ECEN5013

PROJECT1

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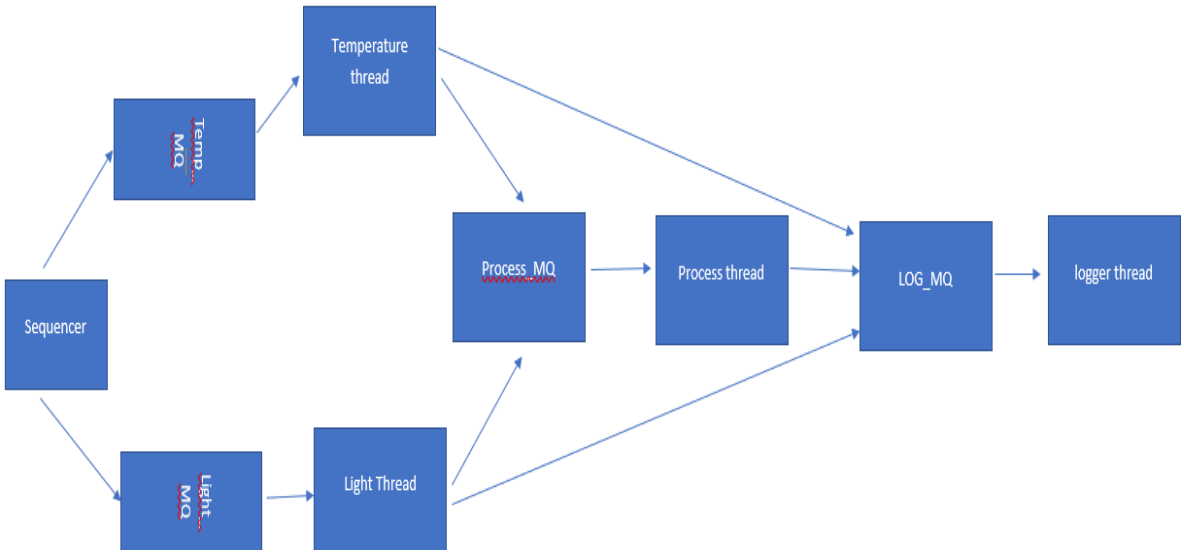
HOWTO

1. Download the git repository https://github.com/Mounika1494/Real-Time-Monitoring-and-Data-Acquisition-System-.git
2. Make sure sensors are connected. Both sensors are using the same bus I2C2 of beagle bone green
3. Do a make and output generated will be RT_LOGGER. You should give file name where you want to store sensor data and logger data
   Note: You should run being a root or use sudo
4. When you want to stop logging do a Ctrl+C
5. The data of sensors will be logged in data.txt and any error in logger.txt
6. Watch out for last led on the beagle bone. If the frequency of blink is too high then check your connections which will be recovered if you are able to correct the connections. On no error the frequency will be less.
7. We are used CMOCKA Unit test framework. Make sure you have installed it
8. If you want to test your connections and sensors working there are unit tests in tests/ folder
9. Change accordingly in Makefile and do a make.

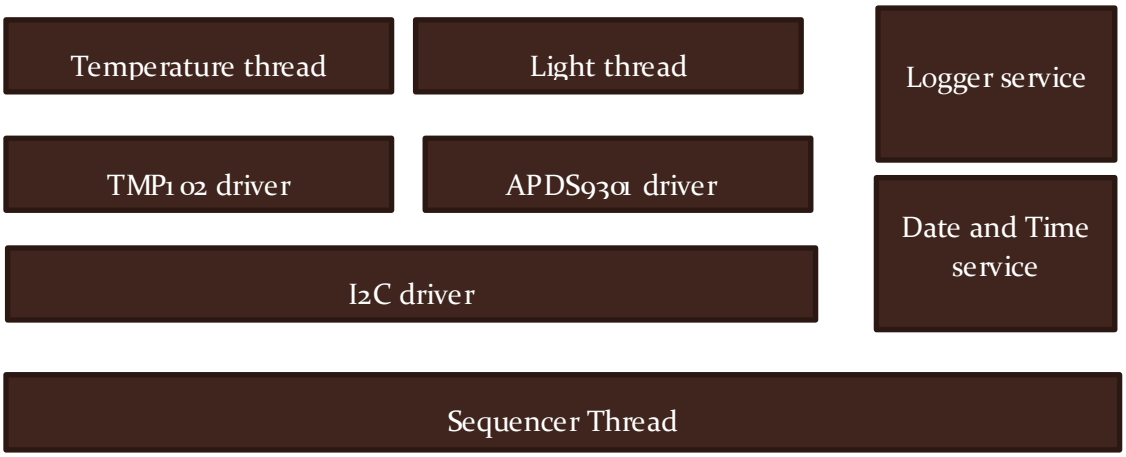
Software Architecture diagram



1. In this architecture each thread will have a queue. If you want information about any thread you need to add what you want in the respective queue.
2. Every thread will be blocking on its queue
3. For logging all the threads on error will push error into logger file and any state change in the light.
4. This system is robust it can handle killing of the main thread, Ctrl+c, recovering if any sensor is removed and attached back again

5. Heart beat is implemented in beagle bone green user led on normal operation the led blinks at a different frequency than on an error so watch out for that.
6. If temperature is below 25C then it queries light thread for light intensity and logs into the file as queried light.
7. If light intensity is greater than 100 AUX then it queries for temperature and logs into the file as queried temperature
8. System is a continuous working which can be interrupted with Ctrl+C
9. All the threads gracefully exit on an interruption
10. Logger file has temperature in F and light in AUX
11. Unit tests are implemented for i2c drivers,TMP102 driver ,APDS9301 driver, led_diver.

