Unbearable Test Smells

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Who am I?

- Name: Steven Mak
- Agile Coach at Odd-e
- Lives in Hong Kong
- Agile/Scrum, TDD Coaching
- I love coding - Java, C/C++, PHP, Perl, C#, VB, and some weird languages

Copy and Paste Code

Long test codes are copied and pasted somewhere else with only a few lines changing

DRY

Don’t Repeat Yourself!
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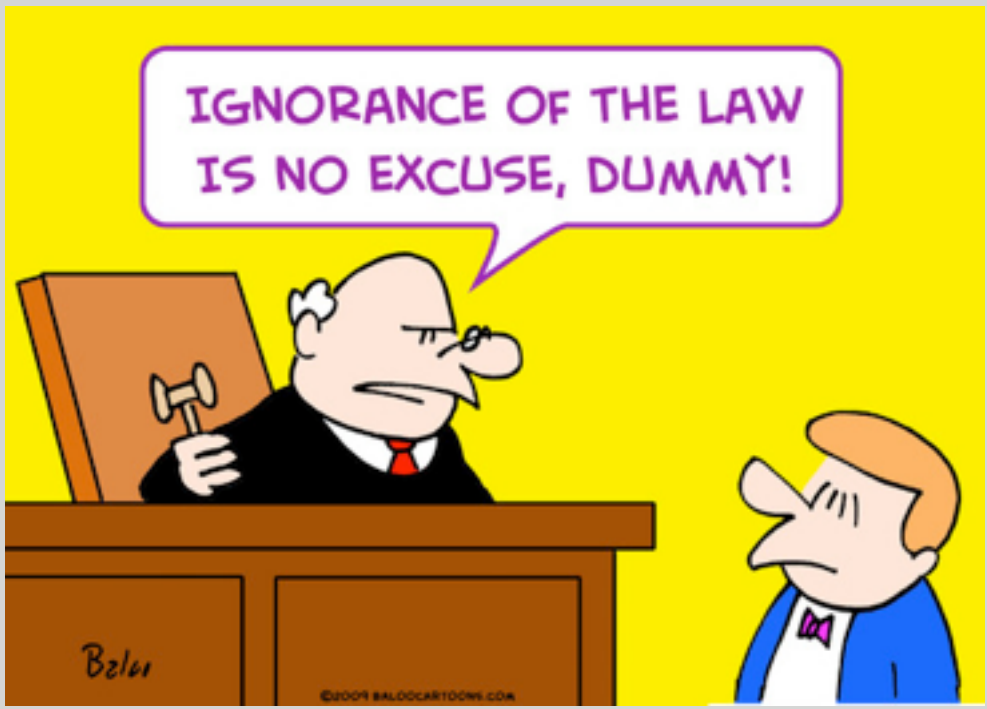
Not knowing the fixtures

Some initialisation and clean up codes that are repeated in each tests...



What is fixture?

```
TEST_GROUP (TEST_thisObject)
{
        void setup() {
        }
        void teardown() {
        }
};
```

Duplication causing fragile tests

Where is the duplication?

EXPECT_LOG(“ABC error”);

Duplication causing fragile tests

Where is the duplication?

EXPECT_LOG("ABC error");

So there is a line in code that prints this log message

Duplication causing fragile tests

Put it under centralise header file:

#define ABC_ERROR_WITH_EC “ABC error”

The test will then look like:

EXPECT_LOG(ABC_ERROR);

Over-Optimism?

Tests that forgot to cover exceptional cases or just covered the easiest condition

```
if (aaa() || bbb() || ccc() {
        ...
  } else {
        ...
  }
```

Tests don’t have assertions

```
TEST(TEST_GROUP, TEST_THIS)
{
        runThisFunctionLaLaLa();
}
```

What does it mean by 80% Unit Test Coverage?

Why xUnits don't have CHECK_NOT_EQUAL?

What is the problem with:

CHECK(TRUE, xxx != 3);

Why xUnits don't have CHECK_NOT_EQUAL?

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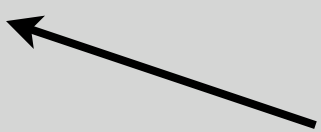

Is there any good reason why you cannot know the output value?

