PHPUnit Best Practices

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Hello! My name is Sebastian.

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Hello! My name is Sebastian …

and this is what I do:

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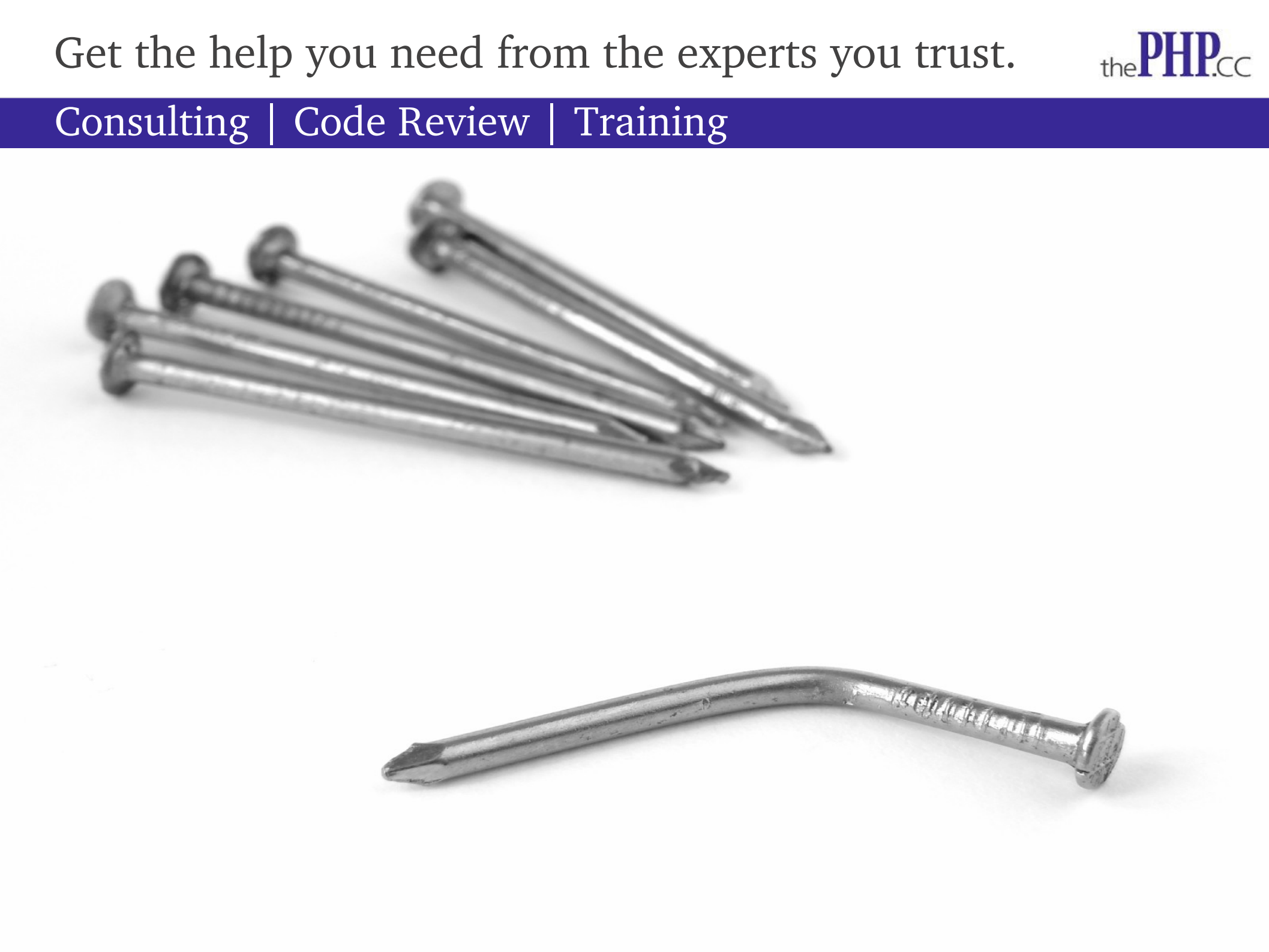

Some of these practices may be obvious to you.

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Especially the first one :-)

Best Practices for Writing Tests

Do not write tests that do not test anything

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testSomething()
    {
        $foo = new Foo;
        $foo->doSomething(new Bar);
    }
}
```

Best Practices for Writing Tests

Do not write tests that do not test anything

```
sb@ubuntu ~ % phpunit FooTest
PHPUnit 3.5.0 by Sebastian Bergmann.

