

Testing: An Introduction

Web Programming and Testing

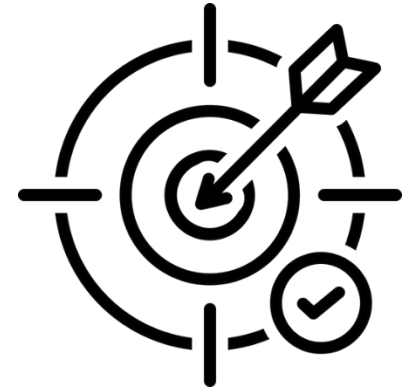


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Objectives

- The objective of this session is the following:
 - The students are able to reason the importance of testing.



Outlines

1. When Things Went Wrong.
2. Testing.

When Things Went Wrong

When Things Went Wrong

NASA's Mars Climate Orbiter

On its mission to Mars in 1998 the Climate Orbiter spacecraft was ultimately lost in space. Although the failure bemused engineers for some time it was revealed that a sub contractor on the engineering team failed to make a simple conversion from English units to metric. An embarrassing lapse that sent the \$125 million craft fatally close to Mars' surface after attempting to stabilize its orbit too low. Flight controllers believe the spacecraft plowed into Mars' atmosphere where the associated stresses crippled its communications, leaving it hurtling on through space in an orbit

When Things Went Wrong



When Things Went Wrong



The screenshot shows the BBC News website interface. At the top, the BBC logo is on the left, followed by a 'Sign in' button and a navigation menu with links for News, Sport, Weather, Shop, Reel, Travel, and More. Below this is a large red banner with the word 'NEWS' in white. Underneath the banner is a secondary navigation bar with links for Home, Video, World, Asia, UK, Business, Tech (which is underlined), Science, Stories, and Entertainment & Arts. The main content area features the headline 'Airbus A400M plane crash linked to software fault' in large, bold black text. Below the headline, it says 'By Leo Kelion' and 'Technology desk editor'. At the bottom left of the article section, there is a clock icon and the date '20 May 2015'. To the right of the date are social media sharing icons for Facebook, Messenger, Twitter, Email, and a 'Share' button with a green share icon.

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Airbus A400M plane crash linked to software fault

By Leo Kelion
Technology desk editor

🕒 20 May 2015

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When Things Went Wrong

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Technology

Latest 737 Max Fault That Alarmed Test Pilots Rooted in Software

By [Alan Levin](#)

July 27, 2019, 11:01 AM GMT+7

- ▶ More details emerge on new failure on Boeing's grounded plane
- ▶ Issue with computer won't require hardware fix, company says

Most Read

MARKETS

Defaults in One of China's Richest

Will You ...

- ride an untested autonomous vehicle?
- sit on an untested auto-piloted plane?
- use an untested ATM machine?
- be okay to be injected an untested vaccine?

If I know, I won't.

Why?

I am not sure it might not work as expected.

What is the reason to conduct testing?

A fault brings consequences, sometimes they are life threatening.

