

Gebze Technical University
Computer Engineering

CSE 437
REAL TIME SYSTEM
ARCHITECTURES

HOMEWORK 1
REPORT

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A. The Requirements, Constraints Of Timer

- **Requirements**

- Source code runs in C++ version 11.
- The source code's cmake runs in version 3.0.

- **Constraints**

Construct registerTimers which can be different timers . These timers has different version :

- **registerTimer (1)** : If the timer is type 1 then runs the method and deletes in the vector.
- **registerTimer (2)** : If the timer is type 2 then runs the method periodically.
- **registerTimer (3)** : If the timer is type 3 then runs the method periodically but if the stated time over, deletes the timer in the vector.
- **registerTimer (4)** : If the timer is type 4 then runs the method periodically but if the predicate returns false, deletes the timer in the vector.
- There should be 1 timer thread and 1 main thread.
- If there is more than 10ms delay in the period, the deadline will print a miss warning.

B. The Design of the Timer

A class named TimerObjc has been written to hold the variables that come as parameters in the registerTimer method. The Timer is implemented in the main Timer class that extends from ITimer.h. Inside the Timer class was an STL Vector holding TimerObjc variables. Each time the registerTimer function runs, a new TimerObjc object is added to this vector and declared. Typically, the scheduler is designed to create a thread when the scheduler object is created, and this thread will terminate when the scheduler object is deleted. The last callback is in the TimerObjc vector on the Timer thread and it waits with sleep until then. After waiting, it would run with certain if-else sequences, regardless of the scheduler type. End Timers are deleted from the TimerObjc vector. The flag and condition variable is used to add a new timer when there is no timer at startup or to add a new timer when the main is not finished. Used unique_lock for synchronization between main thread and scheduler thread.

