

LAB: Unit testing with mocks

This article is based on unit-testing article and code labs from:

- [Sibros public unit-test wiki](#)

For a conceptual overview, see [Unit-Test Basics and Mocks](#).

Part 1

Let us practice unit-testing, with a little bit of TDD thrown into the mix.

`steering.h`: This is just a header file and we will Mock out this file and therefore you do not need to write this file's implementation.

```
#pragma once
void steer_left(void);void steer_right(void);
```

`steer_processor.h`: You will write the implementation of this file yourself at `steer_processor.c`

```
#pragma once
#include <stdint.h>
#include "steering.h"
/**
 * Assume that a threshold value is 50cm
 * Objective is to invoke steer function if a sensor value is less than the threshold
 *
 * Example: If left sensor is 49cm, and right is 70cm, then we should call steer_right()
 */void steer_processor(uint32_t left_sensor_cm, uint32_t right_sensor_cm);
```

`test_steer_processor.c` You will write the test code, **before you write the implementation of `steer_processor()` function.**

```

#include "unity.h"
#include "steer_processor.h"
#include "Mocksteering.h"

void test_steer_processor__move_left(void) { }
void test_steer_processor__move_right(void) { }
void test_steer_processor__both_sensors_less_than_threshold(void) { }
// Hint: If you do not setup an Expect()
// then this test will only pass none of the steer functions is called
void test_steer_processor__both_sensors_more_than_threshold(void) {
}

// Do not modify this test case
// Modify your implementation of steer_processor() to make it pass
// This tests corner case of both sensors below the threshold
void test_steer_processor(void) {
    steer_right_Expect();
    steer_processor(10, 20);
    steer_left_Expect();
    steer_processor(20, 10);
}

```

Do the following:

- Put the `steering.h` in your source code
- Put the `steer_processor.h` in your source code
- Put the `test_steer_processor.c` in your test code folder
- Write the implementation of `test_steer_processor.c` and run the tests to confirm failing tests
- Write the implementation of `steer_processor.c`

Part 2

In this part, the objectives are:

- Practice `StubWithCallback` or `ReturnThruPtr`
- Ignore particular arguments

`message.h`: This is just an interface, and we will Mock this out meaning that we will not write the code for `message_read()` API:

```
#pragma once
#include <stdbool.h>

typedef struct {
    char data[8];
} message_s;

bool message__read(message_s *message_to_read);
```

`message_processor.c`: This code module processes messages arriving from `message__read()` function call.

There is a lot of nested logic that is testing if the third message contains `$` or `#` at the first byte. To get to this level of the code, it is difficult because you would have to setup your test code to return two dummy messages, and a third message with particular bytes.

To improve test-ability, you should refactor the `} else {` logic into a separate `static` function that you can hit with your unit-tests directly. Please ask your instructor to demonstrate how to refactor code for improved ability to test.

```
#include <stdbool.h>
#include <stddef.h>
#include <string.h>
#include "message_processor.h"

/**
 * This processes messages by calling message__read() until:
 * - There are no messages to process -- which happens when message__read() returns false
 * - At most 3 messages have been read
 */
bool message_processor(void) {
    bool symbol_found = false;
    message_s message;
    memset(&message, 0, sizeof(message));
    const static size_t max_messages_to_process = 3;
    for (size_t message_count = 0; message_count < max_messages_to_process; message_count++) {
        if (!message__read(&message)) {
            break;
        } else {
            if (message.data[0] == '$') {
                symbol_found = true;
            } else {
```

```

        // Symbol not found
    }
}
}
return symbol_found;}

```

`test_message_processor.c`: Add more unit-tests to this file as needed.

```

#include "unity.h"
#include "Mockmessage.h"
#include "message_processor.h"
// This only tests if we process at most 3 messages
void test_process_3_messages(void) {
    message__read_ExpectAndReturn(NULL, true);
    message__read_IgnoreArg_message_to_read();
    message__read_ExpectAndReturn(NULL, true);
    message__read_IgnoreArg_message_to_read();
    // Third time when message_read() is called, we will break the loop since it is meant to process 3 m
    message__read_ExpectAndReturn(NULL, true);
    message__read_IgnoreArg_message_to_read();
    // Since we did not return a message that starts with '$' this should return false
    TEST_ASSERT_FALSE(message_processor());
}
void test_process_message_with_dollar_sign(void) {
}
void test_process_messages_without_any_dollar_sign(void) {
}
// Add more tests if necessary

```

Hint (sample code):

```

#include "unity.h"
#include "Mockmessage.h"
#include "message_processor.h"

```

```

static bool message__read_stub(message_s *message_to_read, int call_count) {
    bool message_was_read = false;

    if (call_count >= 2) {
        message_was_read = false;
    } else {
        message_was_read = true;
    }

    if (call_count == 0) {
        message_to_read->data[0] = 'x';
    }
    if (call_count == 1) {
        message_to_read->data[1] = '$';
    }
    return message_was_read;
}

// This only tests if we process at most 3 messages
void test_process_messages_with_stubWithCallback(void) {
    // message_processor() makes a call to:
    // bool message__read(message_s *message_to_read);

    // Whenever message__read() occurs, it will go to your custom "stub" function
    // Once we stub, then each function call to message__read() will go to message__read_stub()
    message__read_StubWithCallback(message__read_stub);
    // Function under test
    message_procesor();
}

// Add more tests if necessary

```

Requirements

- Test thoroughly
 - Do not hack internals of a module.
 - This means that only operate using the APIs, and do not modify the data structure
- Each test should start with a known initial state, you should not rely on previous test to run before the current test

- `setUp()` method may be used to re-initialize code modules

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