Some Terminologies

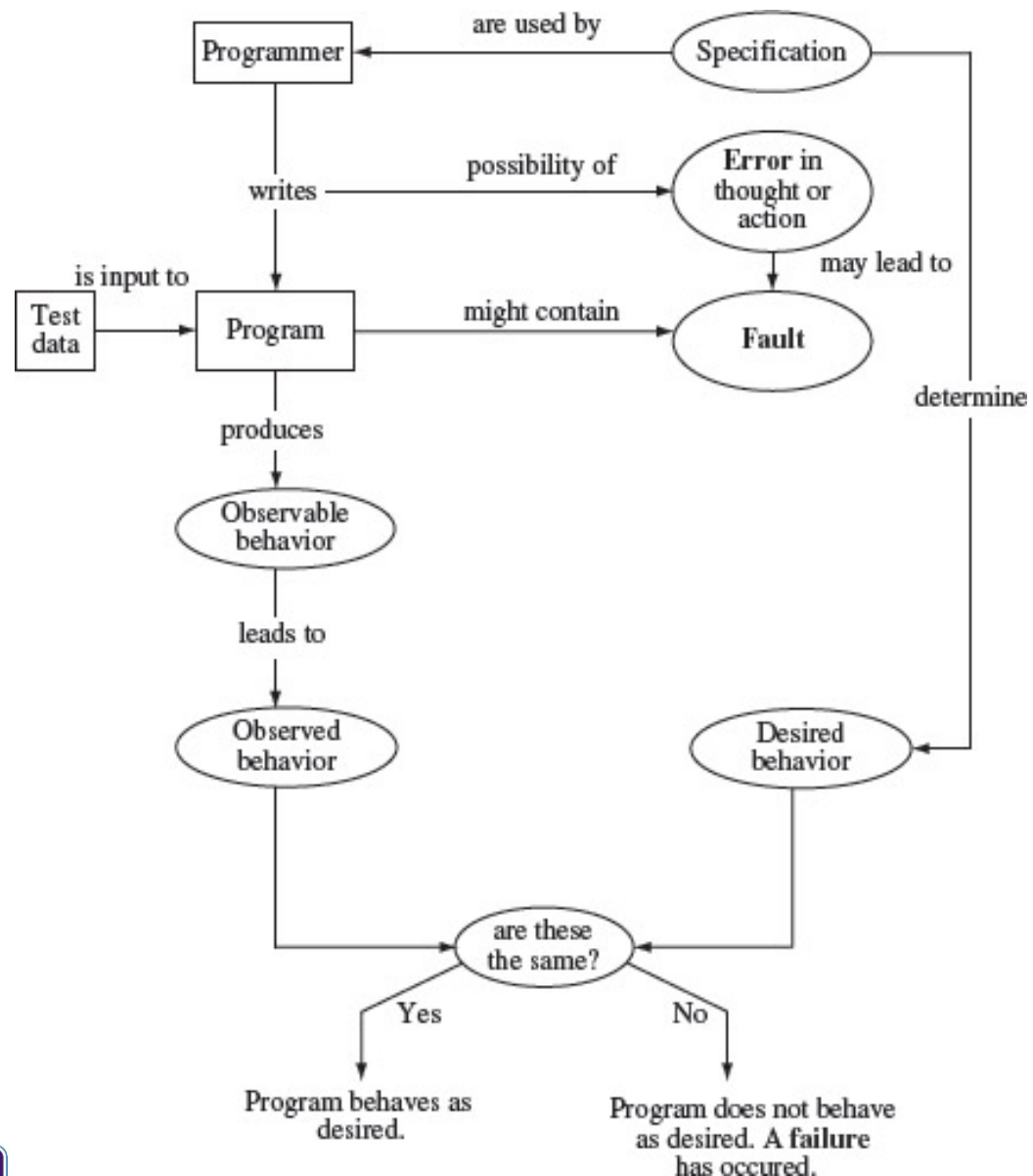
- **Error**: something that occurs unintendedly and leads to one or more faulty or defective spots (incorrect codes).
- **Fault**: a static defect in the software (also known as **bug**).
- **Failure**: an external incorrect behavior with respect to the requirements or another description of the expected behavior. A failure is raised when a faulty spot is executed.
- **Latent fault**: a fault that hasn't produced a failure yet.

An Illustration

A programmer writes a program. An **error** occurs in the process of writing a program. A **fault** is the manifestation of one or more errors. A **failure** occurs when a faulty piece of code is executed leading to an incorrect state that propagates to the program's output.

The programmer might misinterpret the requirements and consequently write incorrect code. Upon execution, the program might display behavior that does not match with the expected behavior implying thereby that a failure has occurred.

Errors, Faults, and Failures in the process of programming and testing



Testing

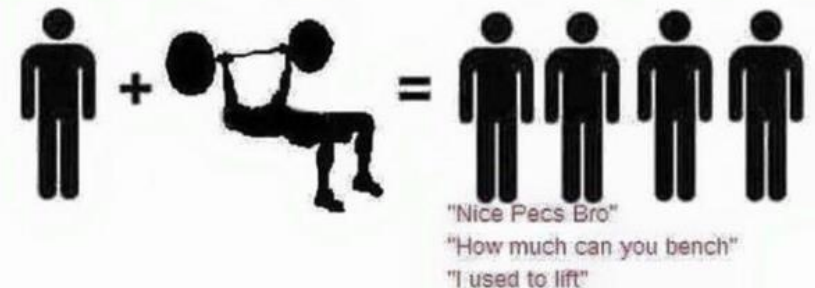
What Is Testing, Really?

- Testing is the process of comparing what it is with what it ought to be.
- Testing can show only the presence of failures, not their absence.
- System under test (SUT).

