



Introduction into Software Testing

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INFAMOUS SOFTWARE ERROR CASE STUDIES

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- Patriot Missile Defense System, 1991
- Disney's *Lion King*, 1994-1995
- Intel Pentium Floating-Point Division Bug, 1994
- NASA Mars Climate Orbiter, 1999
- The Y2K (Year 2000) Bug, circa 1974
- The Explosion of the Ariane 5, 1996

Why do we test?

THERAC-25

- In 1985-87 6 people have received a lethal dose of radiation during the sessions of radiation therapy with medical complex Therac-25
- The end of the process of entering and editing of parameters indicates that all parameters are set and the cursor is at the command line
- Check every 8 seconds... but what happens if edit everything quickly?! - Old data would be used

Why do we test?

PATRIOT MISSILE DEFENSE SYSTEM, 1991

- Fail to defend against several missiles, including one that killed 28 U.S. soldiers in Dhahran, Saudi Arabia
- Timing error in the system's clock accumulated to the point that after 14 hours, the tracking system was no longer accurate
- In the Dhahran attack, the system had been operating for more than 100 hours

Why do we test?

DISNEY'S *LION KING*, 1994-1995

- The Disney company released its first multimedia CD-ROM game for children, *The Lion King Animated Storybook*
- Sales were huge
- Disney failed to properly test the software on the many different PC models available on the market. The software worked on a few systems, but not on the most common systems that the general public had.

Why do we test?

INTEL PENTIUM FLOATING-POINT DIVISION BUG, 1994

- $(4195835 / 3145727) * 3145727 - 4195835 = ???$
- The way Intel handled the situation:
 - The problem was found before the chip was released. Intel's management decided that it wasn't severe enough to warrant fixing it, or even publicizing it.
 - Once the bug was found, Intel attempted to diminish its perceived severity through press releases and public statements.
 - When pressured, Intel offered to replace the faulty chips, but only if a user could prove that he was affected by the bug.

Why do we test?

NASA MARS CLIMATE ORBITER, 1999

- On September 23, 1999, NASA's Mars Climate Orbiter disappeared.
- According to specification SM-FORCE module should process data in newton-seconds, but it were pound-seconds
- 1 pound-second is equal to 4.45newton-seconds

Why do we test?

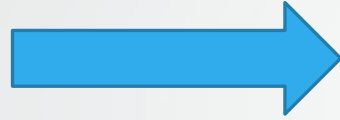
THE EXPLOSION OF THE ARIANE 5, 1996

- On June 4, 1996 Ariane 5 rocket launched exploded forty seconds after its lift-off from Kourou, French Guiana.
- Development costed \$7 billion. The destroyed rocket and its cargo were valued at \$500 million.
- Failure: *a 64 bit floating point number relating to the horizontal velocity of the rocket was converted to a 16 bit signed integer. The number was larger than 32,767, the largest integer storeable in a 16 bit signed integer, and thus the conversion failed.*

Why do we test?

WHY DO WE TEST?

Lack of
Testing



Loss

To tell
somebody that
they are wrong
is called
criticism.

To do so
officially is
called testing.

Why do we test?

WHAT IS SOFTWARE TESTING?