So, tell me what it is then.

OK, fine, so I use CHECK with a specific output value, what now?

What is the problem with:

CHECK(TRUE, xxx == 4);

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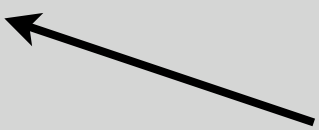
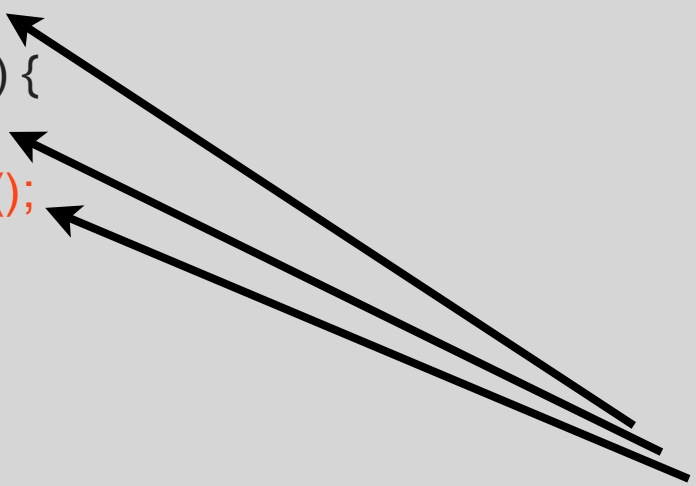


In most xUnits, we have LONGS_EQUAL telling you the actual value when it goes wrong instead of a "false"

Do you know your xUnit harness?

Further example

```
try {
        readConfigurationFile();
        assertTrue(true);
} catch (IOException e) {
        assertTrue(false);
        e.printStackTrace();
}
```



These are the places you know your team does not know the test harness.

Some xUnit harness

- Java: JUnit
- .Net: NUnit
- C/C++: CppUTest
- PHP: PHPUnit

What's wrong?

What is the problem with:

TEST(TEST_AIH, FAIL_BAD_PARAM)

Names don't really tell

What is the problem with:

TEST(TEST_AIH, FAIL_BAD_PARAM)

Be more precise about how it triggered the failure

What names tell us?

- Who
  - Name of the SUT class
  - Name of the method or feature being exercised
- Input
  - Important characteristics of any input values
  - Anything relevant about the state
- Output
  - The outputs expected
  - The expected post-exercise state

Conditional Test Logic?

```
// verify Vancouver is in the list
actual = null;
i = flightsFromCalgary.iterator();
while (i.hasNext()) {
        FlightDto flightDto = (FlightDto) i.next();
        if (flightDto.getFlightNumber().equals(
                expectedCalgaryToVan.getFlightNumber()))
        {
                actual = flightDto;
                assertEquals("Flight from Calgary to Vancouver",
                        expectedCalgaryToVan,
                        flightDto);
                break;
        }
}
```

Tests that crash 50% of the time?!!

Testing everything at a time

```
public void testFlightMileage_asKm2() throws Exception {
        // set up fixture
        // exercise constructor
        Flight newFlight = new Flight(validFlightNumber);
        // verify constructed object
        assertEquals(validFlightNumber, newFlight.number);
        assertEquals("", newFlight.airlineCode);
        assertNull(newFlight.airline);
        // set up mileage
        newFlight.setMileage(1122);
        // exercise mileage translator
        int actualKilometres = newFlight.getMileageAsKm();
        // verify results
        int expectedKilometres = 1810;
        assertEquals( expectedKilometres, actualKilometres);
        // now try it with a canceled flight
        newFlight.cancel();
        try {
                newFlight.getMileageAsKm();
                fail("Expected exception");
        } catch (InvalidRequestException e) {
                assertEquals( "Cannot get cancelled flight mileage",
                e.getMessage());
        }
}
```

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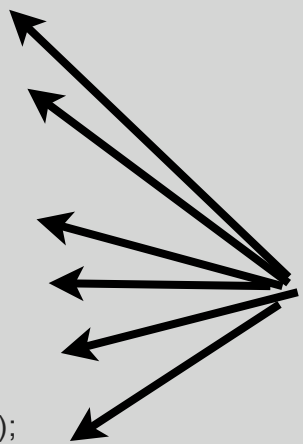

