

EEE243 – Applied Computer Programming

Testing

ROYAL MILITARY COLLEGE OF CANADA
ELECTRICAL & COMPUTER
ENGINEERING



GÉNIE ÉLECTRIQUE
ET GÉNIE INFORMATIQUE
COLLÈGE MILITAIRE ROYAL DU CANADA



Outline

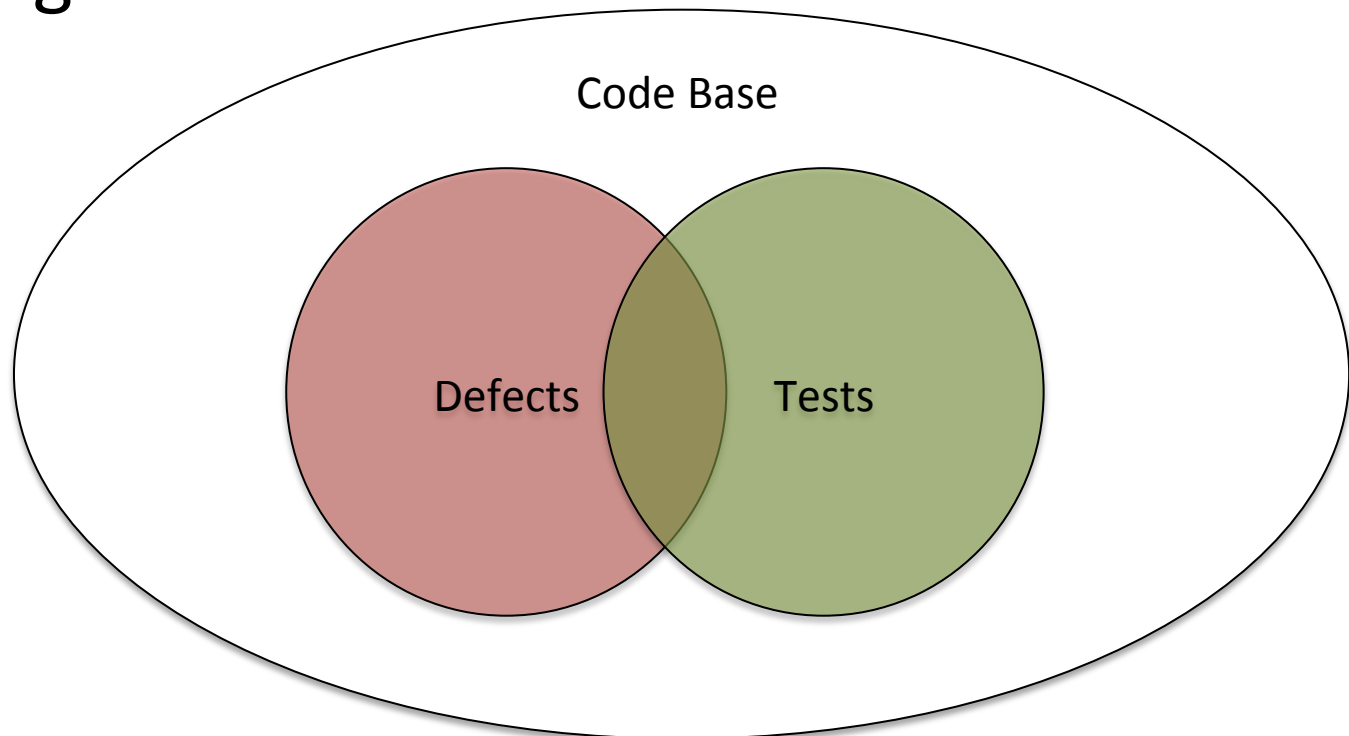
1. Testing methods
2. Testing levels
3. Testing types
4. Testing lifecycle

Definitions

- **Failure:** The system produces the wrong result or crashes
- **Defect:** A coding error or a requirement gap. Might eventually result in a failure if executed in the right conditions.
- **Error:** a programming mistake. Creates a defect in the code.

