SWE 434
SOFTWARE TESTING AND VALIDATION
LAB

INTRODUCTION

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GRADING

- **20% of the course grade.**
- **For class participations and Quizzes.**

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WHY TESTING?

- Software is everywhere.
- Software contains defects. They hide.
- Defects can cause software failures.
- Failures can cost money, and even be mortal!
- Testing assures the quality of the software.
- Testing accelerates software development.

Software testing is a fundamental part of professional software development!

WHY TESTING?

- **More than 3,200 US prisoners have been released early because of a software glitch.**

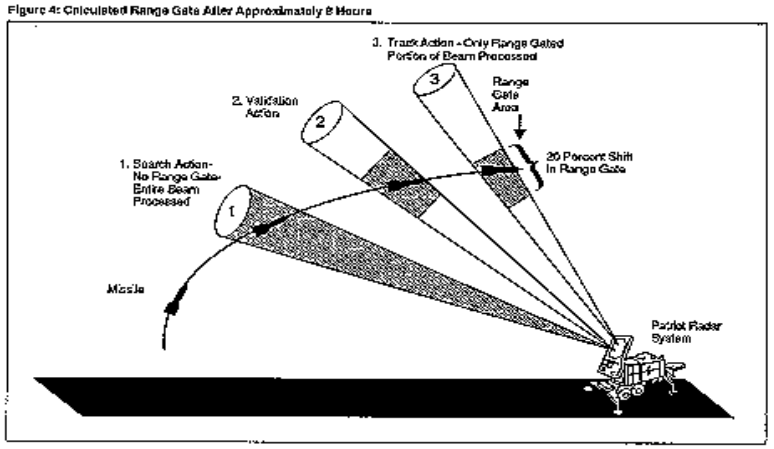
Technology

US prisoners released early by software bug

23 December 2015 | Technology

WHY TESTING?

- AL Dhahran scud Attack 1990, killing 28 U.S. soldiers and injuring another 98.
- Patriot's failed to track and intercept the incoming Scud because of a bug in Patriot's radar and tracking software



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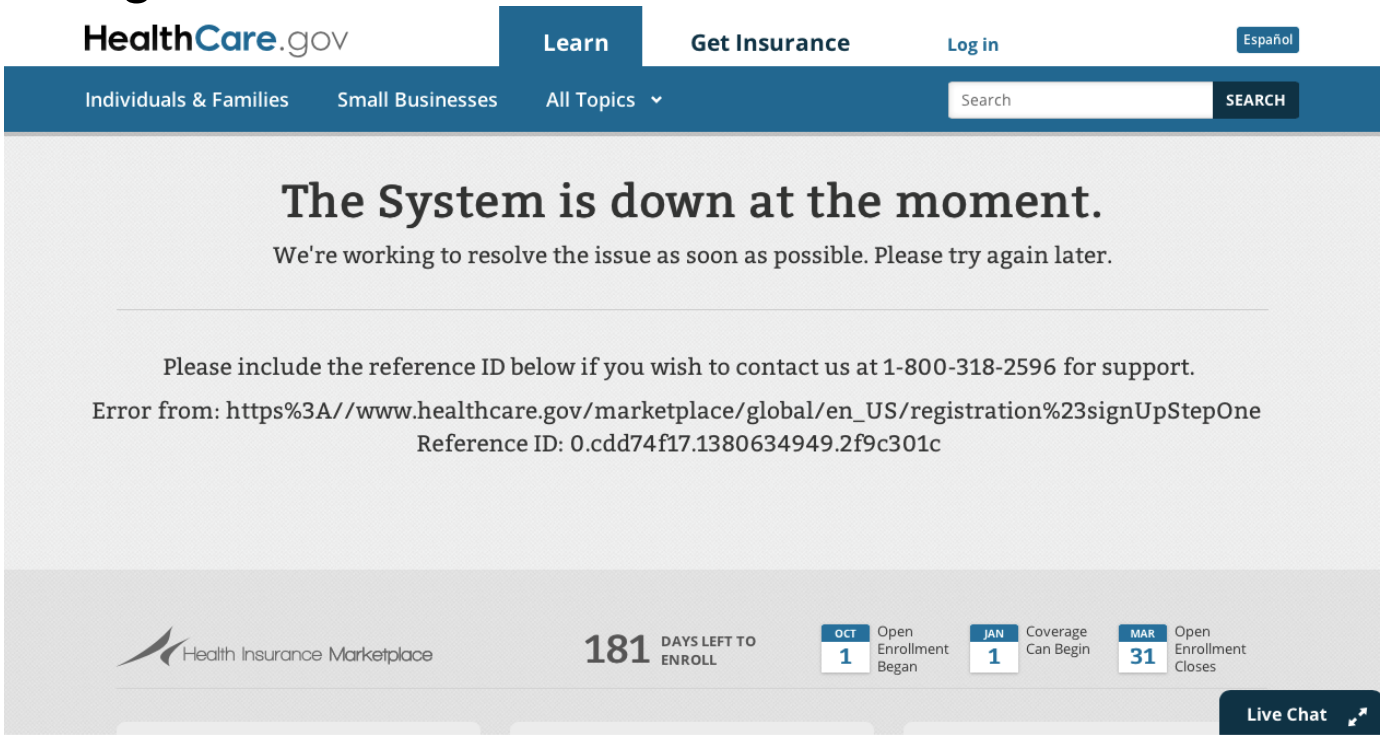
WHY TESTING?