Software Code Architecture



1. Services will be utilized by everyone.
2. Drivers are utilized only by specific threads.
3. Sequencer is like scheduler which triggers all the events

See the screen shots for sample outputs
Data.txt

```
[2017-11-05 18:52:15] Temperature is 74.750000F
[2017-11-05 18:52:15] Light is 0.155400
[2017-11-05 18:52:16] Temperature is 73.062500F
[2017-11-05 18:52:16] Light is 0.155400
[2017-11-05 18:52:16] Temperature is 73.062500F
[2017-11-05 18:52:16] Light is 0.155400
[2017-11-05 18:52:16] Temperature is 73.062500F
[2017-11-05 18:52:16] Light is 0.150200
[2017-11-05 18:52:16] Temperature is 73.062500F
[2017-11-05 18:52:17] Light is 0.139800
[2017-11-05 18:52:17] Temperature is 73.062500F
[2017-11-05 18:52:17] Light is 0.139800
[2017-11-05 18:52:17] Temperature is 73.062500F
[2017-11-05 18:52:17] Light is 0.232948
[2017-11-05 18:52:17] Temperature is 73.062500F
[2017-11-05 18:52:17] Light is 0.310823
[2017-11-05 18:52:18] Temperature is 73.062500F
[2017-11-05 18:52:18] Light is 0.232948
[2017-11-05 18:52:18] Temperature is 73.062500F
[2017-11-05 18:52:18] Light is 0.232948
[2017-11-05 18:52:18] Temperature is 73.062500F
```

Logger.txt

```
[2017-11-05 18:52:11] DEBUG INFO: Temperature sensor initialization success
[2017-11-05 18:52:11] DEBUG INFO: Light sensor initialization success
[2017-11-05 18:52:30] DEBUG INFO: light state changed
[2017-11-05 18:52:33] DEBUG INFO: light state changed
[2017-11-05 18:52:38] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:38] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:39] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:39] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:39] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:39] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:39] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:39] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:40] DEBUG ERROR: Light sensor read failed
[2017-11-05 18:52:40] DEBUG ERROR: Light sensor read failed
```

Unit test APDS9301

```
root@beaglebone:/var/lib/cloud9/ECEN5013Project1/github/Real-Time-Monitoring-and-Data-Acquisition-System-/test# make
cc -o test_APDS9301 obj/APDS9103.o obj/i2c.o obj/test_APDS9301.o -Lcmocka/build/src -Wl,-rpath=cmocka/build/src  -lcmocka -lm
./test_APDS9301
[==========] Running 6 test(s).
[ RUN      ] test_APDS9301_init
connected successfully
[       OK ] test_APDS9301_init
[ RUN      ] test_read_light_CH0
connected successfully
[       OK ] test_read_light_CH0
[ RUN      ] test_APDS9301_poweron
connected successfully
[       OK ] test_APDS9301_poweron
[ RUN      ] test_set_thresh_low
connected successfully
[       OK ] test_set_thresh_low
[ RUN      ] test_set_THIGH
connected successfully
[       OK ] test_set_THIGH
[ RUN      ] test_APDS9301_powerof
connected successfully
[       OK ] test_APDS9301_powerof
[==========] 6 test(s) run.
[  PASSED  ] 6 test(s).
```