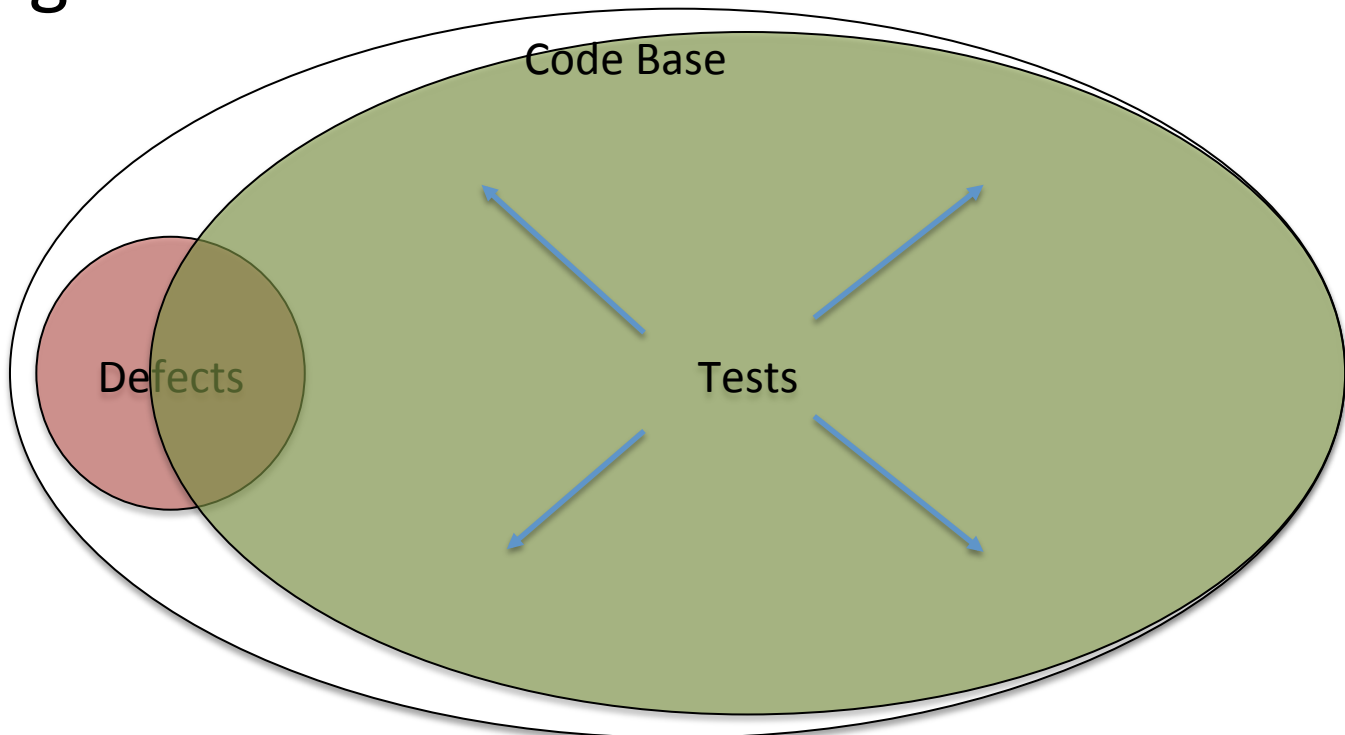
Overview

- Testing = finding defects
- Once we know there is a defect, we need to debug.

