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Practical Test-Driven Development

PHP Northwest Meeting - Manchester, UK

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http://derickrethans.nl/talks.php

It's OK to write code that does not work

It's OK to write code that does not work

Testing Methods

Unit Testing

Tests small parts of an application or library (units) for correctly working code. Tools: PHPUnit, SimpleTest

System Testing

The testing of a whole integrated system against the specified requirements. Tools: Selenium

It is not just a method of testing software.

Back In Time

Traditional Development Phases

Requirements Specification

Define what the software is supposed to do.

Design

Define how the software is supposed to be implemented.

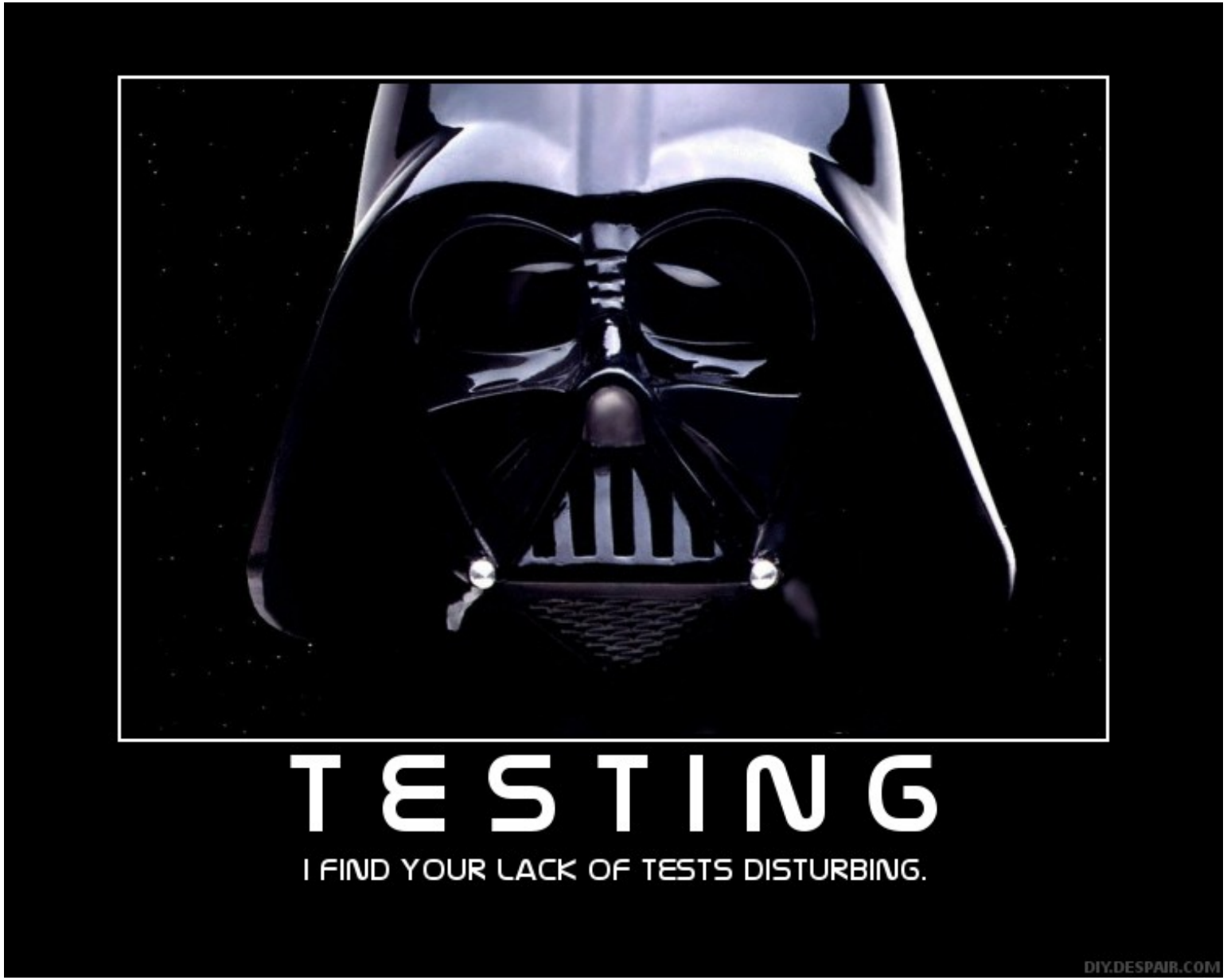
Implementation

The implementation of the software itself.

Testing

The implemented software is tested.

Sometimes.


TESTING
I FIND YOUR LACK OF TESTS DISTURBING.
DIY.DESPAIR.COM

Tests are King

Tests drive the development

- Tests are written before the code
- There is no code without tests

Test Suites

- Contain tests that check whether the code does what it is supposed to do
- Also cover things that should fail

Into the Future

Test-Driven Development Phases

Requirements Specification

Define what the software is supposed to do.