.

Time: 0 seconds, Memory: 3.75Mb

OK (1 test, 0 assertions)
```

Best Practices for Writing Tests

Do not write tests that do not test anything

```
sb@ubuntu ~ % phpunit FooTest
PHPUnit 3.5.0 by Sebastian Bergmann.

.

Time: 0 seconds, Memory: 3.75Mb

OK (1 test, 0 assertions)
```

Best Practices for Writing Tests

Do not write tests that do not test anything

```
sb@ubuntu ~ % phpunit --strict FooTest
PHPUnit 3.5.0 by Sebastian Bergmann.

I

Time: 0 seconds, Memory: 3.75Mb

OK, but incomplete or skipped tests!
Tests: 1, Assertions: 0, Incomplete: 1.
```

Best Practices for Writing Tests

Do not write tests that do not test anything

```
sb@ubuntu ~ % phpunit --strict --verbose FooTest
PHPUnit 3.5.0 by Sebastian Bergmann.

FooTest
I

Time: 0 seconds, Memory: 3.75Mb

There was 1 incomplete test:

1) FooTest::testSomething
This test did not perform any assertions

OK, but incomplete or skipped tests!
Tests: 1, Assertions: 0, Incomplete: 1.
```

Best Practices for Writing Tests

Do not write tests that do not test anything

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testSomething()
    {
        $foo = new Foo;

        $this->assertEquals(
          'something', $foo->doSomething(new Bar)
        );
    }
}
```

Best Practices for Writing Tests

Do not write tests that do not test anything

```
sb@ubuntu ~ % phpunit FooTest
PHPUnit 3.5.0 by Sebastian Bergmann.

.

Time: 0 seconds, Memory: 3.75Mb

OK (1 test, 1 assertion)
```

Best Practices for Writing Tests

Do not write tests that test too much

```php
<?php
class StackTest extends PHPUnit_Framework_TestCase
{
    public function testPushAndPopWorks()
    {
        $stack = array();
        array_push($stack, 'foo');
        $this->assertEquals('foo', $stack[count($stack)-1]);
        $this->assertNotEmpty($stack);
        $this->assertEquals('foo', array_pop($stack));
        $this->assertEmpty($stack);
    }
}
```

Best Practices for Writing Tests

Do not write tests that test too much

```php
<?php
class StackTest extends PHPUnit_Framework_TestCase
{
    public function testPushAndPopWorks()
    {
        $stack = array();
        array_push($stack, 'foo');
        $this->assertEquals('foo', $stack[count($stack)-1]);
        $this->assertNotEmpty($stack);
        $this->assertEquals('foo', array_pop($stack));
        $this->assertEmpty($stack);
    }
}
```

Best Practices for Writing Tests

Do not write tests that test too much

```
sb@ubuntu ~ % phpunit --testdox StackTest
PHPUnit 3.5.0 by Sebastian Bergmann.

Stack
 [x] Push and pop works
```

Best Practices for Writing Tests

Do not write tests that test too much

```
sb@ubuntu ~ % phpunit --testdox StackTest
PHPUnit 3.5.0 by Sebastian Bergmann.

Stack
 [x] Push and pop works
```

Best Practices for Writing Tests

Exploit dependencies between tests

```php
<?php
class StackTest extends PHPUnit_Framework_TestCase
{
    public function testStackIsInitiallyEmpty()
    {
        $stack = array();
        $this->assertEmpty($stack);
        return $stack;
    }

    /**
     * @depends testStackIsInitiallyEmpty
     */
    public function testPushingAnElementOntoTheStackWorks(array $stack)
    {
        array_push($stack, 'foo');
        $this->assertEquals('foo', $stack[count($stack)-1]);
        return $stack;
    }

    /**
     * @depends testPushingAnElementOntoTheStackWorks
     */
    public function testPoppingAnElementOffTheStackWorks(array $stack)
    {
        $this->assertEquals('foo', array_pop($stack));
        $this->assertEmpty($stack);
    }
}
```

Best Practices for Writing Tests

Exploit dependencies between tests

```
sb@ubuntu ~ % phpunit --testdox StackTest
PHPUnit 3.5.0 by Sebastian Bergmann.

Stack
 [x] Stack is initially empty
 [x] Pushing an element onto the stack works
 [x] Popping an element off the stack works
```