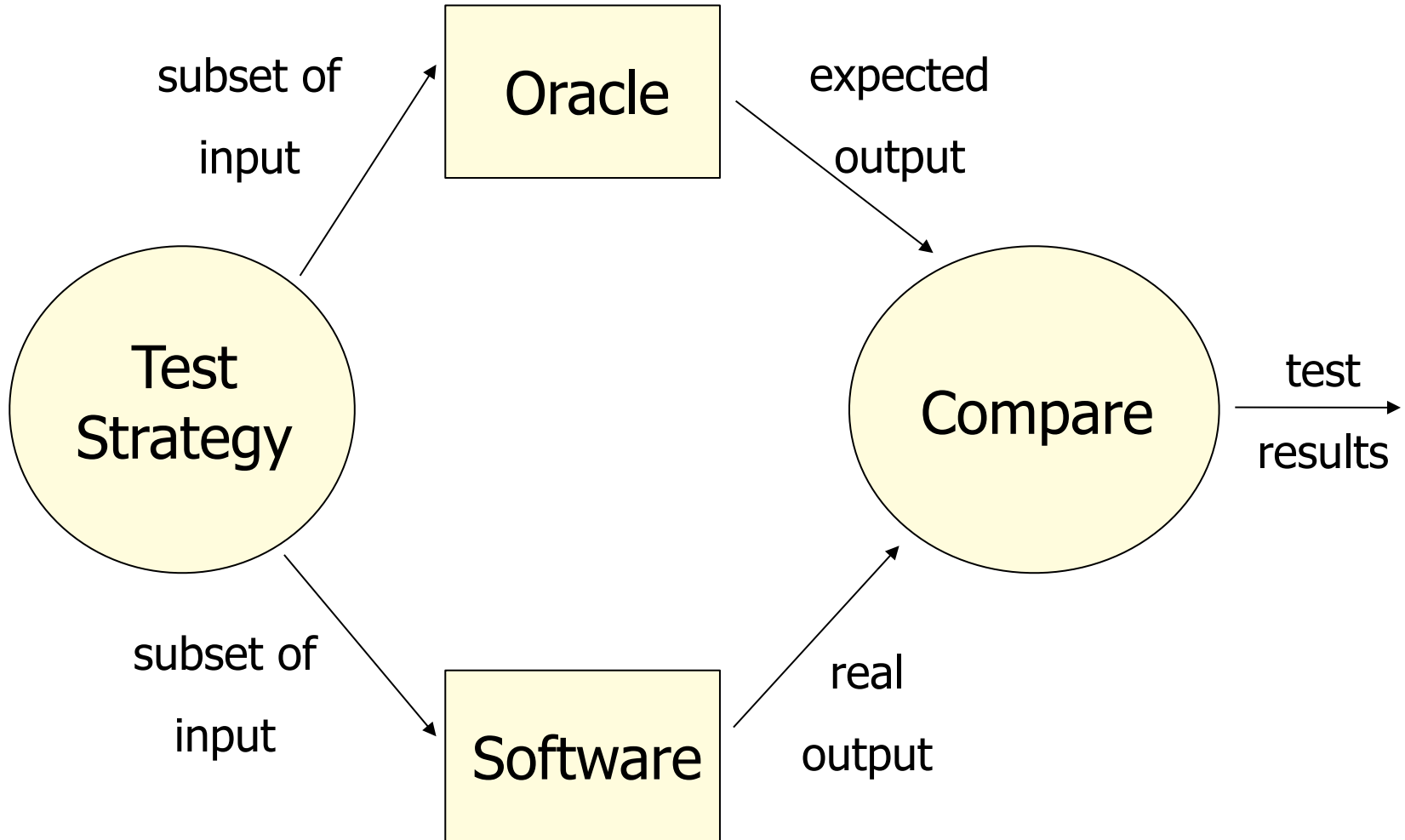


Overview

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Overview



Static vs. Dynamic Testing

- **Static:** looking at the source code (review, inspection, walkthrough)
- **Dynamic:** Executing the code with a set of test cases

Box Testing

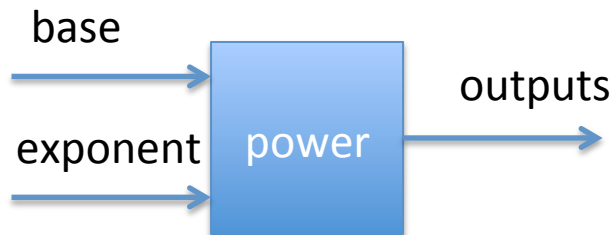
- Black Box
 - No knowledge of internal workings



