
ECEN 5013 Spring 2017 Project 2

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Contents

1	Goal	1
2	UART Logger	1
3	Unit Tests	1

Repository: <https://bitbucket.org/bjandre/embedded-software-essentials>

Tag of changeset: **project-2-rel**

NOTE : The screen shots are readable, but you must zoom in several times to see the details.

1 Goal

Creation of a binary logger that operates over a UART hardware abstraction layer. The UART HAL uses the micro-controller UART peripheral or a wrapper around printf and getc.

2 UART Logger

Figure 1 shows the high level software architecture diagram for the UART logger, including the resources shared between the main thread and the UART interrupt handler.

3 Unit Tests

Example screen shots of cmocka unit test results:

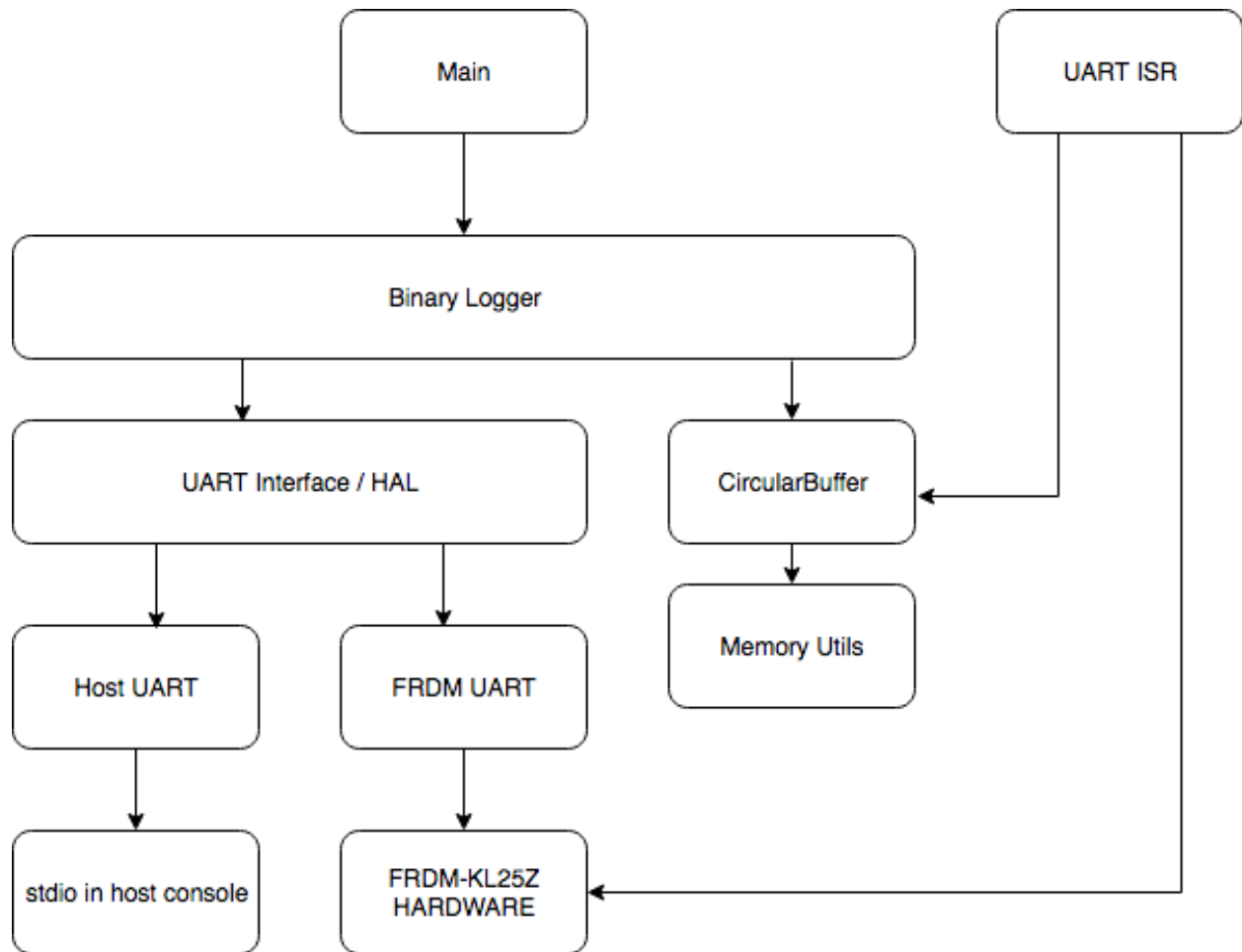


Figure 1: Software architecture diagram for the binary logger.