C. How to build and test project

- **cmake** . If you are same direction '.', otherwise you must give absolute path
- **make**
- **./exe**

```
dilarakarakas@Dilara-MacBook-Pro hw1 % cmake .
-- The C compiler identification is AppleClang 13.0.0.13000029
-- The CXX compiler identification is AppleClang 13.0.0.13000029
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Check for working C compiler: /Library/Developer/CommandLineTools/usr/bin/cc - skipped
-- Detecting C compile features
-- Detecting C compile features - done
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Check for working CXX compiler: /Library/Developer/CommandLineTools/usr/bin/c++ - skipped
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Looking for pthread.h
-- Looking for pthread.h - found
-- Performing Test CMAKE_HAVE_LIBC_PTHREAD
-- Performing Test CMAKE_HAVE_LIBC_PTHREAD - Success
-- Found Threads: TRUE
-- Configuring done
-- Generating done
-- Build files have been written to: /Users/dilarakarakas/Desktop/hw1/hw1
dilarakarakas@Dilara-MacBook-Pro hw1 % make
[ 33%] Building CXX object CMakeFiles/exe.dir/main.cpp.o
[ 66%] Building CXX object CMakeFiles/exe.dir/Timer.cpp.o
[100%] Linking CXX executable exe
[100%] Built target exe
dilarakarakas@Dilara-MacBook-Pro hw1 % ./exe
GIVEN TEST
Timer::thread function starting
[0] (cb -1): main starting.
[505] (cb 4): callback str
[505] (cb 5): callback str
[700] (cb 3): callback str
[1002] (cb 2): callback str
[1006] (cb 4): callback str
[1006] (cb 5): callback str
[1405] (cb 3): callback str
[1511] (cb 5): callback str
[2000] (cb 1): callback str
[2111] (cb 3): callback str
[2816] (cb 3): callback str
[3519] (cb 3): callback str
[4225] (cb 3): callback str
[4927] (cb 3): callback str
[5005] (cb -1): main terminating.
MY TEST
[5630] (cb 3): callback str
[0] (cb -1): main starting.
[325] (cb 3): callback str
[325] (cb 3): callback str (200ms period - type 2 timer)
[526] (cb 3): callback str (200ms period - type 2 timer)
[732] (cb 3): callback str (200ms period - type 2 timer)
[805] (cb 8): callback str (800ms period - type 4 timer)
[936] (cb 3): callback str (200ms period - type 2 timer)
[1003] (cb 2): callback str (type 1 timer)
[1003] (cb 4): callback str (1000ms period - type 2 timer)
[1004] (cb 5): callback str (1000ms period - type 3 timer)
[1026] (cb 3): callback str
[1104] (cb 6): callback str (1100ms period - type 3 timer)
[1141] (cb 3): callback str (200ms period - type 2 timer)
[1346] (cb 3): callback str (200ms period - type 2 timer)
[1551] (cb 3): callback str (200ms period - type 2 timer)
[2577] (cb 3): callback str (200ms period - type 2 timer)
[2778] (cb 3): callback str (200ms period - type 2 timer)
[2981] (cb 3): callback str (200ms period - type 2 timer)
[3004] (cb 7): callback str (3000ms period - type 4 timer)
[3005] (cb 4): callback str (1000ms period - type 2 timer)
[3005] (cb 5): callback str (1000ms period - type 3 timer)
[3136] (cb 3): callback str
[3186] (cb 3): callback str (200ms period - type 2 timer)
[3217] (cb 8): callback str (800ms period - type 4 timer)
[3392] (cb 3): callback str (200ms period - type 2 timer)
[3592] (cb 3): callback str (200ms period - type 2 timer)
[3796] (cb 3): callback str (200ms period - type 2 timer)
[3841] (cb 3): callback str
[4001] (cb 3): callback str (200ms period - type 2 timer)
[4006] (cb 4): callback str (1000ms period - type 2 timer)
[4020] (cb 8): callback str (800ms period - type 4 timer)
[4206] (cb 3): callback str (200ms period - type 2 timer)
[4411] (cb 3): callback str (200ms period - type 2 timer)
[4546] (cb 3): callback str
[4617] (cb 3): callback str (200ms period - type 2 timer)
[4822] (cb 3): callback str (200ms period - type 2 timer)
[5011] (cb 4): callback str (1000ms period - type 2 timer)
[5025] (cb 3): callback str (200ms period - type 2 timer)
[5230] (cb 3): callback str (200ms period - type 2 timer)
[5250] (cb 3): callback str
[5432] (cb 3): callback str (200ms period - type 2 timer)
[5637] (cb 3): callback str (200ms period - type 2 timer)
[5842] (cb 3): callback str (200ms period - type 2 timer)
[5953] (cb 3): callback str
[6008] (cb 7): callback str (3000ms period - type 4 timer)
[6012] (cb 4): callback str (1000ms period - type 2 timer)
[6047] (cb 3): callback str (200ms period - type 2 timer)
[6253] (cb 3): callback str (200ms period - type 2 timer)
[6454] (cb 3): callback str (200ms period - type 2 timer)
[6659] (cb 3): callback str
[6659] (cb 3): callback str (200ms period - type 2 timer)
[6864] (cb 3): callback str (200ms period - type 2 timer)
[7016] (cb 4): callback str (1000ms period - type 2 timer)
[7064] (cb 3): callback str (200ms period - type 2 timer)
[7269] (cb 3): callback str (200ms period - type 2 timer)
[7360] (cb 3): callback str
[7474] (cb 3): callback str (200ms period - type 2 timer)
[7679] (cb 3): callback str (200ms period - type 2 timer)
[7884] (cb 3): callback str (200ms period - type 2 timer)
[8021] (cb 4): callback str (1000ms period - type 2 timer)
[8062] (cb 3): callback str
[8089] (cb 3): callback str (200ms period - type 2 timer)
[8294] (cb 3): callback str (200ms period - type 2 timer)
[8499] (cb 3): callback str (200ms period - type 2 timer)
[8705] (cb 3): callback str (200ms period - type 2 timer)
[8767] (cb 3): callback str
[8910] (cb 3): callback str (200ms period - type 2 timer)
[9013] (cb 7): callback str (3000ms period - type 4 timer)
[9024] (cb 4): callback str (1000ms period - type 2 timer)
[9115] (cb 3): callback str (200ms period - type 2 timer)
[9316] (cb 3): callback str (200ms period - type 2 timer)
[9472] (cb 3): callback str
[9522] (cb 3): callback str (200ms period - type 2 timer)
[9727] (cb 3): callback str (200ms period - type 2 timer)
[9930] (cb 3): callback str (200ms period - type 2 timer)
[10005] (cb -1): main terminating.
Timer::thread function terminating
dilarakarakas@Dilara-MacBook-Pro hw1 %
```