- White box
 - Involves knowledge of the internal workings

Testing Levels

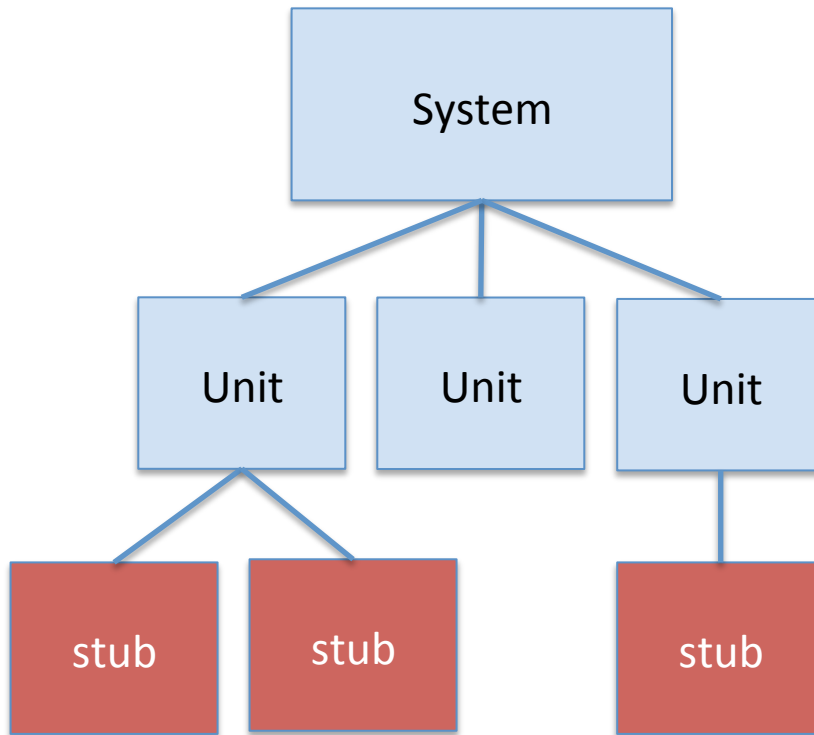
- Unit testing
 - usually at the function level
 - most times written by developer (white box)
 - exercises the function



```
for (int i = 0; i < 10; i++) {  
    for (int j = 0; j < 10; j++) {  
  
        diff = pow(i, j) - power(i, j);  
        if (fabs(diff) < 0.1) {  
            pass++;  
        } else {  
            fail++;  
        }  
        count++;  
    }  
}
```

Testing Levels

- Integration testing



Testing Levels

- System testing
 - The fully integrated system



Testing Types

- Functional
 - to verify the functionalities of the program (“does it work properly”)
- Non-Functional
 - not related to functionalities
 - Scalability, performance, behaviour under certain constraints, security, etc. [1]

Testing Types

- Regression testing
 - seeks to uncover software “regression” as a result of updates
 - Usually involves running a previously ran test suite
- Alpha testing
 - testing by users at developer’s site (internal)
- Beta testing
 - external
 - Code is released to some users to test

Testing Types

- Continuous testing
 - executing automated tests as part of the development lifecycle.
- Usability testing
 - Checks how easy the user interface is to use.