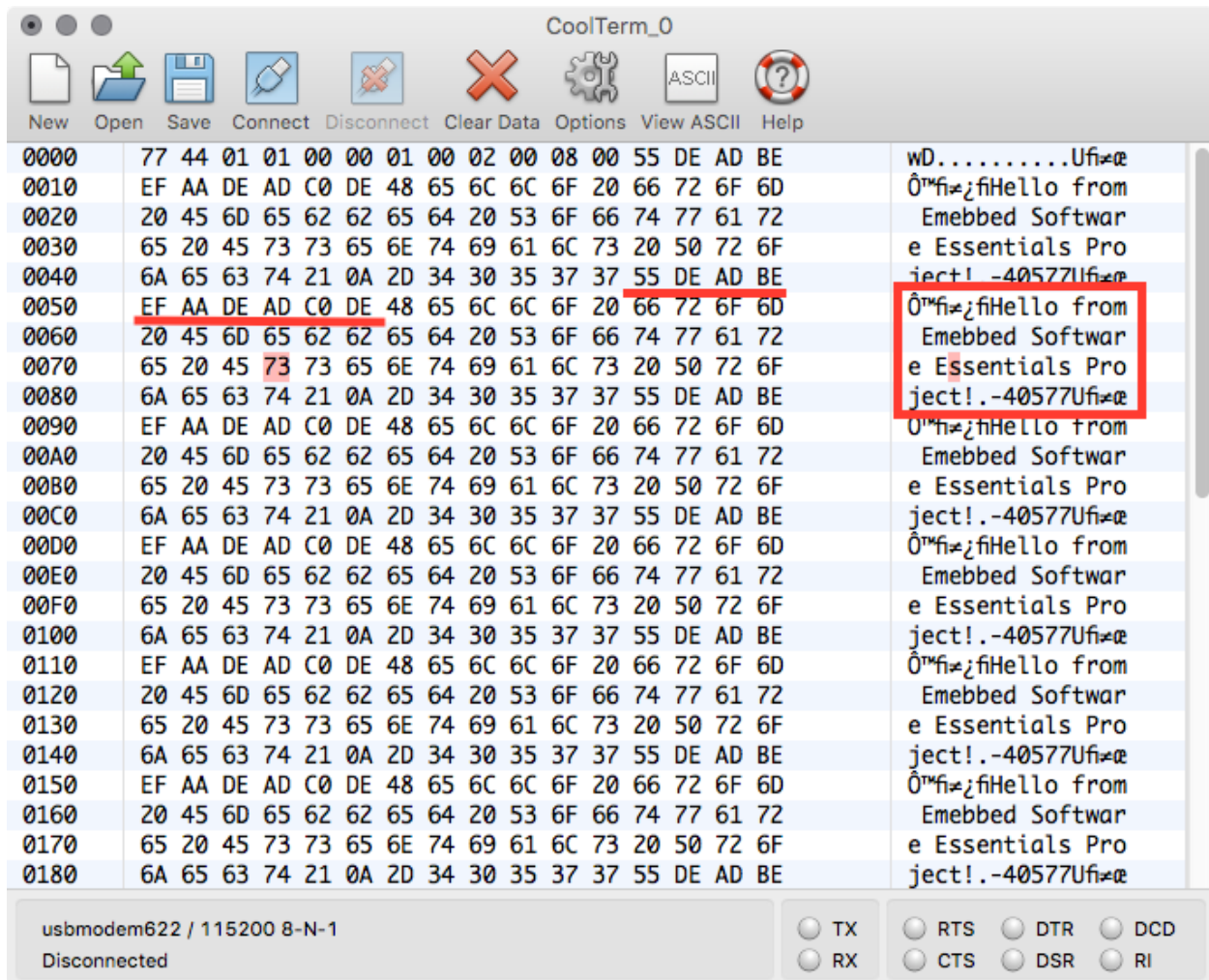


Figure 2: Intermediate stage debugging output of logger sending byte patterns (0x55 0xDEADBEEF 0xAA 0xDEADC0DE), a string (Hello from Embedded Software Essentials Project!), and a negative integer (-40577).

```
embedded-software-essentials — -bash — 109x37
lldb ./src/main/proj...out ▸ project2.out  ...bedded-software-essentials — -bash  ...software-essentials/src/main — -bash +
make: *** [src] Error 2
(pyrite) embedded-software-essentials $ ./src/main/ese-project.out < ./src/main/console-input.txt
77440401000000000002000000000800000000070000000016107000000016207000000016307000000013107000000013207000000013
307000000010a07000000010907000000010607000000012207000000012c07000000012407000000017b070000000141070000000142
0700000001430900000004060000000a00000004030000000b00000004040000000c00000004030000000d00000000Abort trap: 6
(pyrite) embedded-software-essentials $ ./src/main/ese-project.out < ./src/main/console-input.txt | ./src/main/ese-process-logs.py
Byte 1: 77
Byte 2: 44
sizeof(ID): 4