Best Practices for Writing Tests

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Exploit dependencies between tests

```php
<?php
class StackTest extends PHPUnit_Framework_TestCase
{
    public function testStackIsInitiallyEmpty()
    {
        $stack = array('foo');
        $this->assertEmpty($stack);
        return $stack;
    }

    /**
     * @depends testStackIsInitiallyEmpty
     */
    public function testPushingAnElementOntoTheStackWorks(array $stack)
    {
        array_push($stack, 'foo');
        $this->assertEquals('foo', $stack[count($stack)-1]);
        return $stack;
    }

    /**
     * @depends testPushingAnElementOntoTheStackWorks
     */
    public function testPoppingAnElementOffTheStackWorks(array $stack)
    {
        $this->assertEquals('foo', array_pop($stack));
        $this->assertEmpty($stack);
    }
}
```

Best Practices for Writing Tests

Exploit dependencies between tests

```
sb@ubuntu ~ % phpunit StackTest
PHPUnit 3.5.0 by Sebastian Bergmann.

FSS

Time: 0 seconds, Memory: 4.00Mb

There was 1 failure:

1) StackTest::testEmpty
Failed asserting that an array is empty.

/home/sb/StackTest.php:7

FAILURES!
Tests: 1, Assertions: 1, Failures: 1, Skipped: 2.
```

Best Practices for Writing Tests

Exploit dependencies between tests

```
sb@ubuntu ~ % phpunit --verbose StackTest
PHPUnit 3.5.0 by Sebastian Bergmann.

StackTest
FSS

Time: 0 seconds, Memory: 3.75Mb

There was 1 failure:

1) StackTest::testEmpty
Failed asserting that an array is empty.

/home/sb/StackTest.php:7

There were 2 skipped tests:

1) StackTest::testPush
This test depends on "StackTest::testEmpty" to pass.

2) StackTest::testPop
This test depends on "StackTest::testPush" to pass.

FAILURES!
Tests: 1, Assertions: 1, Failures: 1, Skipped: 2.
```

Best Practices for Writing Tests

Use the most specific assertion available to express what you want to test

```php
    $this->assertEmpty($stack);
```

vs.

```php
    $this->assertTrue(empty($stack));
```

Best Practices for Writing Tests

Use the most specific assertion available to express what you want to test

```
    $this->assertEmpty($stack);
vs.
    $this->assertTrue(empty($stack));


    $this->assertInstanceOf('Foo', $foo);
vs.
    $this->assertTrue($foo instanceof Foo);
```

Best Practices for Writing Tests

Use the most specific assertion available to express what you want to test

```
    $this->assertEmpty($stack);
vs.
    $this->assertTrue(empty($stack));


    $this->assertInstanceOf('Foo', $foo);
vs.
    $this->assertTrue($foo instanceof Foo);


    $this->assertInternalType('string', 'foo');
vs.
    $this->assertTrue(is_string('foo'));
```

Best Practices for Writing Tests

Decouple test code from test data

```php
<?php
class DataTest extends PHPUnit_Framework_TestCase
{
    /**
     * @dataProvider providerMethod
     */
    public function testAdd($a, $b, $c)
    {
        $this->assertEquals($c, $a + $b);
    }

    public function providerMethod()
    {
        return array(
          array(0, 0, 0),
          array(0, 1, 1),
          array(1, 1, 3),
          array(1, 0, 1)
        );
    }
}
```

Best Practices for Writing Tests

Decouple test code from test data

```
sb@ubuntu ~ % phpunit DataTest
PHPUnit 3.5.0 by Sebastian Bergmann.

..F.

Time: 0 seconds, Memory: 4.00Mb

There was 1 failure:

1) DataTest::testAdd with data set #2 (1, 1, 3)
Failed asserting that <integer:2> matches expected <integer:3>.

/home/sb/DataTest.php:9

FAILURES!
Tests: 4, Assertions: 4, Failures: 1.
```