Testing Types

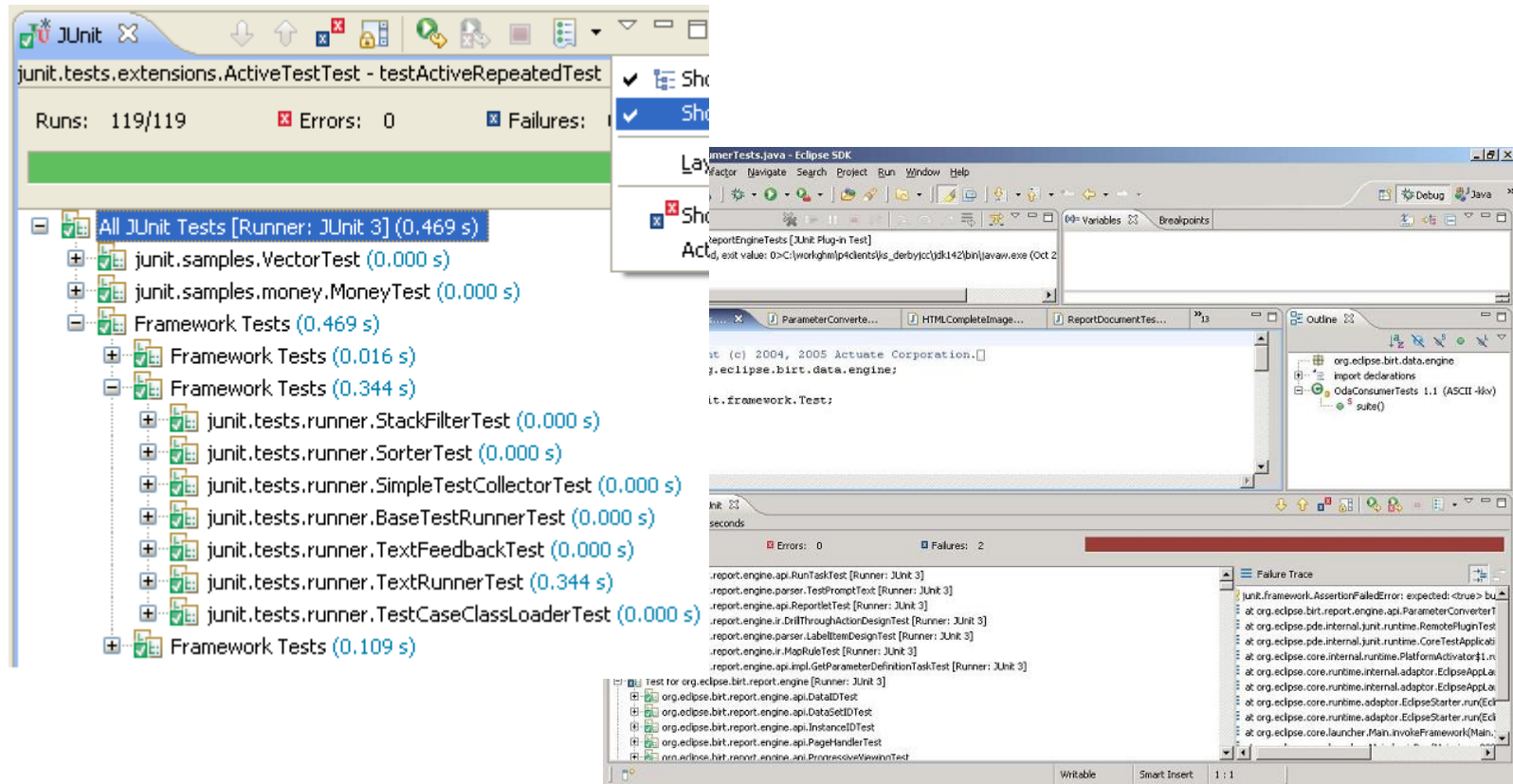
- Stress testing Performance-under load tests
 - 100 hits per second
 - 50 simultaneous database accesses
 - release all real-time tasks at once to observe scheduleability