sizeof(size): 1
LOGGER_INITIALIZED(0) size = 0 :
SYSTEM_INITIALIZED(2) size = 0 :
DATA_ANALYSIS_STARTED(8) size = 0 :
DATA_RECEIVED(7) size = 1 : 61
DATA_RECEIVED(7) size = 1 : 62
DATA_RECEIVED(7) size = 1 : 63
DATA_RECEIVED(7) size = 1 : 31
DATA_RECEIVED(7) size = 1 : 32
DATA_RECEIVED(7) size = 1 : 33
DATA_RECEIVED(7) size = 1 : 0a
DATA_RECEIVED(7) size = 1 : 09
DATA_RECEIVED(7) size = 1 : 06
DATA_RECEIVED(7) size = 1 : 22
DATA_RECEIVED(7) size = 1 : 2c
DATA_RECEIVED(7) size = 1 : 24
DATA_RECEIVED(7) size = 1 : 7b
DATA_RECEIVED(7) size = 1 : 41
DATA_RECEIVED(7) size = 1 : 42
DATA_RECEIVED(7) size = 1 : 43
DATA_ALPHA_COUNT(9) size = 4 : 06000000
DATA_NUMERIC_COUNT(10) size = 4 : 03000000
DATA_PUNCTUATION_COUNT(11) size = 4 : 04000000
DATA_MISC_COUNT(12) size = 4 : 03000000
DATA_ANALYSIS_COMPLETED(13) size = 0 :
unpack requires a bytes object of length 4
(pyrite) embedded-software-essentials $
```

Figure 3: Finally logger output running native on the host with printf/getc replacing UART. Raw hex output and translated output.

