

Software Quality Assurance,

How to improve the quality
of your software through
testing?

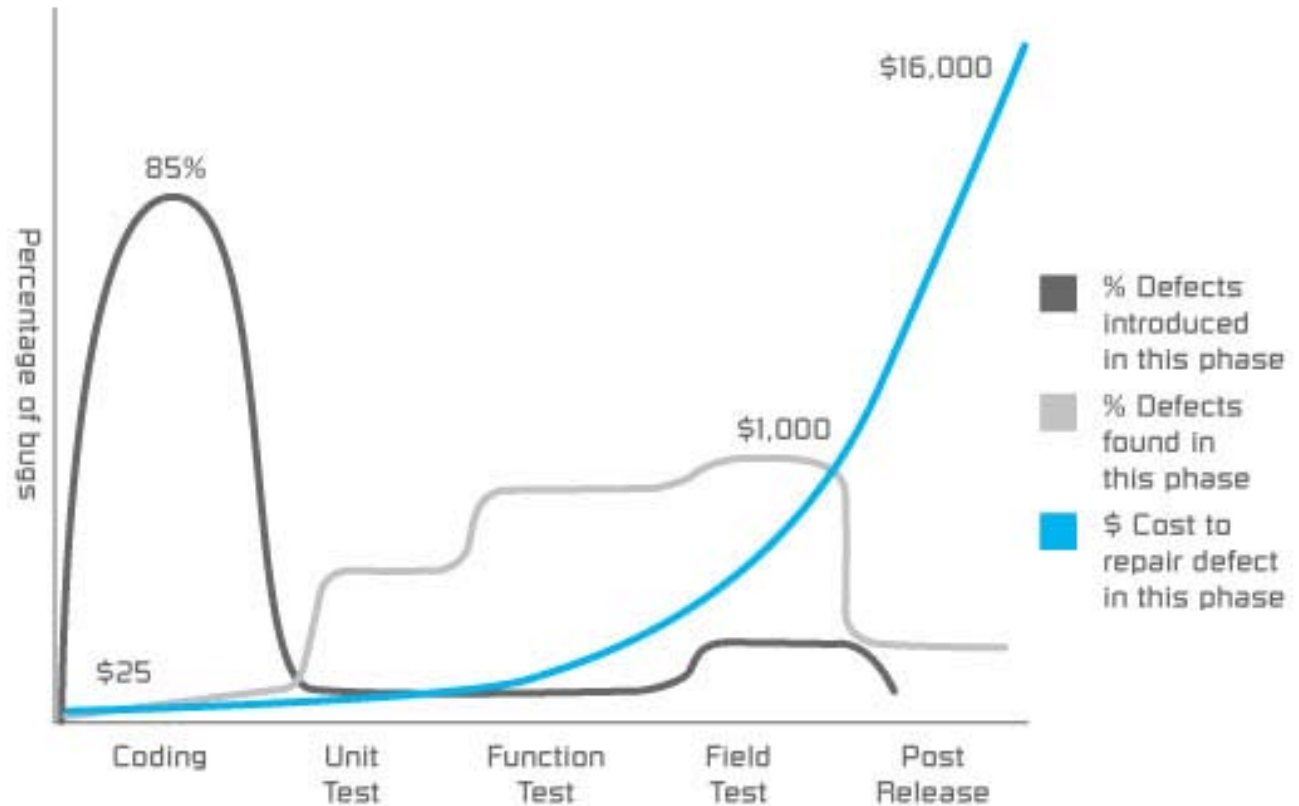
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Outline

- Why worry about testing?
- Basics on testing
- Common questions
- Conclusions


Why worry about testing?