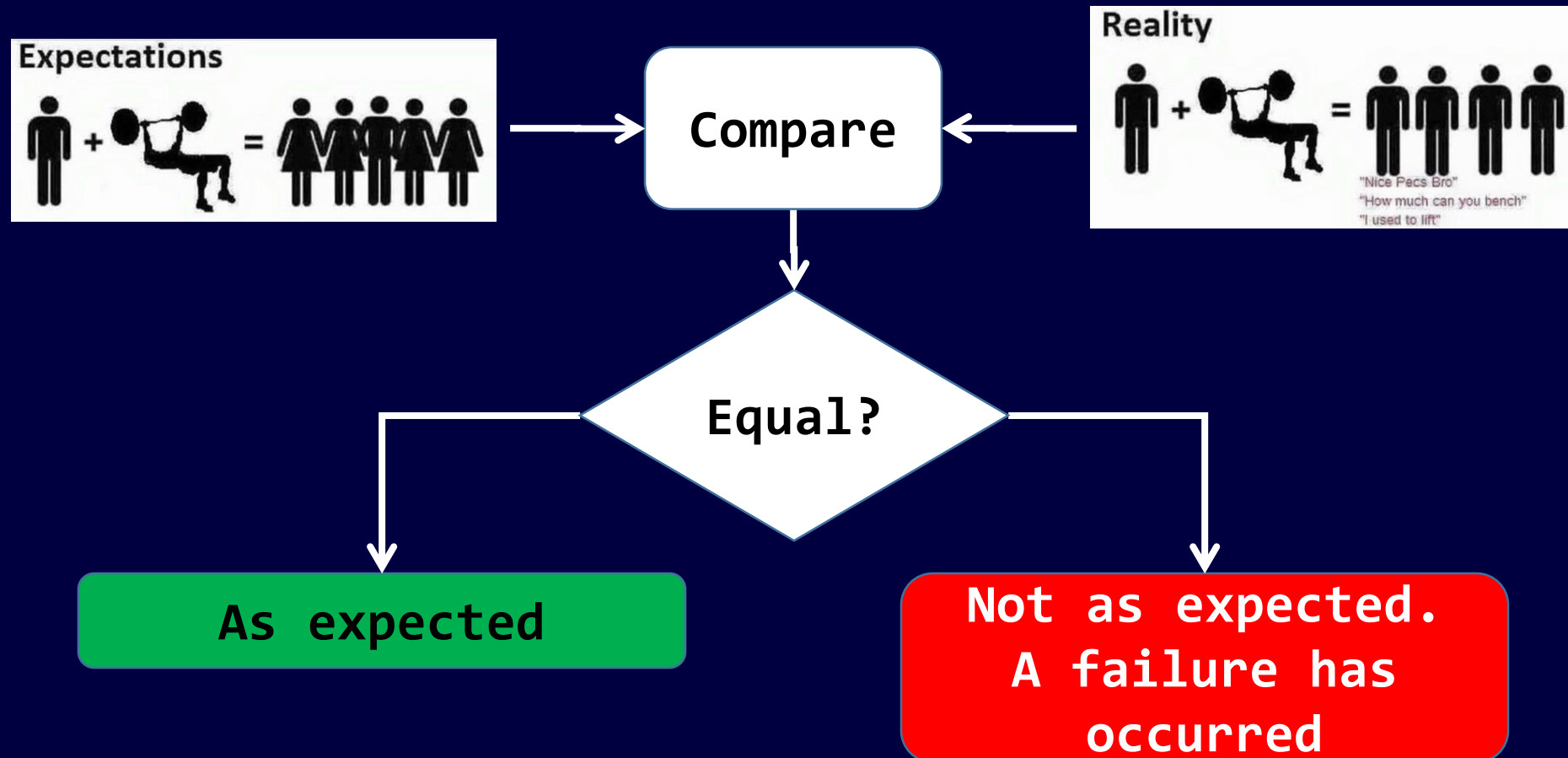
Expectations



Reality



Basic Testing Process



Testing

- To find bugs (fault) by checking its behavior.
- Can be done without design knowledge.
- Can be automated.