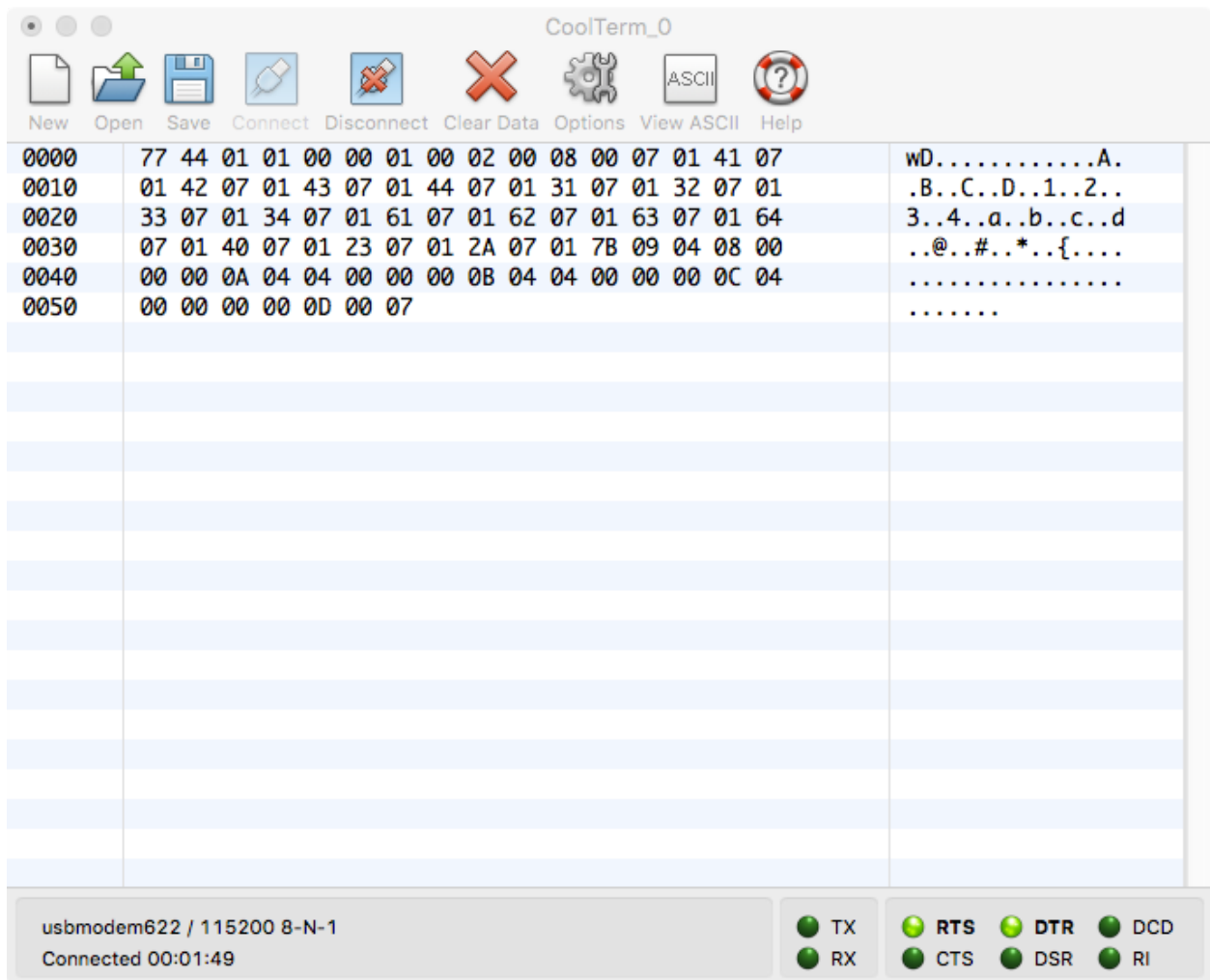


Figure 4: Final logger output in the serial console of the UART logger running on the FRDM-KL25Z:

```
embedded-software-essentials — -bash — 109x58
lldb ./src/main/proj....out > project2.out
...bedded-software-essentials — -bash
...software-essentials/src/main — -bash
+
if [ -e ./test_utils.out ]; then \
    ./test_utils.out ; \
fi
[====] Running 18 test(s).
[ RUN ] test_my_memmove_null_ptrs
[ OK ] test_my_memmove_null_ptrs
[ RUN ] test_my_memmove_src_dest_complete_overlap
[ OK ] test_my_memmove_src_dest_complete_overlap
[ RUN ] test_my_memmove_no_overlap_src_dest
[ OK ] test_my_memmove_no_overlap_src_dest
[ RUN ] test_my_memmove_no_overlap_dest_src
[ OK ] test_my_memmove_no_overlap_dest_src
[ RUN ] test_my_memmove_overlap_src_in_dest
[ OK ] test_my_memmove_overlap_src_in_dest
[ RUN ] test_my_memmove_overlap_dest_in_src
[ OK ] test_my_memmove_overlap_dest_in_src
[ RUN ] test_my_memset_null_ptrs
[ OK ] test_my_memset_null_ptrs
[ RUN ] test_my_memset_set_entire_array
[ OK ] test_my_memset_set_entire_array
[ RUN ] test_my_memset_set_subarray
[ OK ] test_my_memset_set_subarray
[ RUN ] test_my_memzero_null_ptrs
[ OK ] test_my_memzero_null_ptrs
[ RUN ] test_my_memzero_set_entire_array
[ OK ] test_my_memzero_set_entire_array
[ RUN ] test_my_reverse_null_ptr
[ OK ] test_my_reverse_null_ptr
[ RUN ] test_my_reverse_even_length
[ OK ] test_my_reverse_even_length
[ RUN ] test_my_reverse_odd_length
[ OK ] test_my_reverse_odd_length
[ RUN ] test_my_reverse_zero_length
[ OK ] test_my_reverse_zero_length
[ RUN ] test_my_reverse_subarray_after
[ OK ] test_my_reverse_subarray_after
[ RUN ] test_my_reverse_subarray_before
[ OK ] test_my_reverse_subarray_before
[ RUN ] test_my_reverse_all_characters
[ OK ] test_my_reverse_all_characters
[====] 18 test(s) run.
[ PASSED ] 18 test(s).
[====] Running 12 test(s).
[ RUN ] test_big_to_little_null_ptr
[ OK ] test_big_to_little_null_ptr
[ RUN ] test_big_to_little_valid
[ OK ] test_big_to_little_valid
[ RUN ] test_little_to_big_null_ptr
[ OK ] test_little_to_big_null_ptr
[ RUN ] test_little_to_big_valid
[ OK ] test_little_to_big_valid
[ RUN ] test_convert_endian32_1
[ OK ] test_convert_endian32_1
[ RUN ] test_convert_endian32_2
[ OK ] test_convert_endian32_2
[ RUN ] test_my_atoi_leading_whitespace_null_term