Best Practices for Organizing Tests

Composing a Test Suite Using the Filesystem

```
Object                                  Tests
|-- Freezer                             |-- Freezer
|   |-- HashGenerator                   |   |-- HashGenerator
|   |   `-- NonRecursiveSHA1.php        |   |   `-- NonRecursiveSHA1Test.php
|   |-- HashGenerator.php               |   |
|   |-- IdGenerator                     |   |-- IdGenerator
|   |   `-- UUID.php                    |   |   `-- UUIDTest.php
|   |-- IdGenerator.php                 |   |
|   |-- LazyProxy.php                   |   |
|   |-- Storage                         |   |-- Storage
|   |   `-- CouchDB.php                 |   |   `-- CouchDB
|   |                                   |   |       |-- WithLazyLoadTest.php
|   |                                   |   |       `-- WithoutLazyLoadTest.php
|   |-- Storage.php                     |   |-- StorageTest.php
|   `-- Util.php                        |   `-- UtilTest.php
`-- Freezer.php                         `-- FreezerTest.php
```

Best Practices for Organizing Tests

Running all tests in a directory

```
sb@ubuntu ~ % phpunit Tests
PHPUnit 3.5.0 by Sebastian Bergmann.

.............................................................. 60 / 75
...............

Time: 0 seconds, Memory: 11.00Mb

OK (75 tests, 164 assertions)
```

Best Practices for Organizing Tests

Running all tests of a test case class

```
sb@ubuntu ~ % phpunit Tests/FreezerTest
PHPUnit 3.5.0 by Sebastian Bergmann.

.............................

Time: 0 seconds, Memory: 8.25Mb

OK (28 tests, 60 assertions)
```

Best Practices for Organizing Tests

Filter tests based on name

```
sb@ubuntu ~ % phpunit --filter testFreezingAnObjectWorks Tests
PHPUnit 3.5.0 by Sebastian Bergmann.

.

Time: 0 seconds, Memory: 10.25Mb

OK (1 test, 2 assertions)
```

Use an XML Configuration File

```xml
<?xml version="1.0" encoding="UTF-8"?>

<phpunit>
  <testsuites>
    <testsuite name="My Test Suite">
      <directory>path/to/dir</directory>
    </testsuite>
  </testsuites>
</phpunit>
```

Best Practices for Running Tests

Use a bootstrap script

```
<?xml version="1.0" encoding="UTF-8"?>

<phpunit bootstrap="/path/to/bootstrap.php">
  <testsuites>
    <testsuite name="My Test Suite">
      <directory>path/to/dir</directory>
    </testsuite>
  </testsuites>
</phpunit>
```

Best Practices for Running Tests

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bootstrap.php

```php
<?php
function __autoload($class)
{
    require $class . '.php';
}
```

Best Practices for Running Tests

Configure the test suite using the XML configuration file

```
<?xml version="1.0" encoding="UTF-8"?>

<phpunit>
  <php>
    <const name="foo" value="bar"/>
    <var   name="foo" value="bar"/>
    <ini   name="foo" value="bar"/>
  </php>
</phpunit>
```

Best Practices for Running Tests

Disable PHPUnit features (that you should not need anyway)

- Syntax Check
  - Enabled by default in PHPUnit 3.4
  - Disabled by default in PHPUnit 3.5
  - Removed in PHPUnit 3.6
- Backup/Restore of global variables
  - Enabled by default in PHPUnit 3.5
  - Disabled by default in PHPUnit 3.6
- Backup/Restore of static attributes
  - Disabled by default

Best Practices for Running Tests

Disable PHPUnit features (that you should not need anyway)

```
<?xml version="1.0" encoding="UTF-8"?>

<phpunit backupGlobals="false"
         backupStaticAttributes="false"
         syntaxCheck="false">
  <testsuites>
    <testsuite name="My Test Suite">
      <directory>path/to/dir</directory>
    </testsuite>
  </testsuites>
</phpunit>
```

Best Practices for Code Coverage

Use Code Coverage Whitelisting

```
<?xml version="1.0" encoding="UTF-8"?>

<phpunit backupGlobals="false"
         backupStaticAttributes="false"
         syntaxCheck="false">
  <filter>
    <whitelist addUncoveredFilesFromWhitelist="true">
      <directory suffix=".php">path/to/dir</directory>
    </whitelist>
  </filter>
</phpunit>
```

Best Practices for Code Coverage

Make the Code Coverage information more meaningful

```
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    /**
     * @covers Foo::doSomething
     */
    public function testSomething()
    {
        $foo = new Foo;

        $this->assertEquals(
          'something', $foo->doSomething(new Bar)
        );
    }
}
```

Best Practices for Code Coverage

Make the Code Coverage information more meaningful

```
<?php
/**
 * @covers Foo
 */
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testSomething()
    {
        $foo = new Foo;

        $this->assertEquals(
          'something', $foo->doSomething(new Bar)
        );
    }
}
```

Best Practices for Code Coverage

Make the Code Coverage information more meaningful

```
<?xml version="1.0" encoding="UTF-8"?>

<phpunit mapTestClassNameToCoveredClassName="true">
</phpunit>
```

Best Practices for Code Coverage

Make the Code Coverage information more meaningful

```
<?xml version="1.0" encoding="UTF-8"?>

<phpunit forceCoversAnnotation="true">
</phpunit>
```

The following practices are not really *Best Practices*.