Comments as deodorant

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}
```

Duplications with application logic?

Inappropriate dependencies

- Test setup depending on other tests files
- A test file depending on another test file
- Stub functions depending on other tests

extern int reg_ecx; // in the stub program

int reg_exc; // in SUT

What can we do?

Try: one test group per file

But why can't? is it because of... ?

Test initialisation hard to read and shared among test groups in the same test file

- Fixtures
- Test Data Builder
- Parameterised Creation
- make-it-easy

Dont forget fixtures

```
TEST_GROUP (TEST_thisObject)
{
   void setup()
   {
   }

   void teardown()
   {
   }
};
```

Test Data Builder

```
eth_data_buf
->setControl(2)
->withParameterA(3)
->build();
```

Parameterised Creation

```
@Before
public void setUp() throws Exception {
        alice = new Person();
        alice.setId(1L);
        alice.setFirstname("Alice");
        alice.setLastname("Adams");
        alice.setSsn("111111");
        billy = new Person();
        billy.setId(2L);
        billy.setFirstname("Billy");
        billy.setLastname("Burke");
        billy.setSsn("222222");
        clark = new Person();
        clark.setId(3L);
        clark.setFirstname("Clark");
        clark.setLastname("Cable");
        clark.setSsn("333333");
        alice.isInLoveWith(billy);
}
```

Parameterised Creation

```
public class ParameterizedCreationMethodExample {
     private Person alice, billy, clark;
     @Before
     public void setUp() throws Exception {
          clark = createPerson("Clark", "Cable");
          billy = createPerson("Billy", "Burke");
          alice = createPerson("Alice", "Adams");
          alice.isInLoveWith(billy);
     }
     private Person createPerson(String firstName, String lastName) {
          Person person = new Person();
          person.setFirstname(firstName);
          person.setLastname(lastName);
          person.setId(UniqueNumber.next());
          person.setSsn(String.valueOf(UniqueNumber.next()));
          return person;
     }
     @Test
     public void aliceShouldAcceptWhenProposedToByBilly()
          throws Exception {
          billy.proposeTo(alice);
          assertTrue(alice.isEngagedWith(billy));
     }
}
```

make-it-easy

```
Maker<Apple> appleWith2Leaves = an(Apple, with(2, leaves));
Maker<Apple> ripeApple = appleWith2Leaves.but(with(ripeness, 0.9));
Maker<Apple> unripeApple = appleWith2Leaves.but(with(ripeness, 0.125));

Apple apple1 = make(ripeApple);
Apple apple2 = make(unripeApple);

Banana defaultBanana = make(a(Banana));
Banana straightBanana = make(a(Banana, with(curve, 0.0)));
Banana squishyBanana = make(a(Banana, with(ripeness, 1.0)));
```

http://code.google.com/p/make-it-easy/

Try: One assertion per test

Customised Assertions

```
#define CHECK_OBJ(a,b) CHECK_OBJ(a,b, __FILE__,__FILE__)

void CHECK_OBJ(struct* yourObj, struct* myObj, const char* file, int line)
{
     if (structs are not equal) {
          SimpleString errorMessage = StringFromFormat(
               “My struct: %d, %p, %s”, myObj->d, myObj->p, myObj->s);
          FAIL_LOCATION(errorMessage.asCharString(), file, line);
     }
}
```

At least: One concept per test

Hamcrest

- Framework for writing declarative match criteria

```
String s = "yes we have no bananas today";

Matcher<String> containsBananas = new StringContains("bananas");
Matcher<String> containsMangoes = new StringContains("mangoes");

assertTrue(containsBananas.matches(s));
assertFalse(containsMangoes.matches(s));
```

Or even better

```
assertThat(s, containsString("bananas"));
assertThat(s, not(containsString("mangoes"));
```


http://code.google.com/p/hamcrest/

Meaningful Assertion Messages

- Don’t repeat what the built-in test framework outputs to the console (e.g. name of the test method)
- Don’t repeat what the test name explains
- If you don’t have anything good to say, you don’t have to say anything
- Write what should have happened, or what failed to happen, and possibly mention when it should have happened

It’s Design Smell!!!

Extra Constructor