[ OK ] test_my_atoi_leading_whitespace_null_term
[ RUN ] test_my_atoi_negative_null_term
```

Figure 5: cmocka test results for memory utilites

```
embedded-software-essentials — -bash — 109x58
lldb ./src/main/proj....out > project2.out    ...bedded-software-essentials — -bash    ...software-essentials/src/main — -bash    +

[ OK ] test_my_reverse_subarray_before
[ RUN ] test_my_reverse_all_characters
[ OK ] test_my_reverse_all_characters
[====] 18 test(s) run.
[ PASSED ] 18 test(s).
[====] Running 12 test(s).
[ RUN ] test_big_to_little_null_ptr
[ OK ] test_big_to_little_null_ptr
[ RUN ] test_big_to_little_valid
[ OK ] test_big_to_little_valid
[ RUN ] test_little_to_big_null_ptr
[ OK ] test_little_to_big_null_ptr
[ RUN ] test_little_to_big_valid
[ OK ] test_little_to_big_valid
[ RUN ] test_convert_endian32_1
[ OK ] test_convert_endian32_1
[ RUN ] test_convert_endian32_2
[ OK ] test_convert_endian32_2
[ RUN ] test_my_atoi_leading_whitespace_null_term
[ OK ] test_my_atoi_leading_whitespace_null_term
[ RUN ] test_my_atoi_negative_null_term
[ OK ] test_my_atoi_negative_null_term
[ RUN ] test_my_itoa_positive_base10
[ OK ] test_my_itoa_positive_base10
[ RUN ] test_my_itoa_negative_base10
[ OK ] test_my_itoa_negative_base10
[ RUN ] test_my_itoa_positive_base2
[ OK ] test_my_itoa_positive_base2
[ RUN ] test_my_itoa_negative_base16
[ OK ] test_my_itoa_negative_base16
[====] 12 test(s) run.
[ PASSED ] 12 test(s).
[====] Running 17 test(s).
[ RUN ] test_cb_allocate_free
[ OK ] test_cb_allocate_free
[ RUN ] test_cb_new_length_error
[ OK ] test_cb_new_length_error
[ RUN ] test_cb_new_size_error
[ OK ] test_cb_new_size_error
[ RUN ] test_cb_buffer_null_pointer
[ OK ] test_cb_buffer_null_pointer
[ RUN ] test_cb_item_null_pointer
[ OK ] test_cb_item_null_pointer
[ RUN ] test_cb_uninitialized_buffer
[ OK ] test_cb_uninitialized_buffer
[ RUN ] test_cb_add_remove_one_item
[ OK ] test_cb_add_remove_one_item
[ RUN ] test_cb_add_remove_n_items_sizeof1
[ OK ] test_cb_add_remove_n_items_sizeof1
[ RUN ] test_cb_add_remove_n_items_sizeof2
[ OK ] test_cb_add_remove_n_items_sizeof2
[ RUN ] test_cb_add_remove_n_items_sizeof4
[ OK ] test_cb_add_remove_n_items_sizeof4
[ RUN ] test_cb_buffer_full
[ OK ] test_cb_buffer_full
[ RUN ] test_cb_buffer_empty
[ OK ] test_cb_buffer_empty
[ RUN ] test_cb_wrap_add
```