- Improve
- Cost of a
- Why not

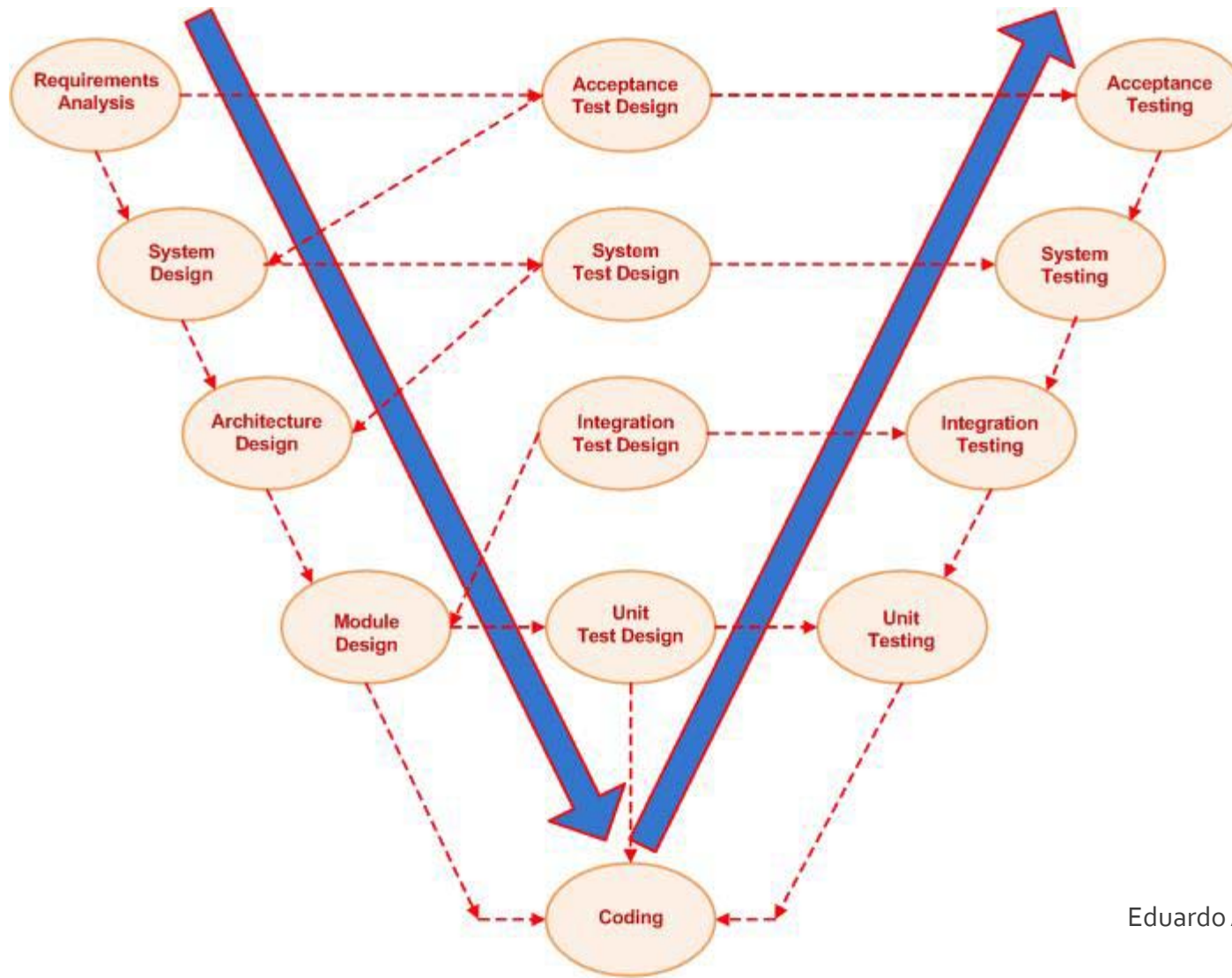


Source: *Applied Software Measurement*, Capers Jones, 1996

Basics on testing

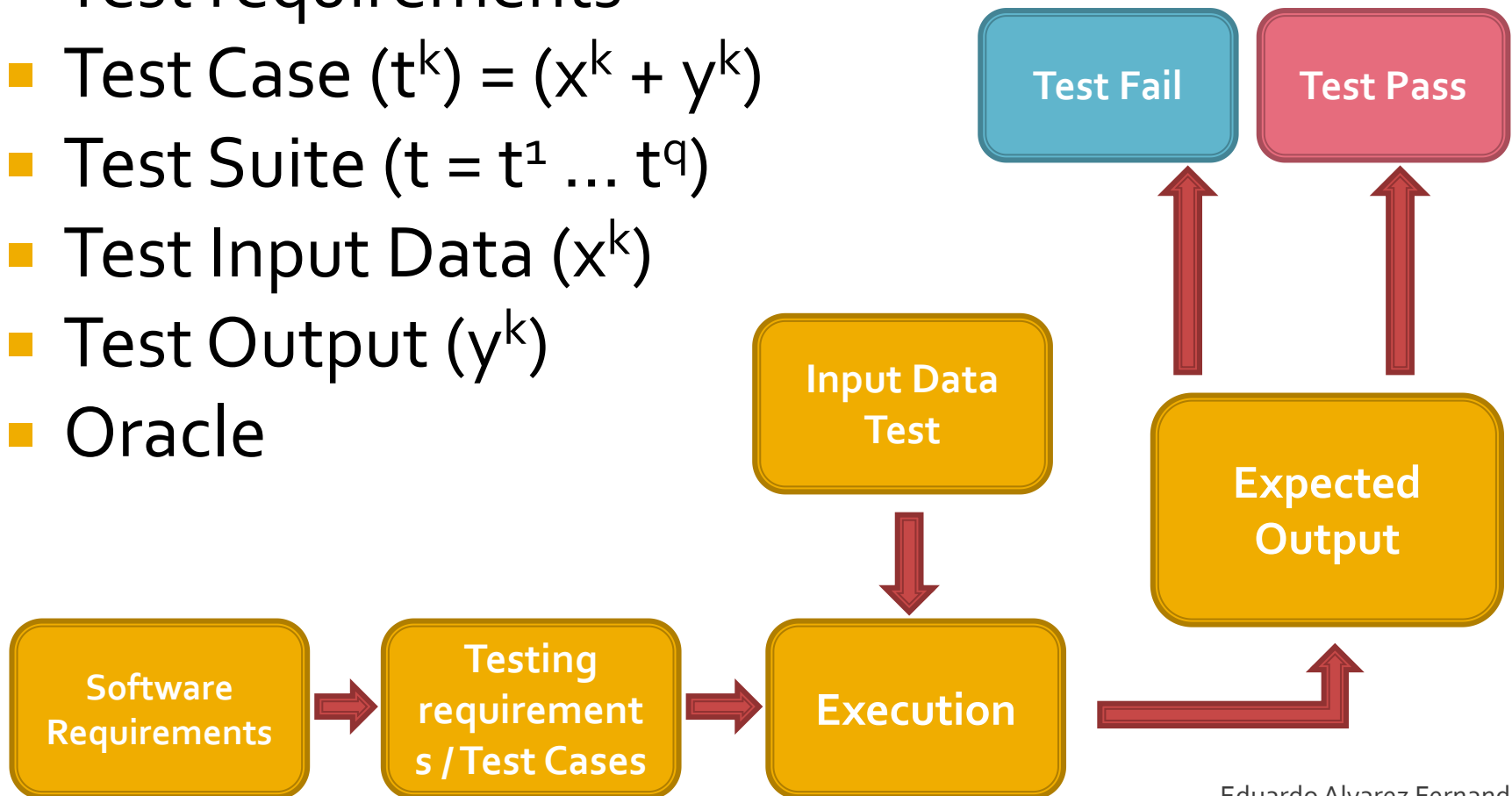
- Purpose of testing
 - Prove that software works 
 - It doesn't crash
 - Right purpose
 - To improve quality
 - Implementation fulfills the initial requirements (functional and not functional)
 - For Verification & Validation (V & V)
 - FIND BUGS/ERRORS!!
 - Good test -> find errors

