

CUTE: C++ Unit Testing Easier

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Abstract

This article describes the design and use of the CUTE C++ testing framework and its integration into the Eclipse C++ Development Tooling.

Unit testing supports code quality and is a corner stone of agile software development. CUTE and its Eclipse plug-in are an easy to use C++ testing framework.

Categories and Subject Descriptors D [2]: 5—Testing tools (e.g., data generators, coverage testing)

General Terms Design, Languages, Verification

Keywords Unit Testing, C++, Eclipse

1. Introduction

Automated unit testing supports high quality of program code, especially under inevitable change and refactoring. As a side effect, unit tested code often has a better structure. Java developers are used to unit testing because of JUnit and its tight integration into IDEs like Eclipse. C++ programmers lacked the tool support for easy-to-use unit testing, even though the language's complexity asks for it. Refactoring and simplifying C++ code without tests is very hard and error-prone.

2. Problems with CPPUnit

One disadvantage of the well-known CPPUnit is that you have to write a subclass to have your own test case. Inheritance is a very strong coupling between classes. Requiring a test-case class to inherit from a CPPUnit-framework class couples both closely together. The CPPUnit tutorial [1] lists at least six classes you have to deal with to get things up and running. You even have to decide if you want to inherit from TestCase or TestFixture for your simple test case you intend to write.

3. Using CUTE

Writing a unit test using CUTE is simple. A test is a simple parameterless void function, there is no need to inherit from a test class.

```
#include "cute.h"
int theAnswer = 42;

void mysimpletest(){
    ASSERT(theAnswer == 6*7);
}
```

In addition each test has a name, which identifies it. That name is either given during construction using the CUTE() macro or derived from the function's typeid.

Running a single test is not very useful. But having a larger collection of test cases and running them after every check-in on a build server, is what makes unit testing so powerful. So there is a need for running many tests at once.

CUTE doesn't use the Composite Design Pattern [2] for implementing the container for these test cases. Instead test suites in CUTE are vectors containing a sequence of test cases. Thus we can avoid the strong coupling caused by inheritance and the lower cohesion in the container class, because the container doesn't need to support the composite interface. Test cases can be added to the suite using the push_back() method inherited from vector or the overloaded += operator.

Since C++ lacks some of the reflection mechanisms available in Java, we have to write our own main function for testing. For simple cases we only instantiate a runner object and pass our test for execution.

Reporting the test results is so common that CUTE provides a means to configure the runner with a listener passed as template parameter.

```

void runSuite(){
    cute::suite s;
    s.push_back(CUTE(mysimpletest));
    cute::ide_listener lis;
    cute::makeRunner(lis)(s, "The Suite");
}

int main(){
    runSuite();
}

```

4. Eclipse CDT Integration

A good integration into a development environment simplifies the use of a testing framework. Additionally a good integration can improve the developers acceptance to write tests, so writing unit tests becomes a natural part of writing source code.

The CUTE Eclipse plug-in¹ integrates the CUTE testing framework into the Eclipse C/C++ Development Tooling (CDT)² similar to the JUnit integration for the Eclipse Java Development Tools³. The plug-in's project creation wizards support the developer by setting up a project including the necessary CUTE headers and the corresponding compiler and linker settings. A specialized wizard exists to create a test project for an already existing library project.

The plug-in uses the standard cute runner with a special output listener that writes the test results to `std::cout` using a defined format. A model representing the test cases including there results is build by parsing the test output. The results of the tests are presented to the developer by the result view. Therefore the result view can be used with other test frameworks as long as they provide the same output as the `cute::eclipse_listener`.

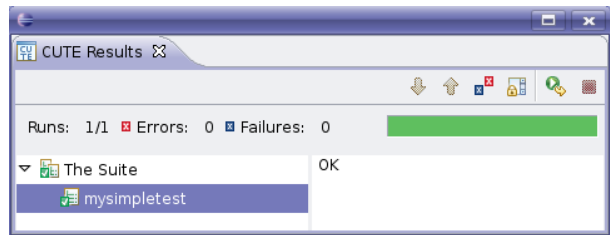


Figure 1. CUTE Result View

CUTE's result view provides all the important features Java developers know from the JUnit-plug-in:

- Red / Green Bar
- test navigator
- diff-viewer for failing tests

5. Requirements and Outlook

CUTE needs `boost::bind` and `boost::function` from the Boost⁴ library that are part of the proposed C++ standard extension `std::tr1`.

There are many ideas for extending CUTE to make it a more convenient environment to work with. For example, better integration into other IDEs like Visual Studio.

References

- [1] M. Feathers and B. Lepilleur. Cppunit cookbook. http://cppunit.sourceforge.net/doc/lastest/cppunit_cookbook.html.
- [2] E. Gamma, R. Helm, R. Johnson, and J. Vlissides. *Design Patterns*. Addison-Wesley Professional, July 1997.

¹ Update Site: <http://ifs.hsr.ch/cute/updatesite/>

² <http://www.eclipse.org/cdt/>

³ <http://www.eclipse.org/jdt/>

⁴ <http://www.boost.org/>