Figure 6: cmocka test results for data utilities

```
embedded-software-essentials — -bash — 109x58
lldb ./src/main/proj....out > project2.out    ...bedded-software-essentials — -bash    ...software-essentials/src/main — -bash    +

[ OK ] test_my_itoa_positive_base2
[ RUN ] test_my_itoa_negative_base16
[ OK ] test_my_itoa_negative_base16
[====] 12 test(s) run.
[ PASSED ] 12 test(s).
[====] Running 17 test(s).
[ RUN ] test_cb_allocate_free
[ OK ] test_cb_allocate_free
[ RUN ] test_cb_new_length_error
[ OK ] test_cb_new_length_error
[ RUN ] test_cb_new_size_error
[ OK ] test_cb_new_size_error
[ RUN ] test_cb_buffer_null_pointer
[ OK ] test_cb_buffer_null_pointer
[ RUN ] test_cb_item_null_pointer
[ OK ] test_cb_item_null_pointer
[ RUN ] test_cb_uninitialized_buffer
[ OK ] test_cb_uninitialized_buffer
[ RUN ] test_cb_add_remove_one_item
[ OK ] test_cb_add_remove_one_item
[ RUN ] test_cb_add_remove_n_items_sizeof1
[ OK ] test_cb_add_remove_n_items_sizeof1
[ RUN ] test_cb_add_remove_n_items_sizeof2
[ OK ] test_cb_add_remove_n_items_sizeof2
[ RUN ] test_cb_add_remove_n_items_sizeof4
[ OK ] test_cb_add_remove_n_items_sizeof4
[ RUN ] test_cb_buffer_full
[ OK ] test_cb_buffer_full
[ RUN ] test_cb_buffer_empty
[ OK ] test_cb_buffer_empty
[ RUN ] test_cb_wrap_add
[ OK ] test_cb_wrap_add
[ RUN ] test_cb_wrap_remove
[ OK ] test_cb_wrap_remove
[ RUN ] test_cb_over_fill
[ OK ] test_cb_over_fill
[ RUN ] test_cb_over_empty
[ OK ] test_cb_over_empty
[ RUN ] test_cb_peak
[ OK ] test_cb_peak
[====] 17 test(s) run.
[ PASSED ] 17 test(s).
[====] Running 6 test(s).
[ RUN ] test_set_bit_true
[ OK ] test_set_bit_true
[ RUN ] test_set_bit_false
[ OK ] test_set_bit_false
[ RUN ] test_flip_bit_true
[ OK ] test_flip_bit_true
[ RUN ] test_flip_bit_false
[ OK ] test_flip_bit_false
[ RUN ] test_get_bit_true
[ OK ] test_get_bit_true
[ RUN ] test_get_bit_false
[ OK ] test_get_bit_false
[====] 6 test(s) run.
[ PASSED ] 6 test(s).
Build complete: util : Sat Mar 11 11:37:36 MST 2017
```

Figure 7: cmocka test results for circular buffer