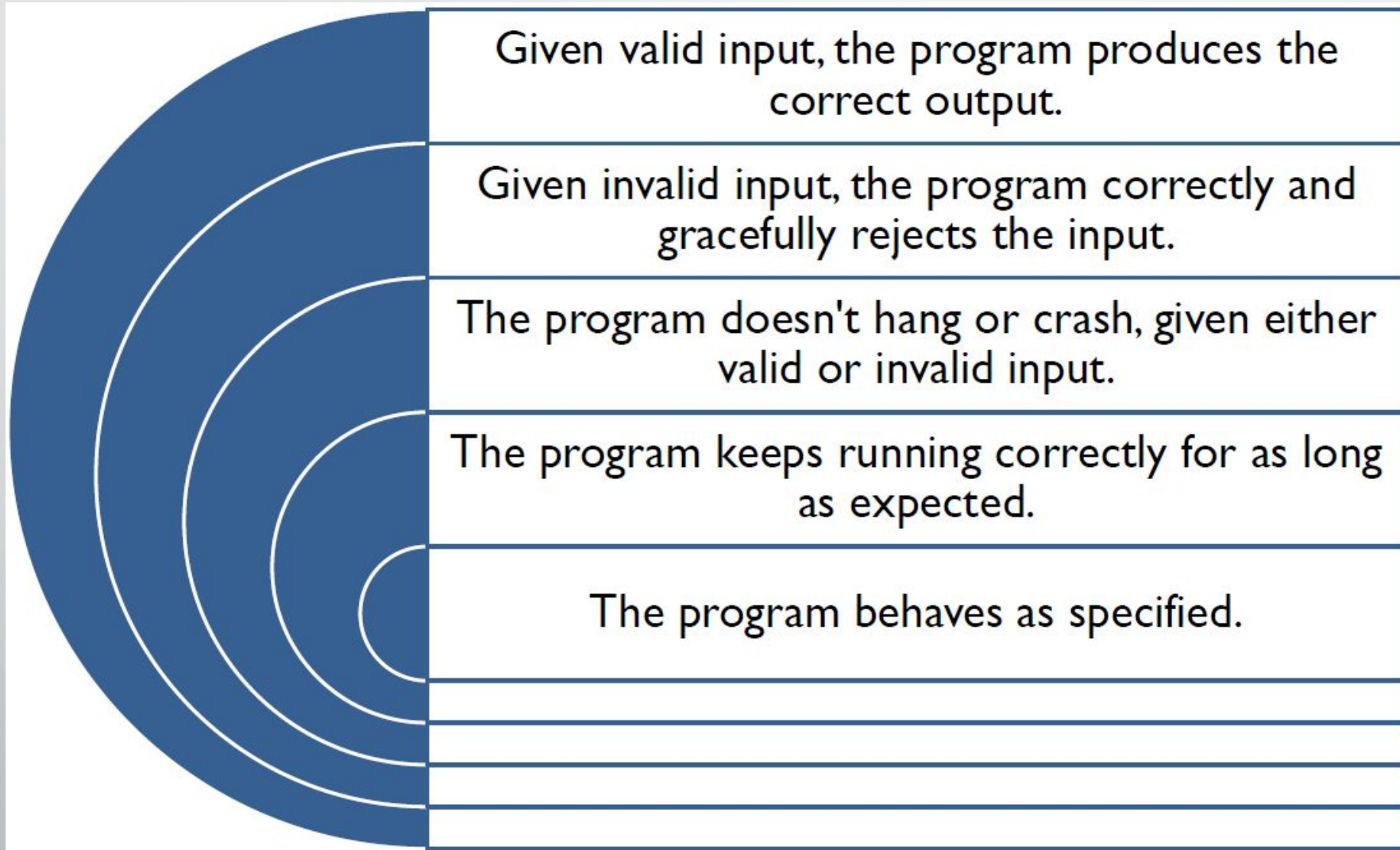
- Business success of different companies, and frequently a human life can depend on reliable functioning the certain types of software.
- In turn, quality of software product depends on the well-coordinated work of project team including testers.
- «*Software Testing is the process of executing a program or system with the intent of finding errors*». Glenford J. Myers
- Testing is any activity directed on errors detection in software product.

**ISTQB Glossary:*

The process consisting of all lifecycle activities, both static and dynamic, concerned with planning, preparation and evaluation of software products and related work products to determine that they satisfy specified requirements, to demonstrate that they are fit for purpose and to detect defects.

What is Software Testing?

THE PROGRAM WORKS CORRECTLY IF:



What is Software Testing?

TESTING: PRIMARY PURPOSES

- - to demonstrate quality or proper behavior;
- - to detect and fix problems.
- **Primary goal of testing** is to increase the probability that the application-under-test will behave correctly under all circumstances and will meet defined requirements.