V Model in software testing



A few important concepts

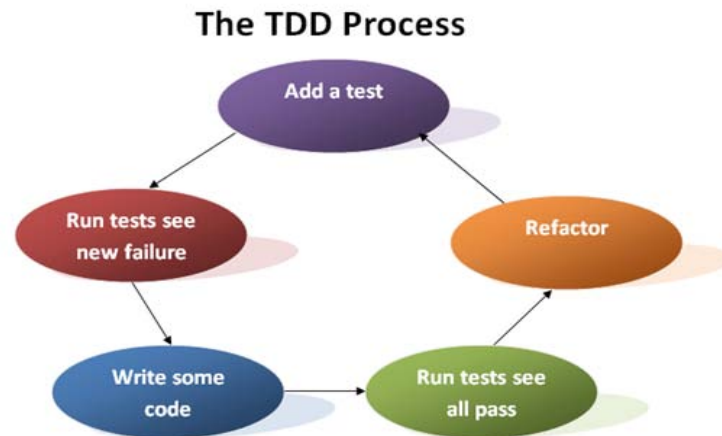
- Test requirements
- Test Case $(t^k) = (x^k + y^k)$
- Test Suite $(t = t^1 \dots t^q)$
- Test Input Data (x^k)
- Test Output (y^k)
- Oracle



Common questions

Who test?

- Developers usually act as testers
 - Code has too much influence in the test cases
- Solution
 - Use an independent test team, or
 - Use some Test-driven development concepts