Design

Define how the software is supposed to be implemented.

Implementation ≡ Testing

The implemented software is tested.

The implementation of the software itself.

Present the Idea

Write the Requirements Document

Design the Component

Implementation

- Write API stubs with parameter documentation and descriptions
- Write test cases
- Initial implementation
- Initial implementation review
- Updating implementation according to review
- Implementation review

Pre-release Testing

Test-Driven Development

Addressing Defects

Write Test Case

Write a test case to test the correct behavior of the method, and verify that the test case fails

Fix the Issue

Fix the implementation

Verify Fix with Test Case

Make sure that the test cases pass with the new implementation

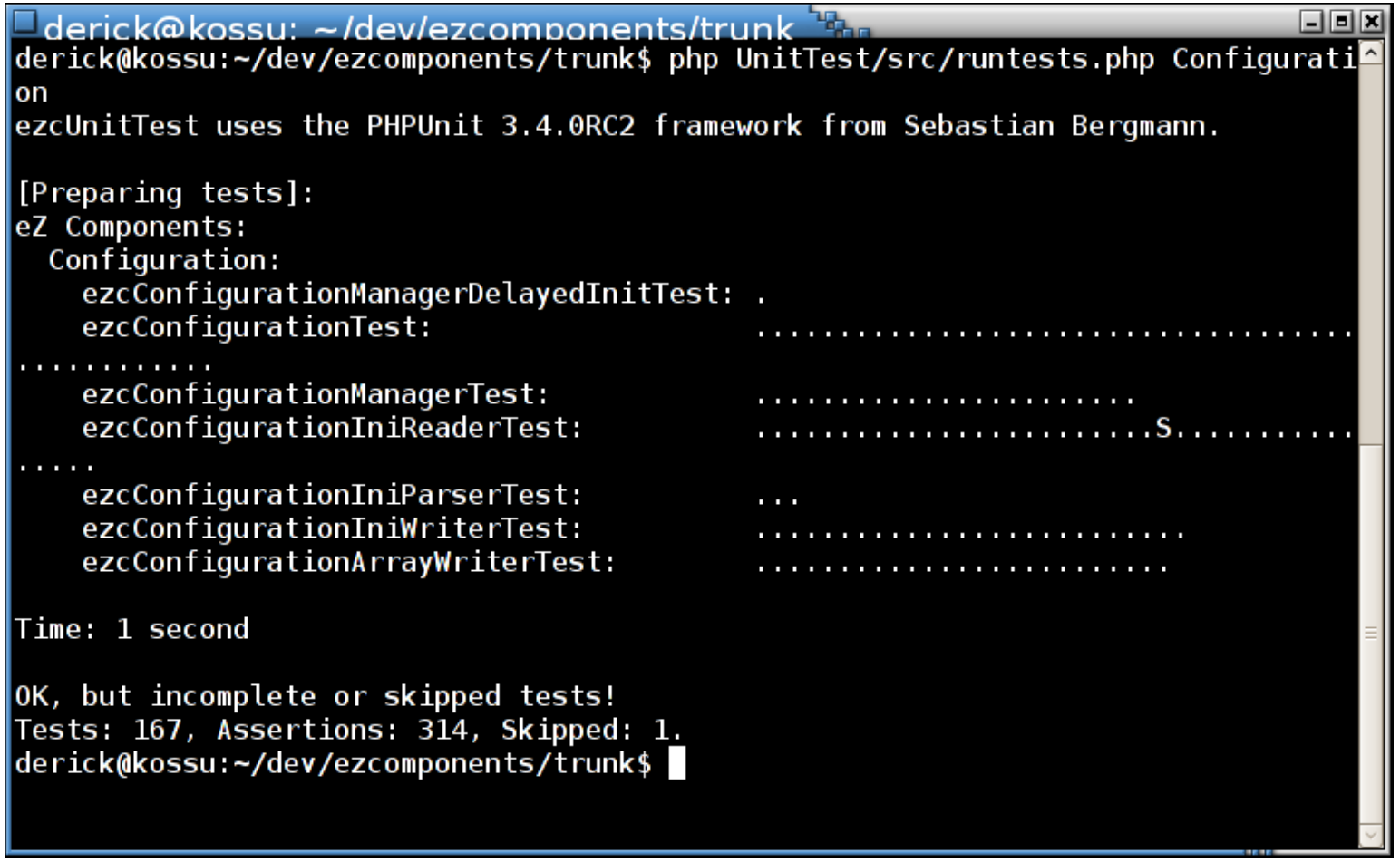
Check Other Test Cases

Verify that the fix for this defect did not break any other test case

PHP Unit

PHPUnit

Unit Testing Framework for PHP



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PHPUnit

Code Coverage: No Code Without Test

eZ Components

Current directory: /home/derick/dev/ezcomponents/trunk/Graph/src

Legend: Low: 0% to 35% | Medium: 35% to 70% | High: 70% to 100%

	Coverage								
	Classes			Methods			Lines		
Total		94.39%	101 / 107		86.89%	444 / 511		86.32%	8990 / 10415
axis		100.00%	5 / 5		85.25%	52 / 61		91.02%	669 / 735
charts		100.00%	5 / 5		100.00%	36 / 36		99.56%	683 / 686
colors		100.00%	3 / 3		100.00%	17 / 17		100.00%	216 / 216
data_container		100.00%	2 / 2		100.00%	13 / 13		100.00%	39 / 39
datasets		100.00%	9 / 9		89.80%	44 / 49		93.63%	235 / 251
driver		50.00%	3 / 6		49.47%	47 / 95		54.97%	1339 / 2436
element		100.00%	4 / 4		100.00%	21 / 21		99.35%	458 / 461
exceptions		96.15%	25 / 26		96.00%	24 / 25		95.50%	106 / 111
interfaces		100.00%	7 / 7		97.73%	43 / 44		93.74%	943 / 1006
math		100.00%	7 / 7		100.00%	43 / 43		99.72%	350 / 351
options		92.86%	13 / 14		90.32%	28 / 31		94.11%	815 / 866
palette		83.33%	5 / 6		100.00%	0 / 0		83.33%	5 / 6
renderer		100.00%	8 / 8		100.00%	67 / 67		96.19%	3005 / 3124
structs		100.00%	3 / 3		100.00%	7 / 7		100.00%	35 / 35
graph.php		100.00%	1 / 1		100.00%	0 / 0		100.00%	1 / 1
tools.php		100.00%	1 / 1		100.00%	2 / 2		100.00%	91 / 91

Generated by PHPUnit 3.3.0RC1 and Xdebug 2.1.0-dev at Mon Sep 8 10:30:06 CEST 2008.

PHPUnit

Code Coverage: No Code Without Test

```
550                 :