ROLE OF SOFTWARE TESTING

- Software Testing is interesting, challenging, many-sided profession requiring a **huge set of skills and knowledge** from testers.
- Testing is very important part of the software engineering. No one more or less serious company creates and delivers its products without testing.
- No one project passes without testing. Even internal products are passed tests before shipping to production environment.
- **Software Testing requires from testers to be a high level professionals.** Successful Testing cannot be performed by everyone from the street. It requires an appropriate education and knowledge.

What is Software Testing?

WHO IS SOFTWARE TESTER?

- Sometimes, testers should pretend to be a «**typical**» **user**. They should use the software the same way that the «**average**» **user** would.
- Sometimes, testers should be **experts, professionals** in some IT-area.
- Testers explore, assess, track, and report product quality, so that others in the project can make informed decisions about product development. *It is important to recognize that testers are not out to «break the code». They are not out to embarrass or complain, just to inform.* They are human meters of product quality.

WHO IS SOFTWARE TESTER?

- A typical tester to perform his duties must have **a lot of different skills and qualities** much more than a typical developer.
- Tester – one of few experts analyzing a product in all details, and often directly ahead of its delivery to the user.
- Testing is not only defects defining, but it is a **continuous striving for perfection** (not a program's perfection though!) of a testing process. This leads to qualification perfection, i.e. perfection of oneself.
- *«Software testers are the unsung heroes who help eliminate the irritating glitches found in software».*

Who is Software Tester?

QUALITIES OF A GOOD SOFTWARE TESTER

An Ideal Tester should have:

- Heightened degree of **responsibility**
- Strong **communication skills**
- Knack to **express his ideas precisely and clearly**
- **Orderliness**
- **Patience, assiduity, attention to details, observation**
- **Flexible** thinking, high **education potential**
- Intelligent **abstract thinking**, ability for **analytical work**
- **Experimenter's psychology**
- Software **engineering skills**

Detective skills

Who is Software Tester?

DIFFICULTIES AND CHALLENGES FOR THE TESTER

- A tester needs to have comprehensive knowledge of the software engineering discipline.
- A tester needs to have knowledge from both experience and education as to how software is specified, designed, and developed.
- A tester needs to be able to manage many details.
- A tester needs to have knowledge of fault types and where faults of a certain type might occur in code constructs.
- A tester needs to reason like a scientist and propose hypotheses that relate to presence of specific types of defects.
- A tester needs to have a good grasp of the problem domain of the software that he/she is testing.

Who is Software Tester?

TEST TEAM ROLES AND RESPONSIBILITIES

- Test Manager
- Test Lead
- Usability Test Engineer
- Manual Test Engineer
- Automated Test Engineer
- Network Test Engineer
- Test Environment Specialist
- Test Configuration Specialist

Tester could have more-less of those roles and responsibilities on daily basis

Business Analyst

Test Team Roles and Responsibilities

MANUAL TEST ENGINEER

Responsibilities:

- Development of test procedures and cases based upon requirements
- Manual execution of the test procedures
- Test procedure walkthroughs
- Conduct of tests and preparation of reports on test progress and regression

Skills:

- Good understanding of GUI design – usability errors are often uncovered during QA testing
- Proficient in software testing
- Proficient in designing test suites
- Proficient in the business area of the application-under-test
- Proficient in GUI design

standards

Adherence to test standards

Test Team Roles and Responsibilities

AUTOMATED TEST ENGINEER

Responsibilities:

- Development of test procedures and cases based upon requirements
- Design, development, and execution of reusable and maintainable automated scripts
- Adherence to test design standards

Skills:

- Good understanding of GUI design – usability errors are often uncovered during QA testing
- Proficient in software testing
- Proficient in designing test suites

AUTOMATED TEST ENGINEER (2)

Responsibilities:

- Test procedure walkthroughs
- Execution of tests and preparation of reports on test progress and regression
- Attendance at test tool user group meetings to stay abreast of test tool capabilities

Skills:

- Proficient in the business area of the application-under-test
- Proficient in GUI design standards

USABILITY TEST ENGINEER

Responsibilities:

- Design and development of usability testing scenarios, administration of testing process
- Definition of criteria for those performing usability testing, analysis of results of testing sessions, presentation of results to development team
- ...