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Not because they are bad, but because you should not need them.

Singletons

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Default implementation of the *Singleton* pattern in PHP

```php
<?php
class Singleton
{
    private static $uniqueInstance = NULL;

    protected function __construct() {}
    private final function __clone() {}

    public static function getInstance()
    {
        if (self::$uniqueInstance === NULL) {
            self::$uniqueInstance = new Singleton;
        }

        return self::$uniqueInstance;
    }
}
```

Singletons

Client with hard-coded dependency on the singleton

```php
<?php
class Client
{
    public function doSomething()
    {
        $singleton = Singleton::getInstance();

        // ...
    }
}
```

Client with optional dependency injection of the singleton

```php
<?php
class Client
{
    public function doSomething(Singleton $singleton = NULL)
    {
        if ($singleton === NULL) {
            $singleton = Singleton::getInstance();
        }

        // ...
    }
}
```

Replacing the singleton with a test-specific equivalent

```php
<?php
class ClientTest extends PHPUnit_Framework_TestCase
{
    public function testSingleton()
    {
        $singleton = $this->getMock(
          'Singleton', /* name of class to mock     */
          array(),     /* list of methods to mock   */
          array(),     /* constructor arguments     */
          '',          /* name for mocked class     */
          FALSE        /* do not invoke constructor */
        );

        // ... configure $singleton ...

        $client = new Client;
        $client->doSomething($singleton);

        // ...
    }
}
```

Singletons

Alternative implementation of the *Singleton* pattern

```php
<?php
class Singleton
{
    private static $uniqueInstance = NULL;

    protected function __construct() {}
    private final function __clone() {}

    public static function getInstance()
    {
        if (self::$uniqueInstance === NULL) {
            self::$uniqueInstance = new Singleton;
        }

        return self::$uniqueInstance;
    }

    public static function reset() {
        self::$uniqueInstance = NULL;
    }
}
```

Alternative implementation of the *Singleton* pattern

```php
<?php
class Singleton
{
    private static $uniqueInstance = NULL;
    public static $testing = FALSE;

    protected function __construct() {}
    private final function __clone() {}

    public static function getInstance()
    {
        if (self::$uniqueInstance === NULL ||
            self::$testing) {
            self::$uniqueInstance = new Singleton;
        }

        return self::$uniqueInstance;
    }
}
```

Registry


```php
<?php
class Registry
{
    private static $uniqueInstance = NULL;
    protected $objects = array();

    protected function __construct() {}
    private final function __clone() {}
    public static function getInstance() { /* … */ }

    public function register($name, $object)
    {
        $this->objects[$name] = $object;
    }

    public function getObject($name)
    {
        if (isset($this->objects[$name])) {
            return $this->objects[$name];
        }
    }
}
```

Registry


```php
<?php
class ClientTest extends PHPUnit_Framework_TestCase
{
    public function testSingleton()
    {
        $singleton = $this->getMock(
          'Singleton', /* name of class to mock     */
          array(),     /* list of methods to mock   */
          array(),     /* constructor arguments     */
          '',          /* name for mocked class     */
          FALSE        /* do not invoke constructor */
        );

        // ... configure $singleton ...

        Registry::getInstance()->register('Singleton', $singleton);

        // ...
    }
}
```

”Static methods are death to testability.”

