

# Introduction to Software Testing – Part 2

Dr. Rodrigo Spínola



Lecture 15 – Introduction to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team



2

## Last time

- Software quality
  - Internal vs external quality factors
  - Dynamic vs static analysis
  - Software validation vs software verification
- Software testing
  - Types: system, integration, functional, unit



Lecture 15 – Introduction to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team



# Agenda

- Software testing
  - Philosophy: black-box vs. white-box
  - Elements: test case, test procedure, test coverage, incident



Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team

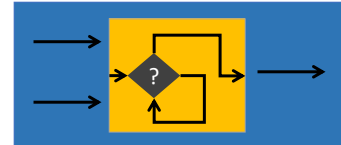


What types of information  
can you use to plan the test cases?

5

# Testing Philosophy

- Glass-box (White box) testing
  - Tester understands the internal details of system to be tested. When, for instance, the developer is testing code.
- Black-box testing
  - Tester does NOT use (or understand) the internal details of system to be tested



Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team

 **VCU**  
Computer Science  
College of Engineering

6

# Basic Testing Concepts



Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team

 **VCU**  
Computer Science  
College of Engineering

# Test Coverage

- Test coverage means what is being tested and how much testing is done
- It helps in monitoring the testing quality, prioritizing the focus areas on critical modules, and allocation of resources
- Coverage: popular metric of testing amount
  - Amount of code or execution paths covered by tests

**It clarifies whether the testing efforts are enough or whether there is a scope of improvement**

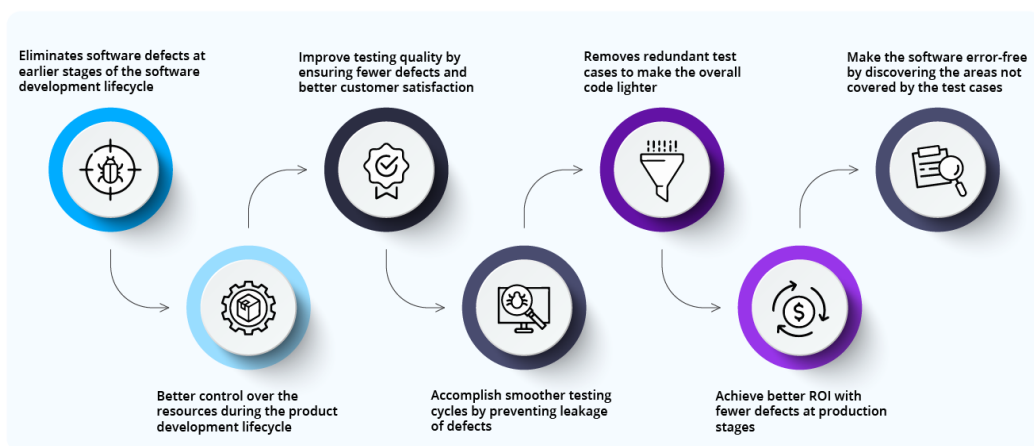


Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team



## Why is software test coverage important?



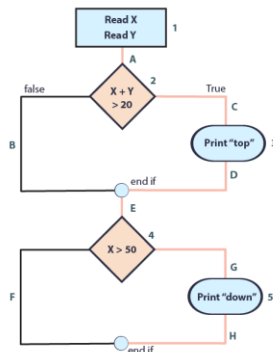
Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team



# Test Coverage Techniques

- **Statement coverage:** It ensures that all the source code statements are tested at least once. It provides the details of failed as well as executed code blocks from the total code blocks



Path that covers all the statements in the flowchart :

1A - 2C - 3D - E - 4G - 5H

A single path is **not enough** to cover all the statements in the case of complex code. In that case, it is required to write **multiple test cases** to cover a variety of statements.