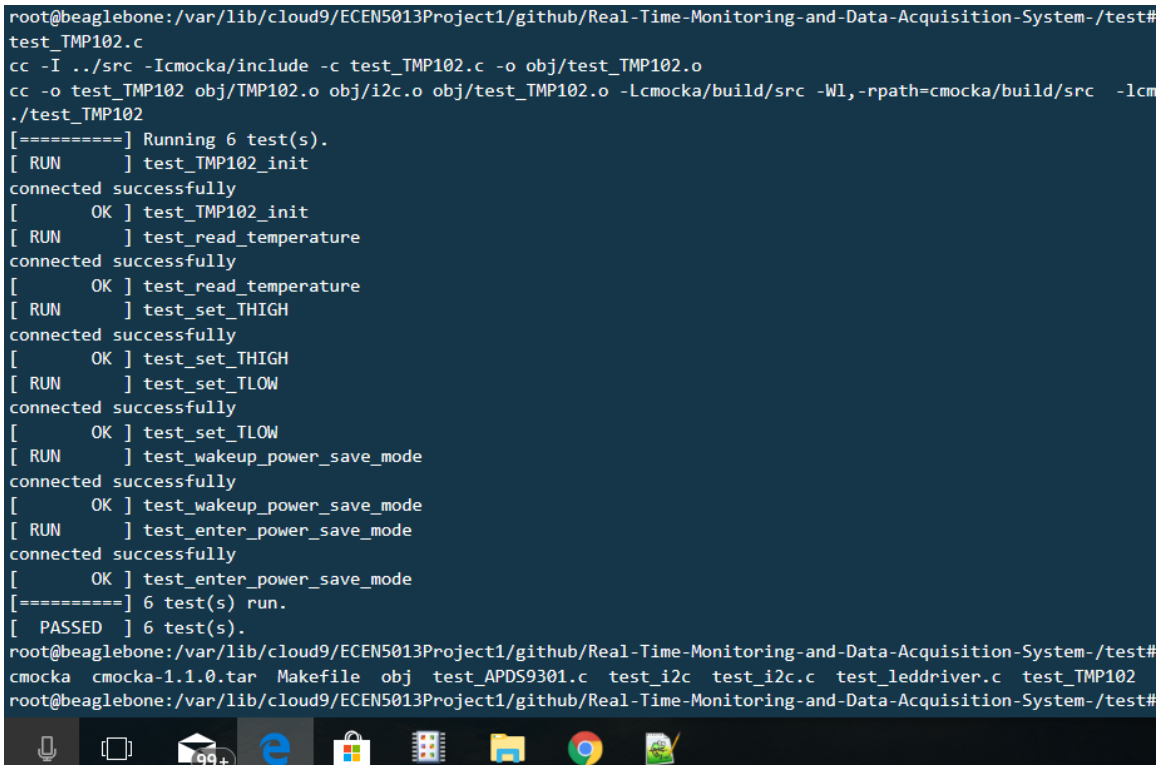
Unit test i2c driver

```
cmocka  cmocka-1.1.0.tar  Makefile  obj  test_APDS9301  test_APDS9301.c  test_i2c  test_i2c.c  test_leddri
root@beaglebone:/var/lib/cloud9/ECEN5013Project1/github/Real-Time-Monitoring-and-Data-Acquisition-System-/
[==========] Running 5 test(s).
[ RUN      ] test_i2c_init
connected successfully
connected successfully
[       OK ] test_i2c_init
[ RUN      ] test_read_two_byte
connected successfully
[       OK ] test_read_two_byte
[ RUN      ] test_read_one_byte
connected successfully
[       OK ] test_read_one_byte
[ RUN      ] test_write_two_byte
connected successfully
[       OK ] test_write_two_byte
[ RUN      ] test_write_one_byte
connected successfully
[       OK ] test_write_one_byte
[==========] 5 test(s) run.
[  PASSED  ] 5 test(s).
```

Unit test for led driver

```
root@beaglebone:/var/lib/cloud9/ECEN5013Project1/github/Real-Time-Monitoring-and-Data-Acquisition-System-/test# make
../src/led_driver.c
cc -I ../src -Icmocka/include -c ../src/led_driver.c -o obj/led_driver.o
cc -o test_leddriver obj/led_driver.o obj/test_leddriver.o -Lcmocka/build/src -Wl,-rpath=cmocka/build/src  -lcmocka -
./test_leddriver
[==========] Running 1 test(s).
[ RUN      ] test_blink_led
[       OK ] test_blink_led
[==========] 1 test(s) run.
[  PASSED  ] 1 test(s).
```

Unit test for TMP102 driver


root@beaglebone:/var/lib/cloud9/ECEN5013Project1/github/Real-Time-Monitoring-and-Data-Acquisition-System-/test#
test_TMP102.c
cc -I ../src -Icmocka/include -c test_TMP102.c -o obj/test_TMP102.o
cc -o test_TMP102 obj/TMP102.o obj/i2c.o obj/test_TMP102.o -Lcmocka/build/src -Wl,-rpath=cmocka/build/src -lcm
./test_TMP102
[==========] Running 6 test(s).
[RUN] test_TMP102_init
connected successfully
[OK] test_TMP102_init
[RUN] test_read_temperature
connected successfully
[OK] test_read_temperature
[RUN] test_set_THIGH
connected successfully
[OK] test_set_THIGH
[RUN] test_set_TLOW
connected successfully
[OK] test_set_TLOW
[RUN] test_wakeup_power_save_mode
connected successfully
[OK] test_wakeup_power_save_mode
[RUN] test_enter_power_save_mode
connected successfully
[OK] test_enter_power_save_mode
[==========] 6 test(s) run.
[PASSED] 6 test(s).
root@beaglebone:/var/lib/cloud9/ECEN5013Project1/github/Real-Time-Monitoring-and-Data-Acquisition-System-/test#
cmocka cmocka-1.1.0.tar Makefile obj test_APDS9301.c test_i2c test_i2c.c test_leddriver.c test_TMP102
root@beaglebone:/var/lib/cloud9/ECEN5013Project1/github/Real-Time-Monitoring-and-Data-Acquisition-System-/test#