Bootstrapping Boost.Test using a macro DSL

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Slightly inaccurate title, but the truthful one sounds silly

Bootstrapping your Boost.Test tests using a macro DSL

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How much wood would a woodchuck chuck etc.

That is, however, what I’m going to talk about; the presumed constraint is that you’re using Boost.Test.

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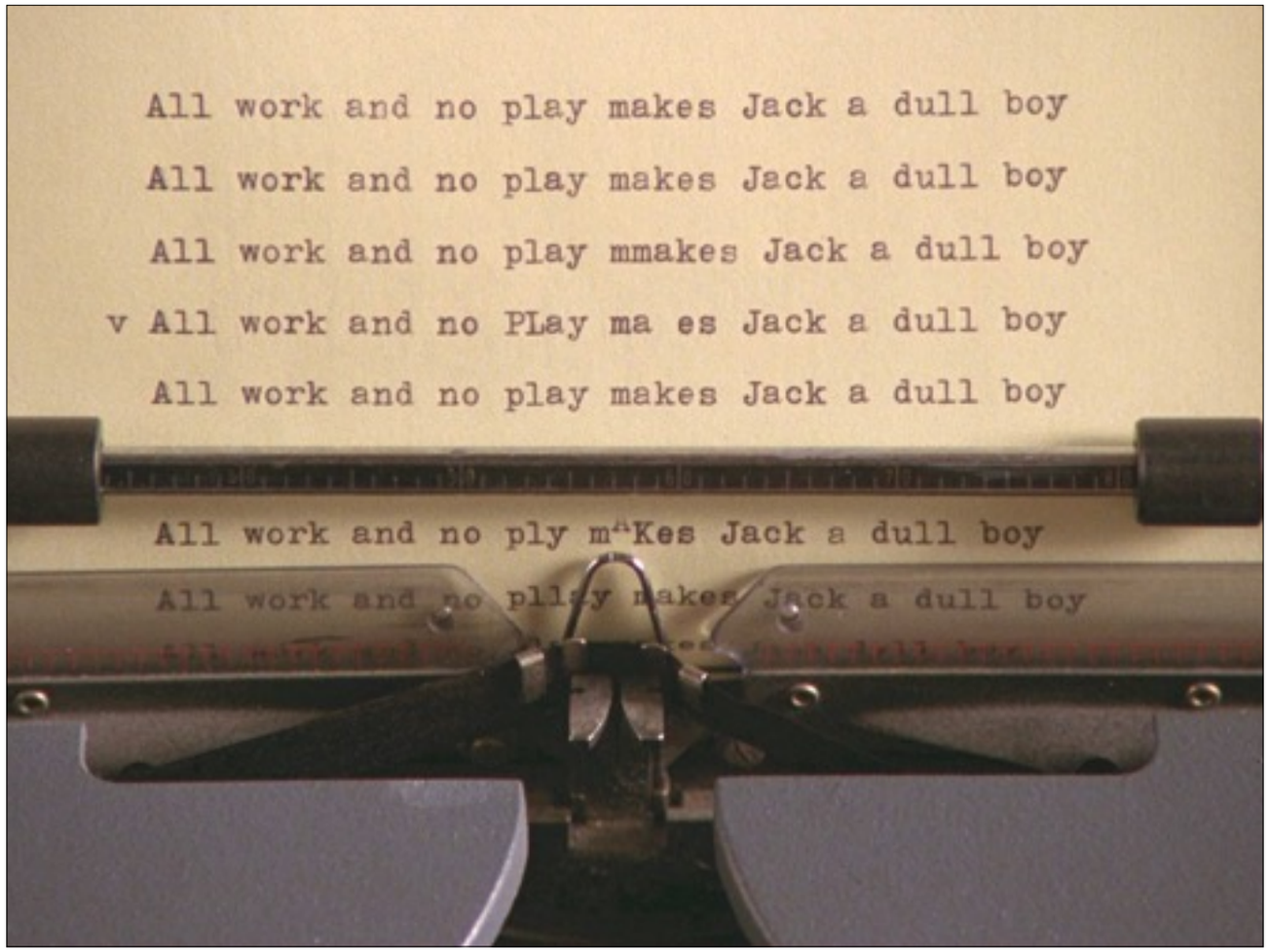
If you start coding tests without thinking about what you're doing you'll end up writing tests you don't need leading to functionality you don't need and then...



madness
So: how do we get started?
The language of writing BDD acceptance tests can help us here.

```
Scenario: popping a non empty stack

  Given  a stack with one member
  When  the stack is popped
  Then  the stack becomes empty
  And  the stack size is reduced by 1
```