www.qaoncloud.com



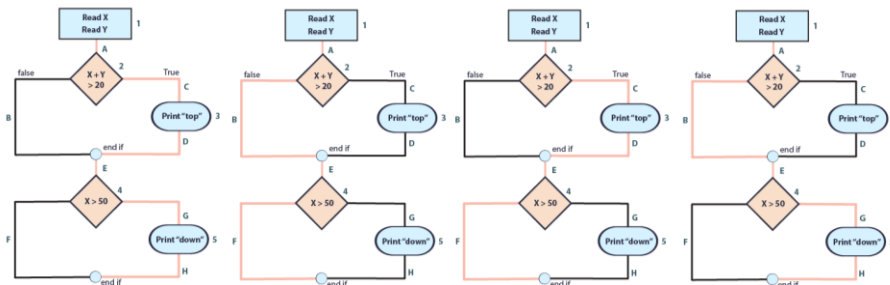
**VCU**  
Computer Science  
College of Engineering

**TDresearchteam**  
Technical Debt Research Team

> **Lecture 15 – Introduction to Testing - Part 2**

# Test Coverage Techniques

- **Path coverage:** It is a structural testing technique and involves the use of the source code to find all the possible executable paths. Path coverage ensures that all the paths are covered



www.qaoncloud.com



**VCU**  
Computer Science  
College of Engineering

**TDresearchteam**  
Technical Debt Research Team

> **Lecture 15 – Introduction to Testing - Part 2**

11

# Test Case

A test case is a set of actions performed on a system to determine if it satisfies software requirements and functions correctly. It describes a particular scenario to be tested.

- It helps guide the tester through a sequence of steps to evaluate whether a software application is working as required by the end-user
- Typically, test cases for a given module are grouped into a test suite. More often than not, a test session will include many test cases because there will usually be more than one specific scenario to be tested



Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team



12



**But... this is still NOT  
enough...**

**Boundary Value Analysis and  
Equivalence Partitioning Testing**

## Test Case Description

TC02 - Login Page - Authenticate Successfully on gmail.com

Last updated on: 29th Nov 2021, Last Saved by: Jake Bartlett  
A registered user should be able to successfully login at gmail.com

**PRECONDITION:** the user must already be registered with an email address and password.  
**ASSUMPTION:** a supported browser being used.

**TEST STEPS:**

1. Navigate to gmail.com
2. In the 'email' field, enter the email address of the registered user
3. Click the 'Next' button
4. Enter the password of the registered user
5. Click 'Sign in'

**EXPECTED RESULTS:**

A page displaying the gmail user's inbox should load, showing any new messages at the top of the page



Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team



13

# Test Procedure

A test procedure is a specification of test cases to be applied to one or more target program module.

- Let's imagine a CRUD scenario to be tested
- Also, consider you have a set of test cases: Add item Remove item Update item Read item
- How would you run your test cases to minimize testing effort while holding the same coverage?

Option 1: Remove Add Remove Remove Add Update Read

Option 2: Add Update Read Remove Remove



Lecture 15 – Introduction  
to Testing - Part 2

TDresearchteam  
Technical Debt Research Team



14

# Test Incident

- While executing a test, you might observe that the actual results vary from expected results. **When the actual result is different from the expected result** then it is called as incidents
  - We refer to an incident as a defect **only** when the root cause is some problem in the item we are testing
- Usually, we report test incidents describing:
  - Inputs
  - Actual and expected results
  - Anomalies
  - Date and time
  - Procedure step
  - Attempts to repeat
  - Testers



Lecture 15 – Introduction  
to Testing - Part 2

TDresearchteam  
Technical Debt Research Team



15

# Other Types of Testing

- Stress testing
  - E.g., testing on OS by opening too many files; by allocating too much memory
- Regression testing
  - automatically rerun old tests so changes don't break what used to work
- Random testing
  - Randomly generate test input and hope to see a crash or some assertion failing
  - 1000 monkeys on the keyboard can generate some interesting test cases
    - MonkeyRunner on Android



Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team



16

# Summary

- Philosophy: black-box vs. white-box
- Elements: test case, test procedure, test coverage, incident



Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team





# Introduction to Software Testing – Part 2

Dr. Rodrigo Spínola



Lecture 15 – Introduction  
to Testing - Part 2

**TDresearchteam**  
Technical Debt Research Team

 **VCU**  
Computer Science  
College of Engineering