Testing Cycle

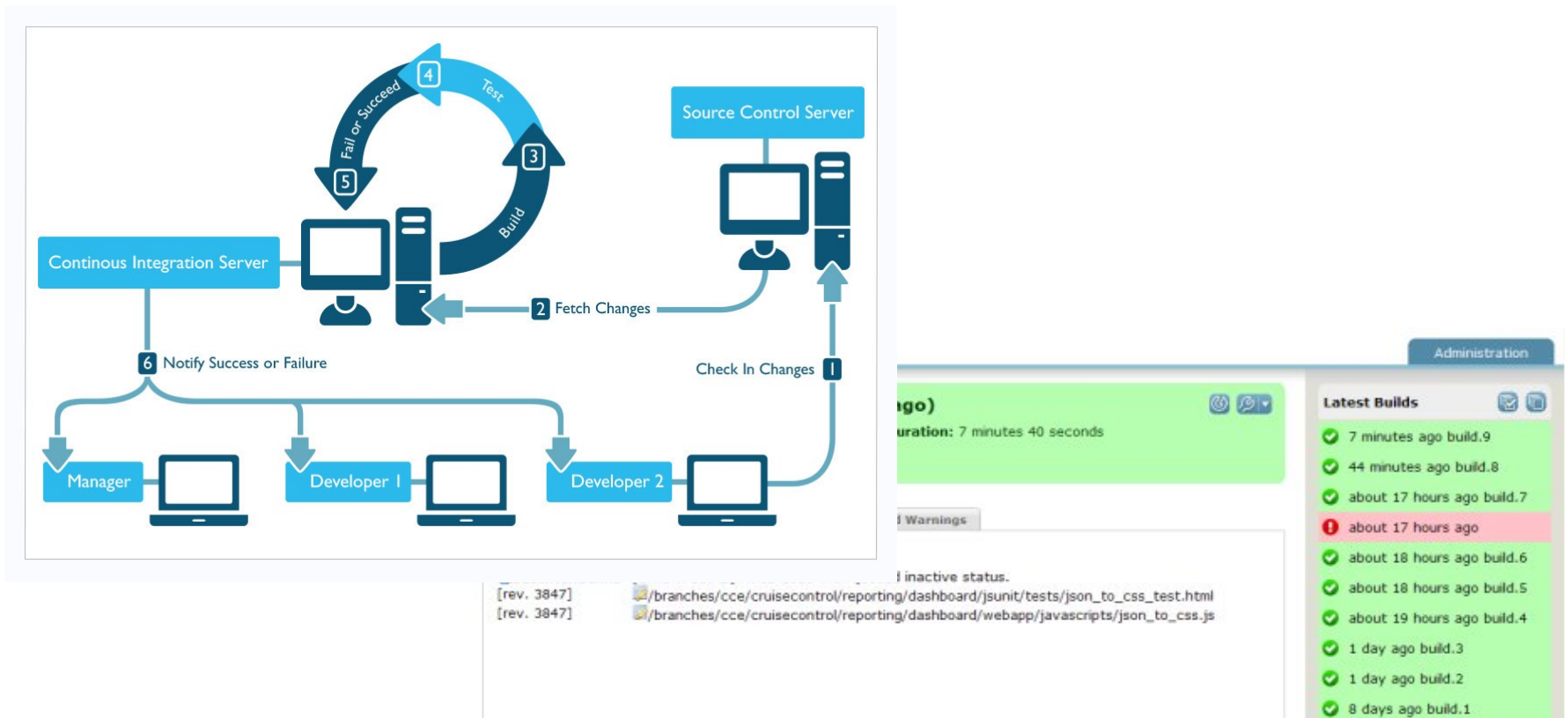
- Requirement analysis
- Test planning
- Test development
- Test execution
- Test reporting
- Test results analysis (what do we do about the defects?)
- Retesting
- Closure (like AAR)