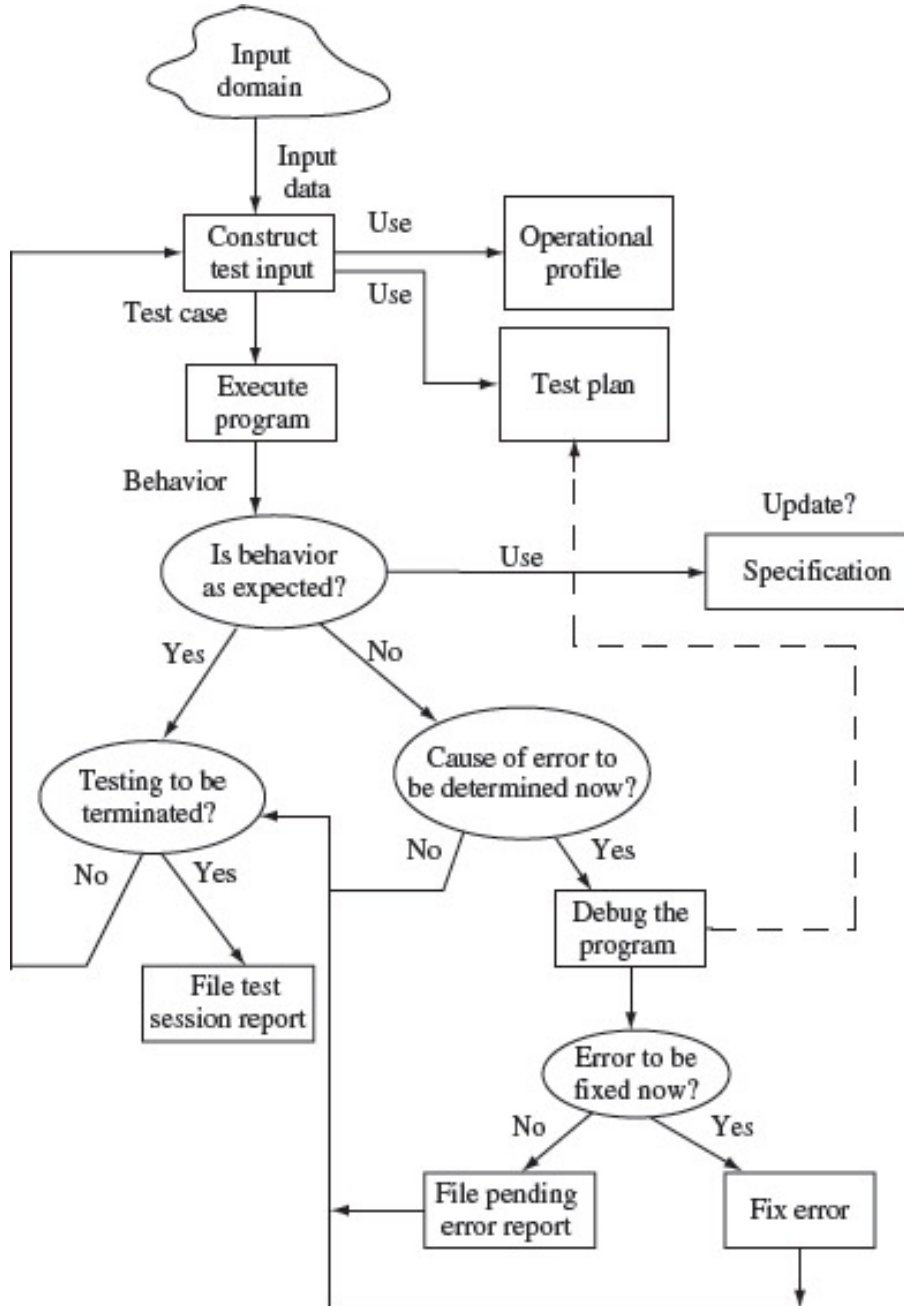


Debugging

- To fix (remove) bugs.
- Can't be done without design knowledge.
- Automation is not possible.



Testing and Debugging Cycle



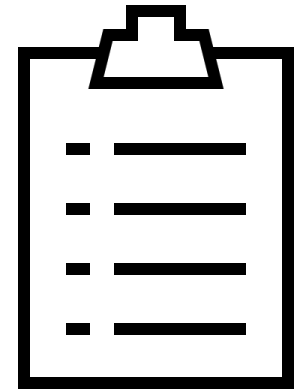
Software Correctness

- A software is tagged with correct when it is **consistent** to the specification.
- Correctness can be verified by testing all the possible input configurations for all possible conditions.
- Unfortunately this is **not** always practical.
- Testing increase the confidence in the software's correctness.



To-dos

1. Next time we will discuss about testing methods, test generation approaches, and API testing.
2. Find some possible impacts when your APIs are left untested.



References

Srinivasan, M. (2012). Web Technology: Theory and Practice. Pearson.

Mathur, A. P. (2013). Foundations of Software Testing. Pearson

Thank
you

