testing is the detailed investigation of internal logic and structure of the code.
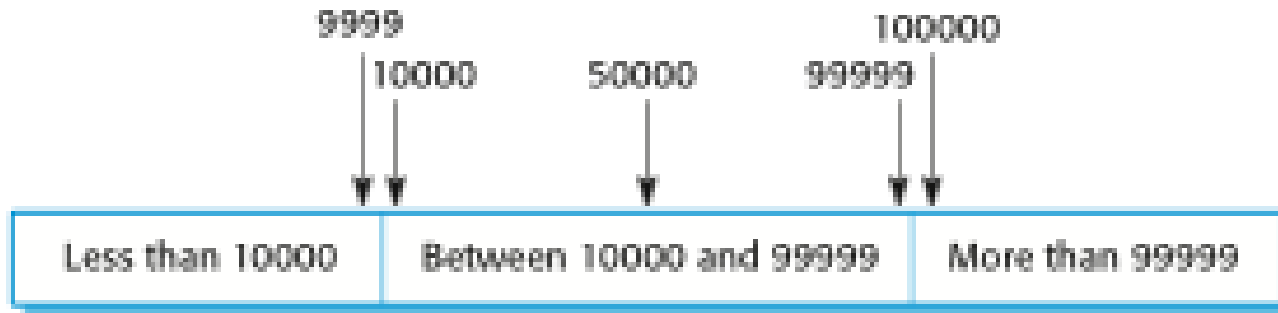
- Grey box testing

Black box tests-techniques

- Equivalence Partitioning
- Boundary Value Analysis

Equivalence partitioning
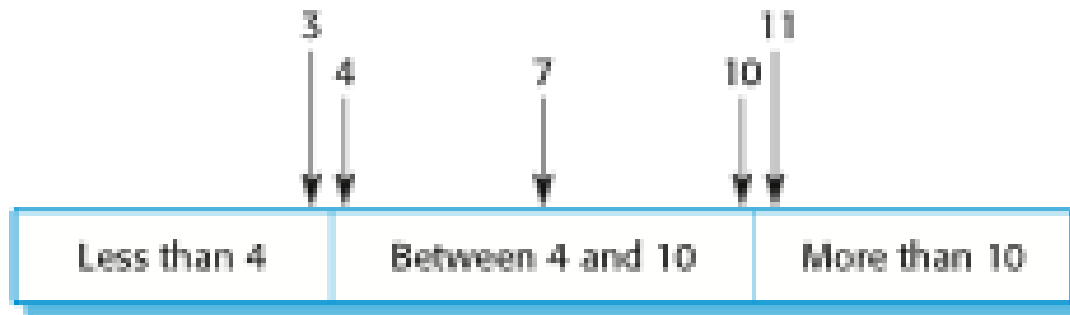
Number of input values

Input values

White box tests-techniques

- Procedure to derive and/or select test cases.
- Test cases involve the set of steps, conditions and inputs which can be used while performing the testing tasks.

Stages of testing

- Development testing
  - where the system is tested during development to discover bugs and defects.

- Release testing
  - where a separate testing team test a complete version of the system before it is released to users.

- User testing
  - where users or potential users of a system test the system in their own environment.

Development testing

- Unit testing
  - where individual program units or object classes are tested.

- Component testing
  - where several individual units are integrated to create composite components.

- System testing
  - where some or all of the components in a system are integrated and the system is tested as a whole.

Unit testing

- Units may be
  - Individual functions or methods within an object
  - Object classes with several attributes and methods
  - Composite components with defined interfaces used to access their functionality.

Component testing

- Software components are often composite components that are made up of several interacting objects.

- You access the functionality of these objects through the defined component interface.

System testing

- System testing during development involves integrating components to create a version of the system and then testing the integrated system.

- System testing tests the emergent behaviour of a system.

Release testing

- The primary goal of the release testing process is to convince the supplier of the system that it is good enough for use.

- Release testing is usually a black-box testing process where tests are only derived from the system specification.

- Ex-performance tetsting

Performance testing

- Part of release testing may involve testing the emergent properties of a system, such as performance and reliability.

- Stress testing is a form of performance testing where the system is deliberately overloaded to test its failure behavior.

User testing

- User or customer testing is a stage in the testing process in which users or customers provide input and advice on system testing.

Types of user testing

- Alpha testing
  - Users of the software work with the development team to test the software at the developer's site.
- Beta testing
  - A release of the software is made available to users to allow them to experiment and to raise problems that they discover with the system developers.
- Acceptance testing
  - Customers test a system to decide whether or not it is ready to be accepted from the system developers and deployed in the customer environment.

Testing and Debugging

- Testing
  - It involves identifying bug/error/defect in a software without correcting it.

- Debugging
  - It involves identifying, isolating, and fixing the problems/bugs.

Quality Assurance

- QA includes activities that ensure the implementation of processes, procedures and standards in context to verification of developed software and intended requirements.

- Process-oriented activities

Automation Testing

- Automation testing, which is also known as Test Automation, is when the tester writes scripts and uses another software to test the product.

Software Testing Tools

- HP Quick Test Professional
- Selenium
- IBM Rational Functional Tester
- SilkTest
- TestComplete
- Testing Anywhere
- WinRunner
- LoadRunner
- Visual Studio Test Professional
- WATIR

Key points

- Testing can only show the presence of errors in a program. It cannot demonstrate that there are no remaining faults.

- Development testing is the responsibility of the software development team. A separate team should be responsible for testing a system before it is released to customers.