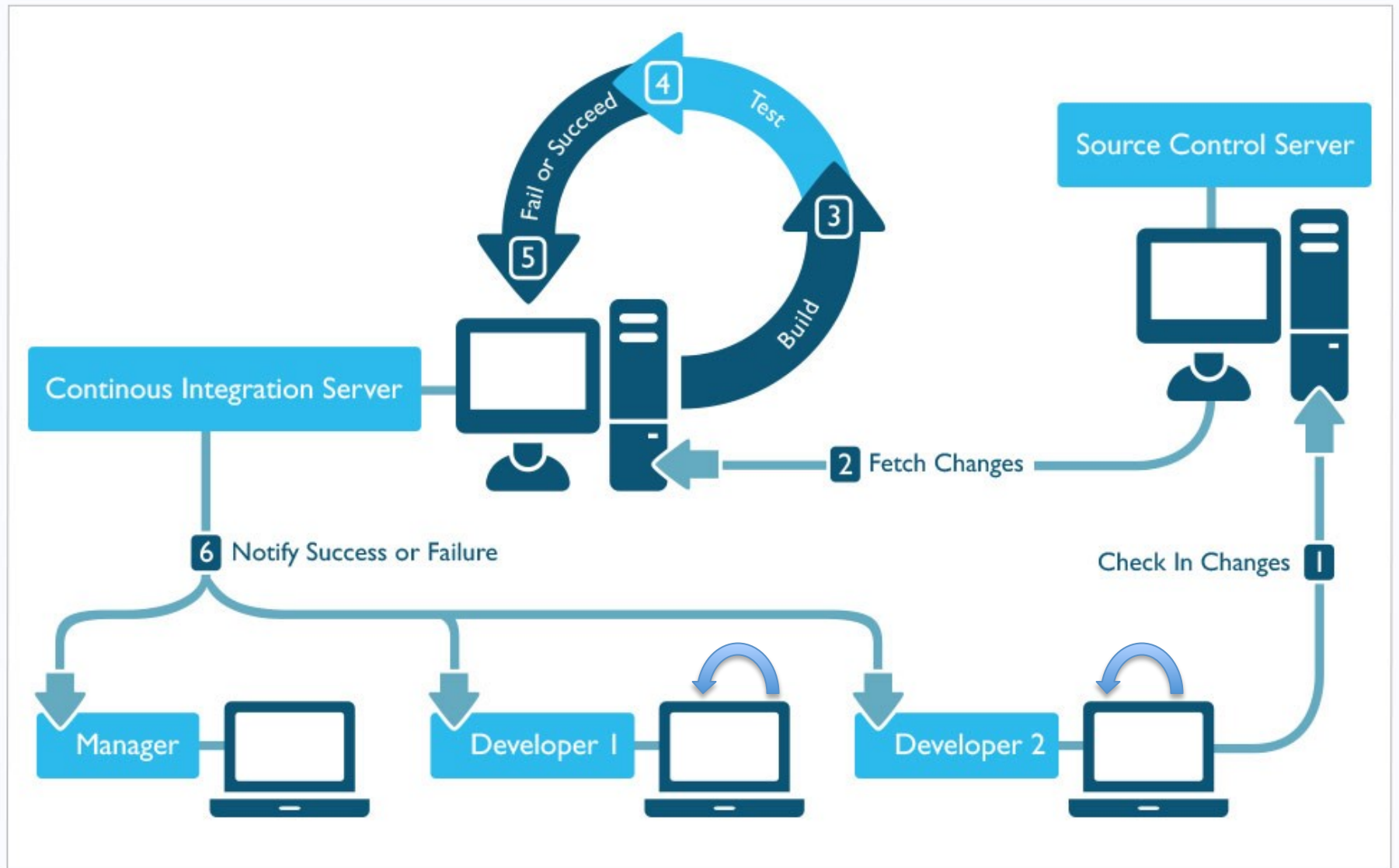
Result Example in Eclipse



Enterprise Testing (Example)

Continuous Integration





Exercise

Write a test suite for the functions below.

```
double deg_to_rad(double deg);  
double power(double x, double y);  
double factorial(int x);  
double sinus(double x, int n);
```

Report any defects in the provided code.

(Linked from the lecture calendar)

http://adrienlapointe.com/courses/17f/EEE243/lecture/testing_ex.c

Questions?

References

- [1] Software testing, https://en.wikipedia.org/w/index.php?title=Software_testing&oldid=807366470 (last visited Nov. 3, 2017).
- [2] Continuous Integration, <https://www.atlassian.com/continuous-delivery/continuous-integration-tutorial>