- **Healthcare.gov.**
- **No proper testing.**
- **Testing was left to the last minute.**



WHY TESTING IS IMPORTANT TO ME?

- **Job opportunities in Saudi Arabia.**
- **There are few professional testers!**
- **It is a great if you are a developer and you know Testing.**

TYPES OF TESTING

- Unit testing
- Verification
- Regression testing
- Inspections
- Static analysis
- Symbolic execution
- Program slicing
- Acceptance testing
- Integration testing
- Data-flow analysis
- Reliability testing
- Penetration testing
- Cleanroom development
- Web crawlers
- Use case testing

MAIN GOAL

- **Understand and Gain hands-on experience with popular testing tools and techniques**

Cucumber

JUnit

MANUAL TESTING

- How do you test your code?

MANUAL TESTING

Print statement? Is it enough?

```
DPLLS.py
Reading sentences no 1 .....
(True, {'Q': False, 'P': False}, set([]))
Done!
Reading sentences no 2 .....
(True, {'A': False, 'C': True, 'B': False}, [])
Done!
Reading sentences no 3 .....
True {'A': True, 'C': True} ['B']
Done!
Reading sentences no 4 .....
True {'A': True, 'C': True, 'B': False, 'E': True, 'D': False, 'G': True, 'F': T
rue, 'I': True, 'H': True, 'K': False, 'M': True, 'L': True, 'O': False, 'N': Fa
lse, 'P': True} ['J']
Done!
Reading sentences no 5 .....
True {'Q': False, 'P': True, 'S': False, 'R': True} []
Done!
Reading sentences no 6 .....
True {'A': True, 'C': True, 'B': True} []
Done!
Reading sentences no 7 .....
True {'Q': True, 'P': True} set([])
```

Manual Testing using excessive print statements

MANUAL TESTING

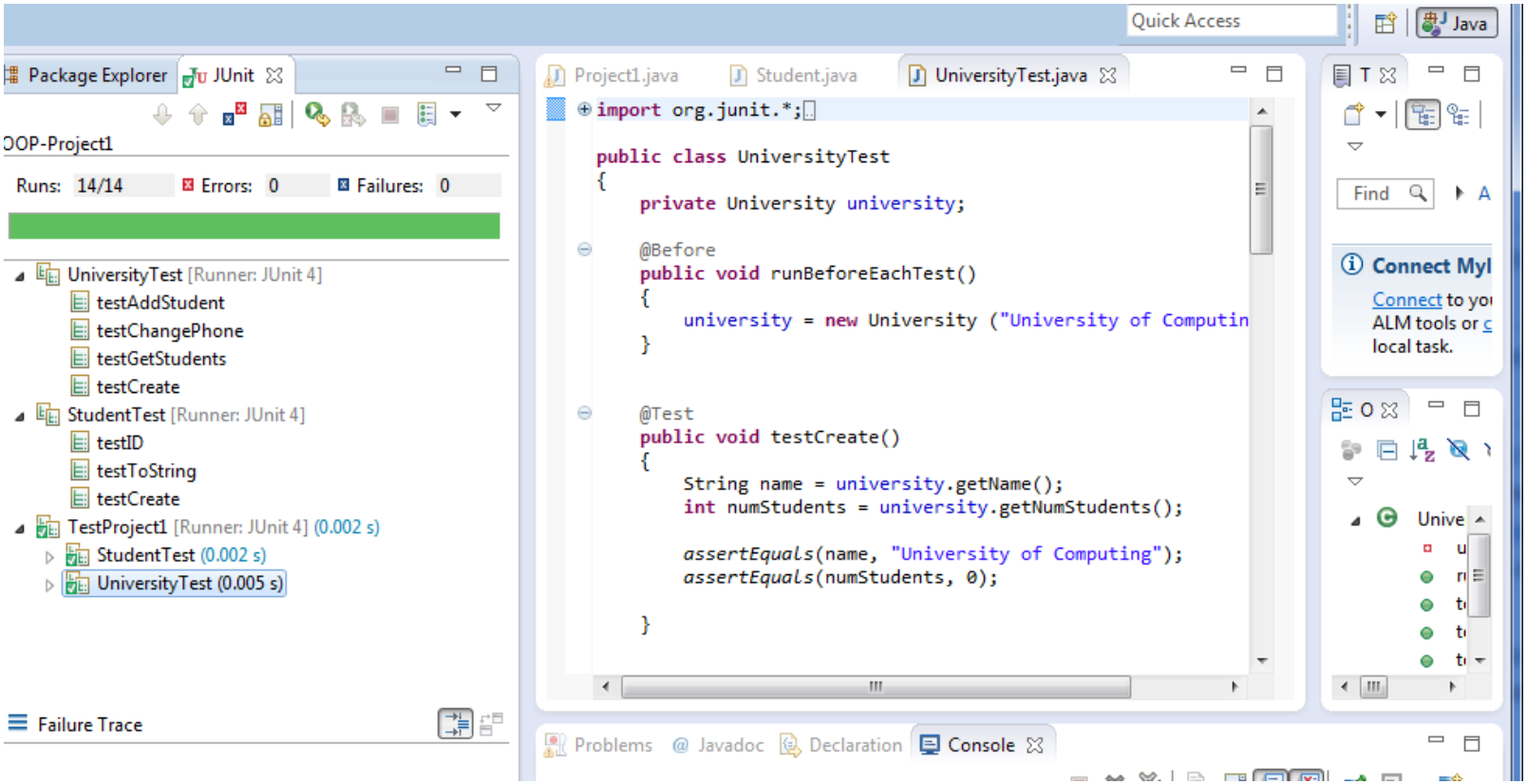
- **Debugging the code using *system.out.println()* will lead to manual scanning of the whole output every time the program is run to ensure the code is doing the expected operations.**
- **in the long run, it takes lesser time to code JUnit methods and test them on class files.**

```
public class manualTest {

    //Trivial Example to show how print statements usually used to verify code
    //@ali
    public static void main(String[] args) {
        int x= 5 ;
        int y =3;
        int RectangleArea=x*y;
        System.out.println("The area is:" + RectangleArea);  // Check the RectangleArea is true before using it again
        int building = RectangleArea*4; //

    }

}
```