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– Miško Hevery

Static Methods


```php
<?php
class Foo
{
    public static function doSomething()
    {
        return self::helper();
    }

    public static function helper()
    {
        return 'foo';
    }
}
?>
```

Static Methods

Early Static Binding

```php
<?php
class Foo
{
    public static function doSomething()
    {
        return self::helper();
    }

    public static function helper()
    {
        return 'foo';
    }
}

class FooMock extends Foo
{
    public static function helper()
    {
        return 'bar';
    }
}

var_dump(FooMock::doSomething());
?>
```

```
string(3) "foo"
```

Static Methods

Late Static Binding (PHP 5.3)

```php
<?php
class Foo
{
    public static function doSomething()
    {
        return static::helper();
    }

    public static function helper()
    {
        return 'foo';
    }
}

class FooMock extends Foo
{
    public static function helper()
    {
        return 'bar';
    }
}

var_dump(FooMock::doSomething());
?>
```

```
string(3) "bar"
```

Static Methods

Stubbing and Mocking (PHP 5.3 + PHPUnit 3.5)

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testDoSomething()
    {









    }
}
```

Static Methods

Stubbing and Mocking (PHP 5.3 + PHPUnit 3.5)

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testDoSomething()
    {
        $class = $this->getMockClass(
          'Foo',           /* name of class to mock     */
          array('helper') /* list of methods to mock   */
        );









    }
}
```

Static Methods

Stubbing and Mocking (PHP 5.3 + PHPUnit 3.5)

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testDoSomething()
    {
        $class = $this->getMockClass(
          'Foo',           /* name of class to mock     */
          array('helper') /* list of methods to mock   */
        );

        $class::staticExpects($this->any())
              ->method('helper')
              ->will($this->returnValue('bar'));




    }
}
```

Static Methods

Stubbing and Mocking (PHP 5.3 + PHPUnit 3.5)

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testDoSomething()
    {
        $class = $this->getMockClass(
          'Foo',           /* name of class to mock     */
          array('helper') /* list of methods to mock   */
        );

        $class::staticExpects($this->any())
              ->method('helper')
              ->will($this->returnValue('bar'));

        $this->assertEquals(
          'bar', $class::doSomething()
        );
    }
}
```

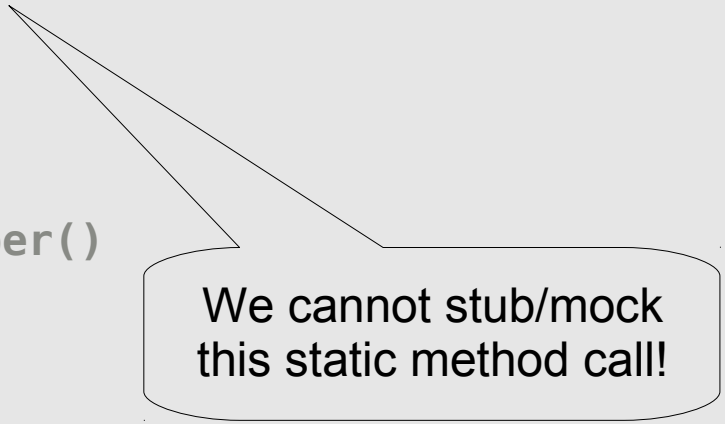
Static Methods

… are death to testability.

```php
<?php
class Foo
{
    public static function doSomething()
    {
        return Bar::helper();
    }
}

class Bar
    public static function helper()
    {
        /* ... */
    }
}

class BarMock extends Bar
{
    public static function helper()
    {
        return 'baz';
    }
}
```



Testing What Should Not Be Tested

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Non-Public Attributes and Methods

Testing What Should Not Be Tested

A class with private attributes and methods

```php
<?php
class Foo
{
    private $bar = 'baz';

    public function doSomething()
    {
        return $this->bar = $this->doSomethingPrivate();
    }

    private function doSomethingPrivate()
    {
        return 'blah';
    }
}
```

Testing What Should Not Be Tested

Assertions on non-public attributes

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testPrivateAttribute()
    {
        $this->assertEquals(
          'baz',
          $this->readAttribute(new Foo, 'bar')
        );
    }
}
```

Testing What Should Not Be Tested

Assertions on non-public attributes

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testPrivateAttribute()
    {
        $this->assertAttributeEquals(
          'baz',  /* expected value */
          'bar',  /* attribute name */
          new Foo /* object          */
        );
    }
}
```