Here’s an example for a simple stack.
We’re going to ignore the argument that doing BDD without a domain expert is not useful; the language helps us to focus on what we’re trying to do.
We can turn that into code with a scattering of syntax:

```
Scenario_(popping_a_non_empty_stack)

  Given_(a_stack_with_one_member)
  When_(the_stack_is_popped)
  Then_(the_stack_becomes_empty) {}
  And_(the_stack_size_is_reduced_by_1) {}

  End_
  End_

End_
```

This code compiles and runs! You'll get some warnings about not checking any assertions, but it _does_ work. This is good; we've got ourselves to point where we have to fill in the blanks with the stuff that fulfils our statements.

```
struct before_each {
  Stack<int> stack;
};

Scenario_(popping_a_non_empty_stack)

  Given_(a_stack_with_one_member)
    Before_each_(stack.push(1))

    When_(the_stack_is_popped)
      struct before_each: outer_before_each {
        std::size_t size_before_pop;
        before_each(): size_before_pop(stack.size()) {
          stack.pop();
        }
      };
      Then_(the_stack_becomes_empty)
      {
        BOOST_CHECK(stack.empty());
      }
      And_(the_stack_size_is_reduced_by_1)
      {
        BOOST_CHECK_EQUAL(stack.size(), size_before_pop - 1);
      }
    End_
  End_

End_
```

And this is it.
[click] You can still see our original test description; we've just filled in the blanks
What's in those blanks?
before_each is a fixture. When writing tests in this style, _all_ fixtures are called before_each, and each suite and test implicitly uses a fixture called before_each. If you don't define it, an empty one will be used.
Before_each_ is shorthand for declaring a fixture with no member data, with the argument as the contents of the ctor.
If you declare before_each inside a suite, inherit from outer_before_each so you get the outer fixture (this isn't wrapped in a macro because it's a) important to be aware that we have a struct here, and b) it allows us to trivially mix-in other helper classes)
And then here are our tests.

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    End_
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```

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And then here are our tests.

```
Entering test suite "SCENARIO_popping_a_non_empty_stack"
Entering test suite "given_a_stack_with_one_member"
Entering test suite "when_the_stack_is_popped"
Entering test case "then_the_stack_becomes_empty"
Leaving test case "then_the_stack_becomes_empty"; testing time: 76mks
Entering test case "and_the_stack_size_is_reduced_by_1"
Leaving test case "and_the_stack_size_is_reduced_by_1"; testing time: 79mks
Leaving test suite "when_the_stack_is_popped"
Leaving test suite "given_a_stack_with_one_member"
Leaving test suite "SCENARIO_popping_a_non_empty_stack"
```

The default boost test output is uninspiring; let’s see what we can do about that.

```
SCENARIO popping a non empty stack
   given a stack with one member
     when the stack is popped
       then the stack becomes empty
       and the stack size is reduced by 1
```

So here we've removed the noise and are showing the test hierarchy

Implementation

Boost.Test Building Blocks

```
BOOST_AUTO_TEST_SUITE(suite_name)
   namespace suite_name {

BOOST_AUTO_TEST_SUITE_END()
   }

BOOST_FIXTURE_TEST_CASE(test_name, fixture_class_name)
   struct test_name: public fixture_class_name {
     void test_method();
   };
   void test_name::test_method()
```

Building blocks: Boost.Test has fixtures, suites, and test-cases.
Note that I'm ignoring the test registration machinery: it's not relevant to what we're attempting.
A suite is just a namespace
A test-case is a class, with a single method that contains your code. It inherits from the supplied fixture, which means we get setup/teardown using RAII.

before_each

```
#define GWT_TEST_SUITE(test) \
  BOOST_AUTO_TEST_SUITE(test); \
  typedef before_each outer_before_each;

#define GWT_TEST_CASE(test) \
  BOOST_FIXTURE_TEST_CASE(test, before_each)
```

These two macros allow us to call all our fixtures before_each, and allow chaining them to fixtures in outer scope

Given/When/Then

```
#define Scenario_(x) GWT_TEST_SUITE(SCENARIO_ ## x)

#define Given_(x) GWT_TEST_SUITE(given_ ## x)
#define When_(x) GWT_TEST_SUITE(when_ ## x)

#define Then_(x) GWT_TEST_CASE(then_ ## x)
#define And_(x) GWT_TEST_CASE(and_ ## x)

#define End_ BOOST_AUTO_TEST_SUITE_END()
```

We can now define Given/When/Then, and we’re done.

Bells and Whistles

- Logger
  - Clearer formatting
  - Print filter string for failing tests
- Spec-style testing

```
#define Describe_(x) GWT_TEST_SUITE(x ## _)
#define Context_(x) GWT_TEST_SUITE(x)
#define It_(x) GWT_TEST_CASE(x)
```

The Logger is much more code than the actual macros; see the repo on github
Describe has a trailing _ to allow us to say Describe(class-name) without clashing with the class-name

Questions?

Questions?

- Why not use Catch?
  - Because reasons

github.com/guyboltonking/bdd-with-boost-test

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