

Advanced Object-Oriented Design

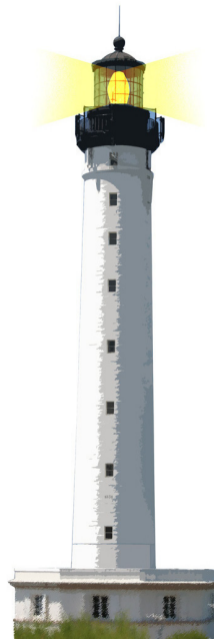
Test 101

The minimum you should know

S.Ducasse



<http://www.pharo.org>



Goal of the lecture

- How can you **trust** that a change did not destroy something?
- What is **my confidence** in the system?
- What is unit testing?
- How do I write tests?

Test main points

- When there is a change
 - Tests verify that what worked before still works
 - Tests are your **life insurance**: you get aware of a side effect and **regression**
- Tests are enablers of future evolution
- Tests reduce the **fear of change**
- Per se tests do not prevent bugs to happen but they reduce **unnoticed** bugs or side effects

About automation

A unit test that is not **automated** does **NOT EXIST!**

- Seriously!
- Repetition
- No human intervention



Unit tests

- Unit tests ensure that you get the specified behavior of a class
- Normally *unit* tests test a single class
- A test one scenario: one point!

Anatomy of a test

A test:

- Creates a **context**
- Performs a **stimulus**: an action in the context
- **Checks** the result with **assertions**

Example: Testing set addition

A test:

- Creates a context: Create an empty set
- Performs a stimulus: Add twice the same element
- Checks the results: Check that the set contains only one element

Set testcase

```
TestCase subclass: #SetTest
```

```
...
```

```
SetTest >> testAdd
```

```
| empty |
```

```
empty := Set new.
```

```
"Context"
```

```
empty add: 5.
```

```
"Stimulus"
```

```
empty add: 5.
```

```
self assert: empty size equals: 1. "Check"
```

```
SetTest run: #testAdd
```


Success, failures, and errors

- Success: a test passes
- A failure is a failed assertion, i.e., an anticipated problem that you test failed
- An error is a condition you didnt check for, i.e., a runtime error.



A failure

If we get `empty` size returning 2 instead of 1.

```
SetTest >> testAdd  
| empty |  
empty := Set new.  
empty add: 5.  
empty add: 5.  
self assert: empty size equals: 1.
```

An error

Sending the message `foobar:` raises an exception.

```
SetTest >> testAdd  
| empty |  
empty := Set new.  
empty foobar: 5.  
self assert: empty size equals: 1.
```

How to reuse setting test context?

If a context is repeated among tests:

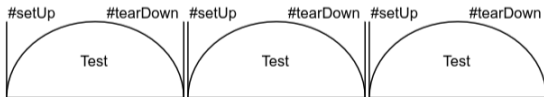
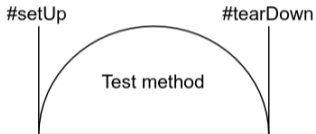
- duplication is never a good idea
- hampers future evolution

The framework offers the `setUp` method to create a context before any test execution.

setUp and tearDown messages

Executed **systematically** before and after each test run

- setUp allows us to specify and reuse the context
- tearDown to clean after test execution



Defining a setUp method

- Turn `empty` in an instance variable
- Just create a context, here `empty` is initialized to an empty set.

```
SetTestCase >> setUp  
  empty := Set new
```

`setUp` is executed for you before any test execution

```
SetTestCase >> testOccurrences  
  self  
  assert: (empty occurrencesOf: 0)  
  equals: 0.  
  empty add: 5; add: 5.  
  self  
  assert: (empty occurrencesOf: 5)  
  equals: 1
```

About writing tests

- Remember: Tests represent your trust in the system
- Build them incrementally
 - Do not need to focus on everything
 - When a new bug shows up, write a test
- Even better, write them before the code
 - Act as your first client, produce a better interface
- Active documentation is always in sync
- It has a cost: writing them, maintaining them, so make them worth
- But pay off is Huge

But I can't cover everything!

Sure! Nobody can but:

- When someone discovers a defect in code, first write a test that demonstrates the defect.
- Then debug until the test succeeds.

Whenever you are tempted to type something into a print statement or a debugger expression, write it as a test instead. Martin Fowler



Testing style: TDD

"The style here is to write a few lines of code, then a test that should run, or even better, to write a test that won't run, then write the code that will make it run."

- Write unit tests that thoroughly test a single class
- Write tests as you develop (even before you implement your class!)
- Write tests for every new piece of functionality

Developers should spend 25-50% of their time developing tests.
(see next lecture)

Good tests

- Repeatable
- No human intervention
- *self-described*
- Change less often than the system
- Tells a story

Conclusion

- Invest in tests
- Use Xtreme TDD: write a test, execute, debug and code in the debugger (see following lecture)
- Tests are your best investment

A course by

S. Ducasse, G. Polito, and Pablo Tesone



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