Testing What Should Not Be Tested

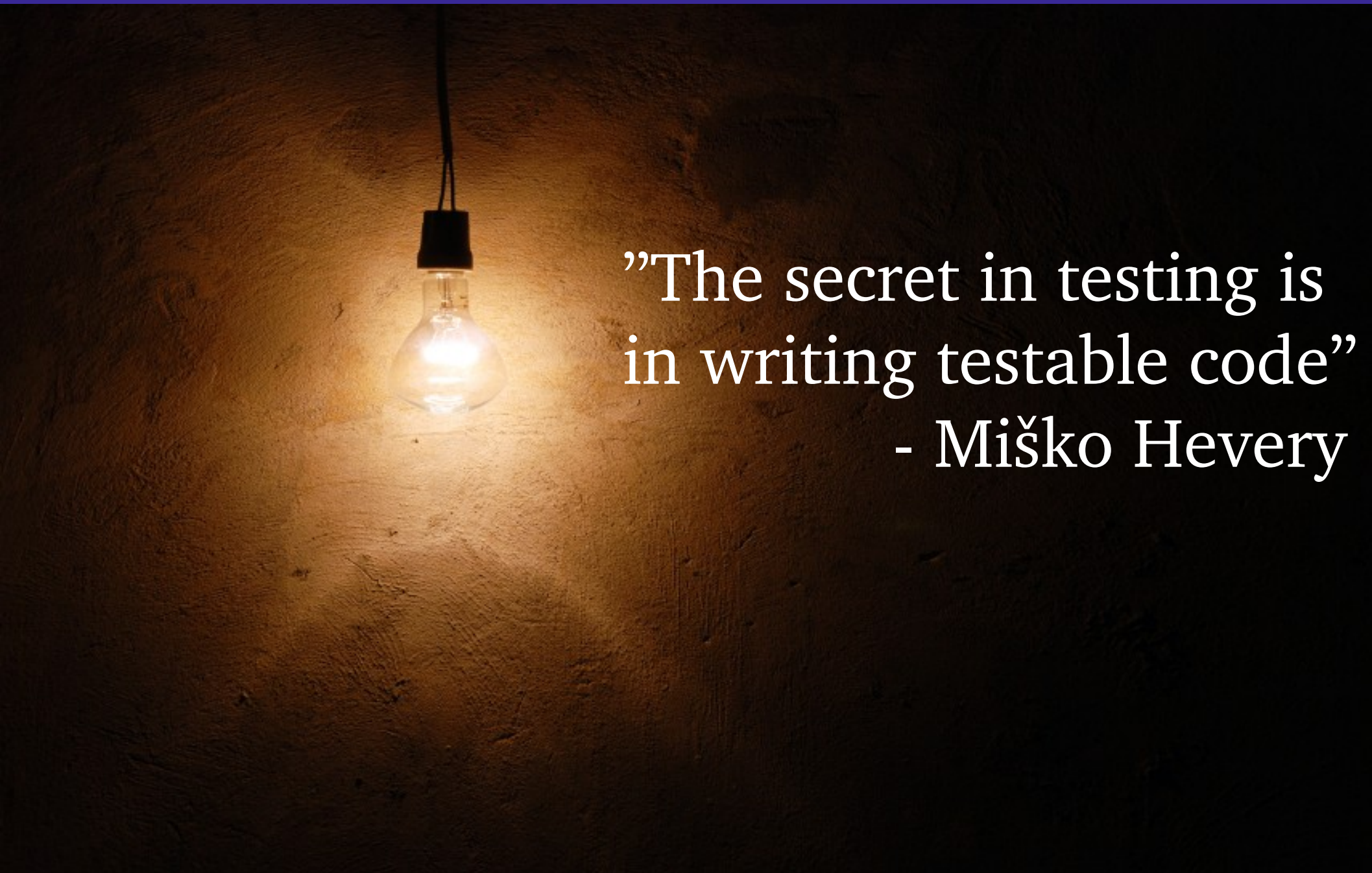
Testing a non-public method (requires PHP 5.3.2)

```php
<?php
class FooTest extends PHPUnit_Framework_TestCase
{
    public function testPrivateMethod()
    {
        $method = new ReflectionMethod(
          'Foo', 'doSomethingPrivate'
        );

        $method->setAccessible(TRUE);

        $this->assertEquals(
          'blah', $method->invoke(new Foo)
        );
    }
}
```

Testable Code



Avoid the hell that is global state.

This includes *singletons* and *static methods*.

Use loosely coupled objects …

Use loosely coupled objects …

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… and dependency injection to wire them together.

Write short methods.

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The End

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  http://sebastian-bergmann.de/
- Mail: sebastian@thePHP.cc
- Twitter: @s_bergmann
- Slides: http://talks.thePHP.cc/
- Buy the book: http://phpqabook.com/