551              19 :                 switch ( $this->interval )
552                 :                 {
553              19 :                     case self::MONTH:
554               4 :                         $time = strtotime( '+1 month', $time );
555               4 :                         break;
556              15 :                     case self::YEAR:
557               4 :                         $time = strtotime( '+1 year', $time );
558               4 :                         break;
559              11 :                     case self::DECADE:
560               0 :                         $time = strtotime( '+10 years', $time );
561               0 :                         break;
562              11 :                     default:
563              11 :                         $time += $this->interval;
564              11 :                         break;
565              19 :                 }
566              19 :             }
567                 :
568              19 :             return $steps;
569                 :         }
570                 :
571                 :         /**
```

Green: Covered code.

Red: Not covered code.

Grey: Unreachable code.

White: No code.

How much coverage should you aim for?

http://www.developertesting.com/archives/month200705/20070504-000425.html

< 100% Coverage ≡ Not fully tested code

100% Coverage ≠ Fully tested code

Code Coverage: 100% is not good enough

```
  1                 : <?php
  2                 : class PathTest
  3                 : {
  4                 :     static public function testMethod( $a, $b )
  5                 :     {
  6                 2 :         $nr = 1;
  7                 2 :         if ( $a == true )
  8                 2 :         {
  9                 1 :             $nr *= 2;
 10                 1 :         }
 11                 2 :         if ( $b == true )
 12                 2 :         {
 13                 1 :             $nr *= 3;
 14                 1 :         }
 15                 2 :         return $nr;
 16                 :     }
 17                 : }
```

```
<?php require 'PathTest.php';
 class CcTest extends PHPUnit_Framework_TestCase
 {
     public function testPath1()
     {
         self::assertEquals( 2, PathTest::testMethod( true, false ) );
     }
     public function testPath2()
     {
         self::assertEquals( 3, PathTest::testMethod( false, true ) );
     }
 }
 ?>
```

