Unci: a C++-based Unit-testing Framework for Intro Students

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6 March 2015

Unci: Intro C++ unit testing

Tests as a concrete specification

- "We agree you will do X"
- How will I know you have done X?
- How will you know you have done X?

Unci: Intro C++ unit testing Tests as a progress report

- The contract includes 15 tests; how many are succeeding?
- Individual, easy-to-perform "unit" tests can be performed frequently
- Hard-to-perform tests will be postponed to the end

Unci: Intro C++ unit testing Tests as a to-do list

- Specifications can change mid-project
- Client has additional requirements, clarifications
- Developer has "aha" moment: tricky edge case

Unci: Intro C++ unit testing Example task: name processing

- Names are complicated (esp. globally)
- Analysis required to e.g. sort alphabetically
- "First" name, "Last" name
- Print last/sur-/family name in ALL CAPS

Unci: Intro C++ unit testing Example task: name processing

Main task:

 canonicalName reformats a provided name into its preferred order but with the family name in all caps. Unci: Intro C++ unit testing Example task: name processing

Main task:

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Subtasks:

- firstName extracts the "first name" from the provided name
- lastName extracts the "last name" from the provided name

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Showing my work: header file

- 1 #include <string>
 2 using namespace std;
- 3
- 4 string canonicalName (string provided);
- 5 string firstName (string provided);
- 6 string lastName (string provided);

Unci: Intro C++ unit testing Showing my work: "stubs"

```
1 #include "names.h"
 2
 3 string canonicalName (string provided)
 4 {
     return "Not implemented yet";
 5
 6 }
 7
8 string firstName (string provided)
9
   Ł
     return "Not implemented yet";
10
11 }
12
13 string lastName (string provided)
14 {
     return "Not implemented yet";
15
16 }
```

Unci: Intro C++ unit testing Examples of data

- "Adrienne Decker"
- "Kurt Eiselt"

Unci: Intro C++ unit testing Examples of data

- "Adrienne Decker"
- "Kurt Eiselt"

Encode as:

```
string decker = "Adrienne Decker";
string eiselt = "Kurt Eiselt";
```

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Test cases

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Encode as...

Unci: Intro C++ unit testing The old way: CppUnit

```
1 #include <cppunit/TestFixture.h>
 2 #include <cppunit/TextTestRunner.h>
 3 #include <cppunit/extensions/HelperMacros.h>
 4
 5 #include "names.h"
 6
 7 class test_names : public CppUnit::TestFixture
8 {
     CPPUNIT_TEST_SUITE( test_names );
9
10
     CPPUNIT_TEST( test_basic );
11
     CPPUNIT_TEST_SUITE_END();
12
     private:
13
14
       string decker = "Adrienne Decker";
15
       string eiselt = "Kurt Eiselt";
16
17
     public:
18
       void test basic()
19
       {
         CPPUNIT_ASSERT_EQUAL(string("Adrienne DECKER"), canonicalName(decker));
20
         CPPUNIT_ASSERT_EQUAL(string("Kurt EISELT"), canonicalName(eiselt));
21
22
```

Unci: Intro C++ unit testing The old way: CppUnit



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A better way: Unci

```
1 #include "names.h"
 2
3 test suite names
4 {
 5 fixture:
     string decker = "Adrienne Decker";
 6
     string eiselt = "Kurt Eiselt";
 7
 8
 9 tests:
     test basic
10
11
    {
       check(canonicalName(decker)) expect == "Adrienne DECKER";
12
13
       check(canonicalName(eiselt)) expect == "Kurt EISELT";
14
    }
15 }
```

UNCI: <u>Un</u>it testing with a <u>clean interface</u>

Unci: Intro C++ unit testing Existing frameworks: problems

• Such as

CppUnitlibunittestUnitTest++Unit++

xUnit++ CxxTest

- Boilerplate code
- Manual registration of test cases
- Macros (error messages)
- Fixture values as "instance variables"
- Intermediate/advanced C++ features (classes, templates, lambdas)

Unci: Intro C++ unit testing Unci files

- Designed to have a minimum of "boilerplate"
- Two sections in most files:
 - List of examples ("test fixture")
 - List of test cases, grouped by unit

Unci: Intro C++ unit testing Some unit tests

• Testing canonicalName with basic names

check (canonicalName(decker))
 expect == "Adrienne DECKER";

check (canonicalName(eiselt))
 expect == "Kurt EISELT";

Unci: Intro C++ unit testing Some unit tests

• Other kinds of expectations

check (countValidItems(list))
 expect >= 1;

check (luftballon.isFlying())
 expect true;

check (triangle.hypotenuseLength())
 expect about 1.414 +- 0.001;

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- 2. Write test cases

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- 3. Run tests

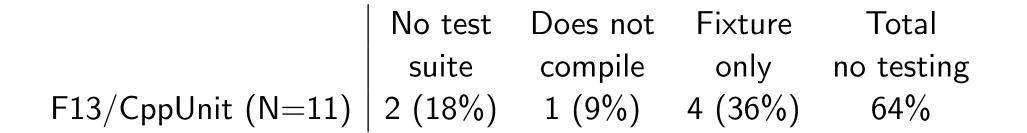
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- 1. Write data examples
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- 3. Run tests
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- 5. Otherwise, write a little piece of the program, and go to 3
 - Also, if you think of a new example, interrupt any step to go to 1
 - And if you think of a new test case, interrupt any step to go to 2

Unci: Intro C++ unit testing Why Unci helps Unci: Intro C++ unit testing Why I thought Unci would help

Unci: Intro C++ unit testing Why I thought Unci would help

- Getting bogged down in step 2 is a real drag
 - Less confusing format
 - Much better (more helpful) error messages
- "Interrupt" parts less disruptive
 - Add one thing, done



Unci: Intro C++ unit testing Thanks!

- Any questions?
- Any suggestions?
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