```
public class LogFileMerge {
    private URL logFileA, logFileB;

    public LogFileMerge() {
        this(new URL("http://server1/system.log"),
        new URL("http://server2/system.log"));
    }

    LogFileMerge(URL a, URL b) {
        this.logFileA = a;
        this.logFileB = b;
    }
}
```

Test-Specific SubClass

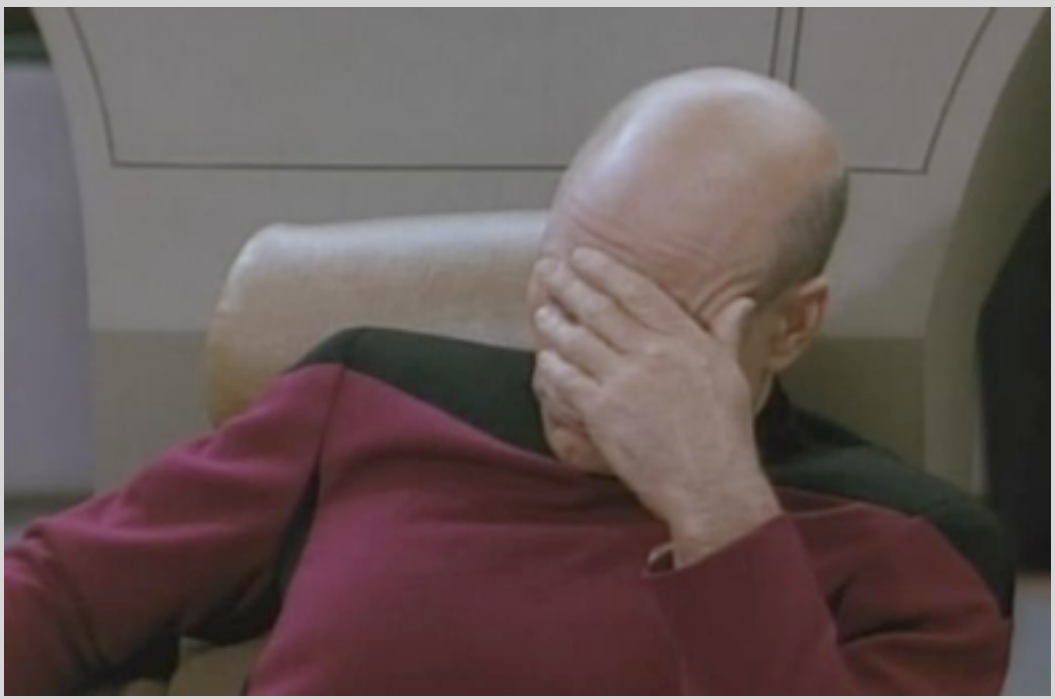
```
public class CreditCardProcessing {

    public boolean isValid(String cardnumber) {
        return validationCodeMatches(cardnumber)
            && cardIsActive(cardnumber);
    }

    protected boolean validationCodeMatches(String cardnumber) {
        // validation logic omitted for brevity...
    }

    protected boolean cardIsActive(String cardnumber) {
        // access to merchant system's web service
        // omitted for brevity...
    }
}
```

Still not testable?



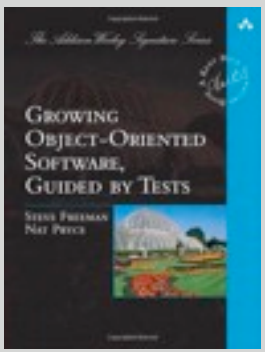
- Do you follow good design principles?

Thinking

- Test code is not second class citizen
- Good design principles apply:
  - Responsibility
  - Dependency
  - Low Coupling
  - High Cohesion
  - Indirection
  - Protected Variations
- Watch out for organisational dysfunction!

References

- Practical TDD and ATDD for Java Developers - Lasse Koskela
- Growing OO Software, guided by tests - Steve Freeman
- xUnit Test Patterns - Gerard Meszaros



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