UNIT TESTING

- **The testing of single entity (class or method). Unit testing is very essential to every software company and developer.**

JUNIT

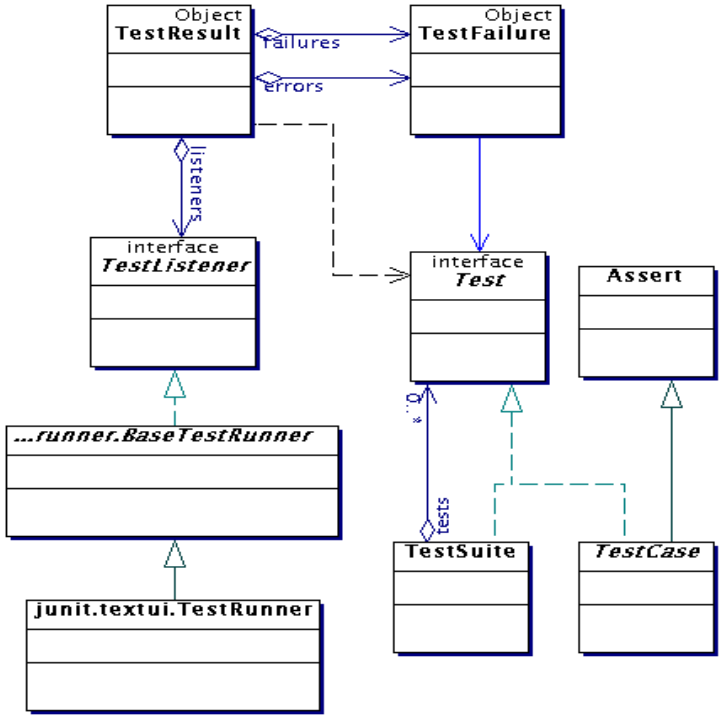

Quick Access
Java
Package Explorer
JUnit
OOP-Project1
Runs: 14/14
Errors: 0
Failures: 0
UniversityTest [Runner: JUnit 4]
testAddStudent
testChangePhone
testGetStudents
testCreate
StudentTest [Runner: JUnit 4]
testID
testToString
testCreate
TestProject1 [Runner: JUnit 4] (0.002 s)
StudentTest (0.002 s)
UniversityTest (0.005 s)
Failure Trace
Project1.java
Student.java
UniversityTest.java
import org.junit.*;
public class UniversityTest
{
private University university;
@Before
public void runBeforeEachTest()
{
university = new University ("University of Computin
}
@Test
public void testCreate()
{
String name = university.getName();
int numStudents = university.getNumStudents();
assertEquals(name, "University of Computing");
assertEquals(numStudents, 0);
}
Problems
Javadoc
Declaration
Console
Find
Connect Myl
Connect to yo
ALM tools or c
local task.

FEATURES OF JUNIT

- It is an open source framework.
- Provides Annotation to identify the test methods.
- Provides Assertions for testing expected results.
- Provides Test runners for running tests.
- JUnit tests can be run automatically and they check their own results and provide immediate feedback.
- JUnit tests can be organized into test suites containing test cases and even other test suites.
- JUnit shows test progress in a bar that is green if test is going fine and it turns red when a test fails.

ARCHITECTURAL OVERVIEW

- JUnit test framework is a package of classes that lets you write tests for each method, then easily run those tests
- TestRunner runs tests and reports TestResults
- You test your class by extending abstract class *TestCase*
- To write test cases, you need to know and understand the Assert class



EXPECTATIONS

- **Attend labs.**
- **Do the lab tutorials**
- **Practice the tools we learn in lab**

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NEXT WEEK

- **Junit**