Skills:

- Proficient in designing test-suites
- Skilled in test facilitation
- ...

USABILITY TEST ENGINEER (2)

Responsibilities:

- Development of test product documentation and reports
- Definition of usability requirements and interaction with customer to refine usability requirements
- Test procedure walkthroughs

Skills:

- Excellent interpersonal skills
- Proficient in GUI design standards

NETWORK TEST ENGINEER

Responsibilities:

- Network, database, and middleware testing
- Research on network, database, and middleware performance monitoring tools
- Implementation of performance monitoring tools on an ongoing basis

Skills:

- Network, database, and system administration skills
- Expertise in a variety of technical skills, including programming languages, database technologies, and computer operation systems
- Product evaluation and integration skills

TEST ENVIRONMENT SPECIALIST

Responsibilities:

- Installation of test tools and establishment of test tool environments
- Creation and control of the test environment via environment setup scripts
- Maintenance of a test database
- Maintenance of a requirements hierarchy within the test tool environment

Skills:

- Network, database, and system administration skills
- Expertise in a variety of technical skills, including programming languages, database technologies, and computer operation systems
- Test tool experience
- Product evaluation and integration skills

Test Team Roles and Responsibilities

TEST CONFIGURATION SPECIALIST

Responsibilities:

- Test script change management
- Test script version control
- Maintenance of a test script reuse library

Skills:

- Network, database, and system administration skills
- Expertise in a variety of technical skills, including programming languages, database technologies, and computer operation systems
- Configuration management tool expertise

- Test tool experience

Test Team Roles and Responsibilities

TEST LEAD

Responsibilities:

- Technical leadership for the test program, including the test approach
- Customer interaction, recruiting, test tool introduction, test planning, staff supervision, and cost/progress status reporting
- Interaction with test tool vendor to identify best ways to leverage test tool on project

Skills:

- Understands application business area and application requirements
- Familiar with test program concerns such as test data management, trouble reporting and resolution, test design, and development
- ...

Test Team Roles and Responsibilities

TEST LEAD (2)

Responsibilities:

- Test requirement definition, test design, test script and test data development, test automation, test environment configuration, test script configuration management, and test execution
- Staying current on latest test approaches and test tools and transfers this knowledge to test team

Skills:

- Expertise in a variety of technical skills, including programming languages, database technologies, and computer operating systems
- ...

TEST LEAD (3)

Responsibilities:

- Test procedure walkthroughs
- Implementation of test process improvements resulting from lessons learned and benefits surveys
- Testing of traceability matrix
- Test process implementation
- Review of test product documentation

Skills:

- Familiar with different test tools and their use

Test Team Roles and Responsibilities

TEST MANAGER

Responsibilities:

- Responsible for customer and test tool vendor interaction, recruiting, test tool introduction, staff supervision, and staff training
- Test plan development, including development of test goals, objectives, and strategy
- Cohesive integration of test and development activities

Skills:

- Familiar with test program concerns, including test data management, trouble reporting and resolution, test design, and development
- Understands application business area and application requirements
- Skilled at developing test goals, objectives, and test strategy

TEST MANAGER (2)

Responsibilities:

- Acquisition of hardware and software
- Test environment and test product configuration management
- Test process definition, training, and continual improvement
- Test program oversight and progress tracking
- User of metrics to support continuous test process improvement

Skills:

- Familiar with different test tools and their user
- Good at all planning aspects, including personnel management, facilities, and schedule

TEST MANAGER (2)

Responsibilities:

- Analysis of business relative to the application's goals
- User interviews and review of current business
- Definition of processes to gather requirements and determination of the need for reengineering
- Creation of requirements specifications

Skills:

- Experience in the business area
- Interviewing skills
- 'People' skills
- Proficient in user and task analysis
- Understand the GUI usability process

Coordination with the usability test engineers

Test Team Roles and Responsibilities



Thank you for your attention!

Questions?

Test Team Roles and Responsibilities