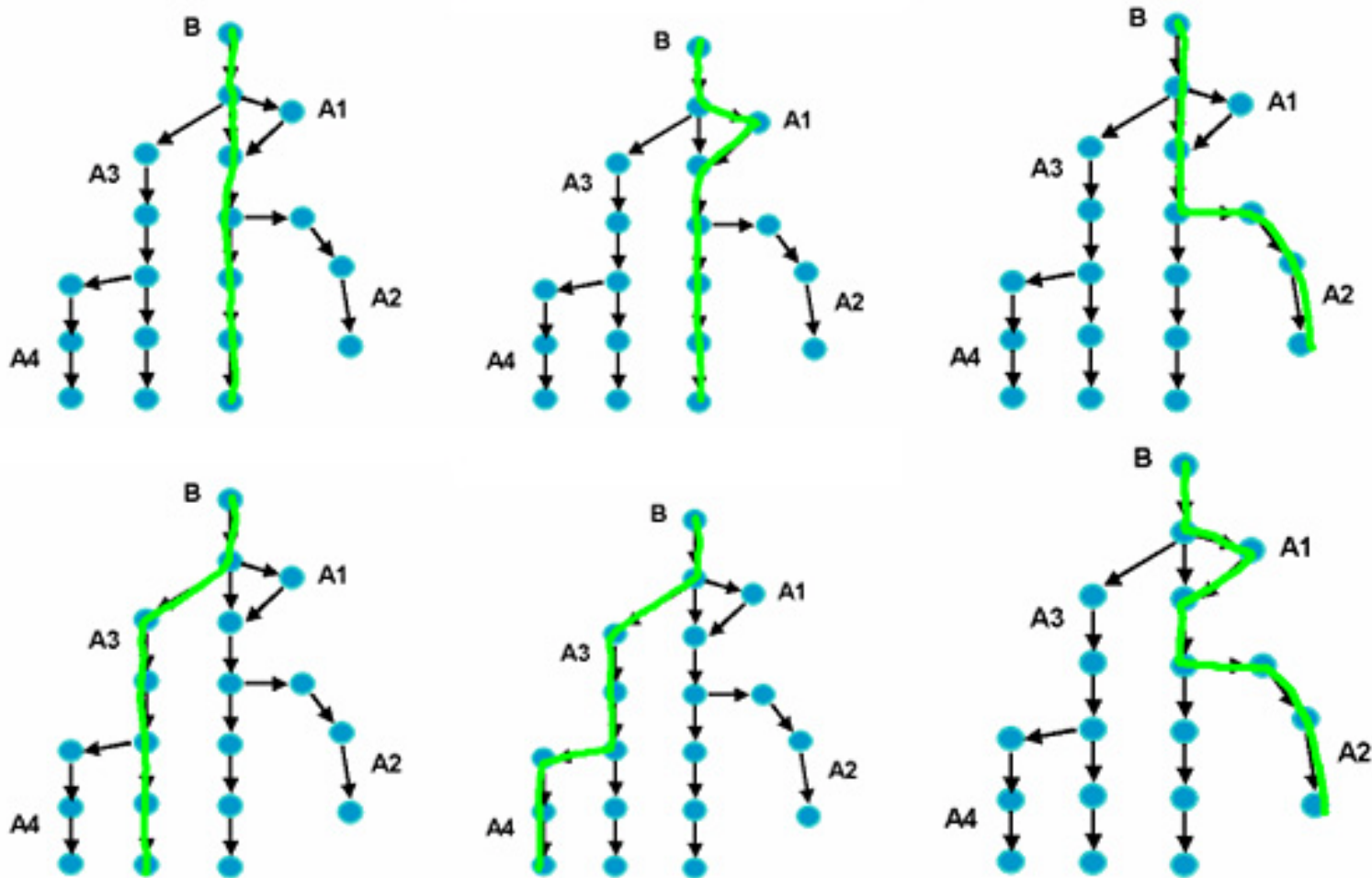
Common questions

How to select good test cases?

- Black-box testing
 - From requirements, use cases, design in general
 - Uses the Data flow and Work flow scheme
- White-box testing
 - Uses control flow and code
 - Different levels of coverage
 - Statement coverage
 - Branch coverage
 - Multiple condition coverage
- Best approach is combine both of them

Common questions

How to select good test cases?



Common questions

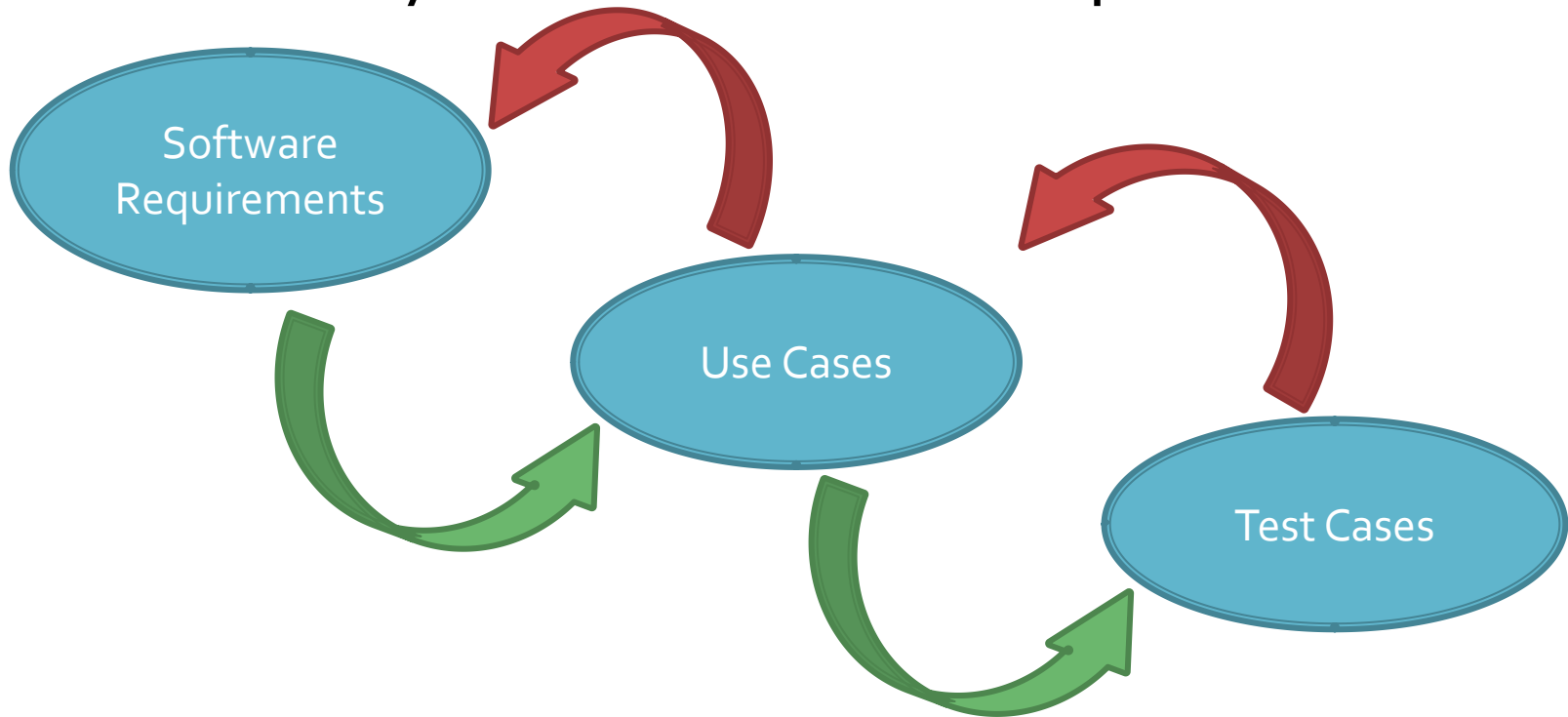
How to select good test cases?