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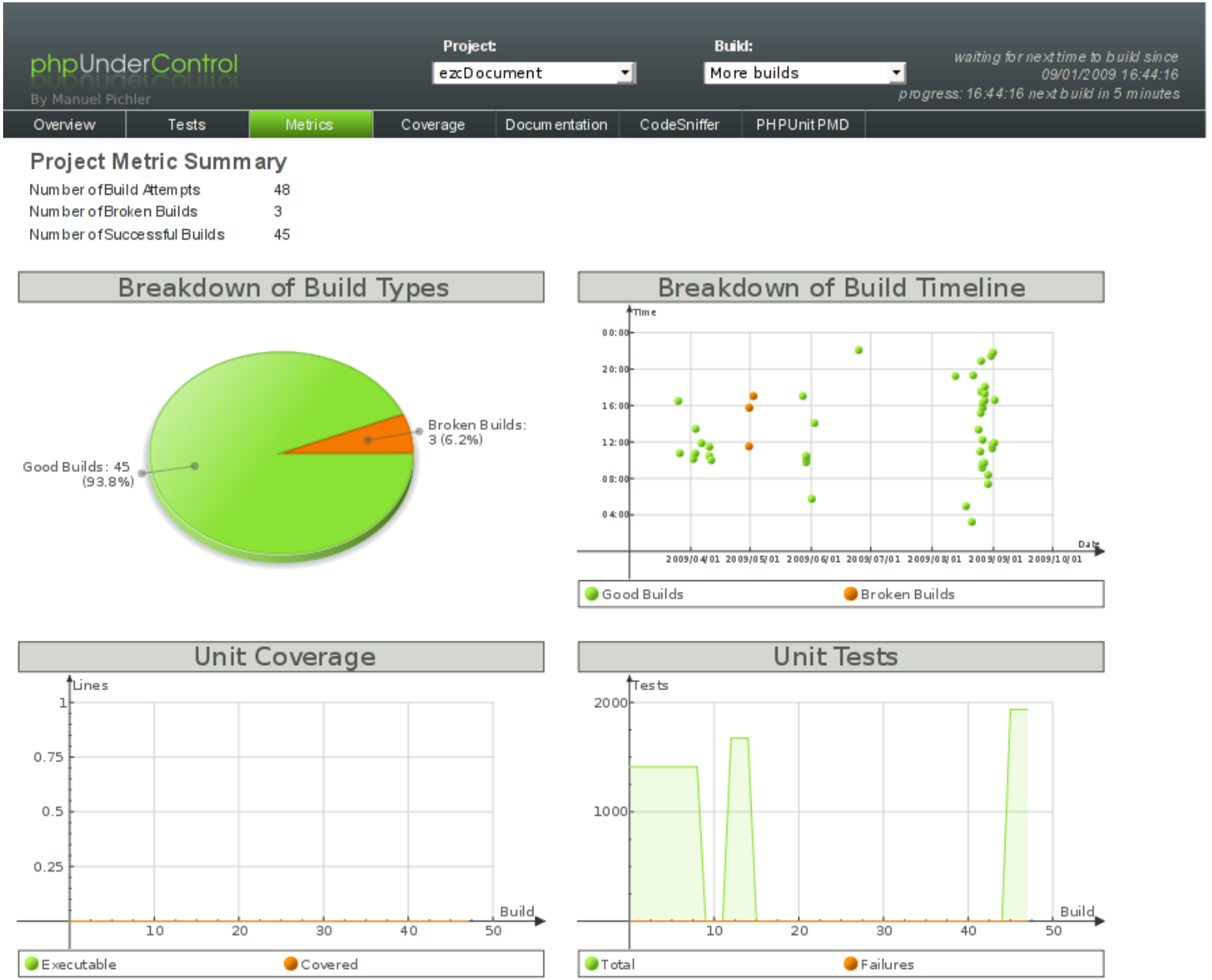
phpUnderControl
Continuous integration with CruiseControl



What stops you from doing TDD?

Fear - more work to do

- Introduce TDD concepts gently
- Whenever a problem is found, make and retain a test case for futher use
- Start using TDD for new projects

Ignorance - too much time spent on testing

- Out of date with modern processes
- Belief that testing slows the schedule (only if you follow the ship-and-see process)
- You save time later, because you wouldn't have to re-test or re-debug newly written additions or big fixes.

Case Studies

Microsoft Case Study

- TDD project has twice the code quality
- Writing tests requires 15% more time

IBM Case Study

- 40% fewer defects
- No impact on the team's productivity

John Deere / Ericsson Case Study

- TDD produces higher quality code
- Impact of 16% on the team's productivity

Case Studies
Developer Comments

- At first I didn't like that I need to write tests for my code, but now after using it for more than two years I can't program without it.
- Helps to come up with better APIs.
- It gives confidence that our software is working well at all times. Even after making major changes and/or changing software we are dependent on.
- Productivity increases - you might loose some when you make the initial tests, but you'll get it back later. The code covered by tests is 'insured' against future changes.
- It works well for libraries, not so well for GUI applications.
- Some things cannot be tested like server errors, unless you use mock-objects.

Un-testable Problems

- Testing singletons more than one time
- System/Operating System dependent tests
- Private methods
- Code that depends on the state of an external resource
- Things that simply should "never" happen

Questions

Resources

- http://homepage.mac.com/hey.you/lessons.html
- Testuvius: http://www.artima.com/weblogs/viewpost.jsp?thread=203994

- PHP Unit: http://phpunit.de
- phpUnderControl: http://phpundercontrol.org
- Xdebug: http://xdebug.org
- These Slides: http://derickrethans.nl/talks.php

- PHP: http://www.php.net