- Some other tips:
 - Try always Limit Values of the parameters
 - Try also with invalid input data (defensive testing)
 - Add systematic errors in the test data or even in the code (Mutation testing) (Very common in DB Testing)
 - Don't forget the non-functional requirements and create test cases to exercise them
 - When you work with composition of services you can apply black-box testing to cover all the workflow paths

Common questions

How to measure the quality of the testing?

- Traceability of the software requirements



- Testing Metrics (**Andres Abad presentation**)

Common questions

Only Unit Testing?

- **No way!!**
- Correctness testing (White-box and Black-box testing)
- Performance testing
 - Really important in Web Applications
 - Verify scalability, reliability and resource usage
 - Several sub-genres
 - Stress testing, massive executions concurrently
 - Endurance testing: continuous load
- Regression testing
 - Assure correctness after changes
 - Well defined sub set of previous tests

Common questions

When stops testing? *

- Not easy to know. Testing is potentially endless
- Several options, but the most common are:
 - You have met previously defined coverage goals
 - Cost of find next bug >>> Expected impact of the bug
 - Simply your boss says "Send the release, **now!**"



*From the testing Guru Mr. Lee Copeland
"The banana principle for testers"

Some interesting tools

- Static Code Test:
 - Rats : C, C++, Perl, PHP and Python
 - ReSharper: .NET
 - Checkstyle: Java
- Unit Test: XUnit (put here your favorite language)
- Automatic testing
 - Mercury WinRunner (commercial)
 - IBM Rational Robot (commercial)
 - Selenium (open source)

More interesting tools

- Performance test (Web Applications)
 - Jmeter (<http://jakarta.apache.org/jmeter>)
 - JUnitPerf (decorate JUnit cases)
 - HP Load Runner (commercial)
- Traceability
 - DOORS (from requirements to test executions)
 - IBM Rhapsody
 - Traceability Matrix in Spreadsheet

Conclusions

- The goal of testing is finding errors and in general assure the quality of a software product
- Lot of techniques, now you have to select which ones you need
- More test cases \neq More quality
 - Selection of the test cases is more important
 - Minimize testing effort
- Don't reinvent the wheel, use tools

Thank you!!!

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