Goal: Learning how to implement 64x32 bit unsigned integer division on a 32-bit cpu.

Implementing 64x32 unsigned integer division in assembly

Objective: To replace the C functions defined in divide.c by equivalent assembly code in divide.s.

Background: On a 32-bit CPU, one would expect the divide instruction to divide a 64-bit dividend by a 32-bit divisor and produce a 32-bit quotient. However, the ARM Thumb2 divide instructions only support the use of a 32-bit dividend. The purpose of this assignment is to write a function in ARM assembly that provides an efficient implementation of division of a 64-bit dividend by a 32-bit divisor.

PART I: Preparation

1. Download the ZIP file called “Lab Assignments.zip” from the course website on Camino.
2. Find the folder called “Lab Assignments” on your desktop and open it.
3. Find a double click on the file called “COEN 20.eww”. This should open the IAR Embedded Workbench program.
4. If step 3 did not open IAR Embedded Workbench, find the program on the Start Menu and open it. Once open, click on “File > Open > Workspace”, navigate to the “COEN 20.eww” file inside the “Lab Assignments” folder and open it.

PART II: Division (using the code provided in file divide.c)

1. In the Workspace panel on the left side of the screen, right-click on “Lab10Unsigned64x32Division” and select “Set As Active”.
2. Click on the “+” sign next to “Lab10Unsigned64x32Division”.
3. Click on the “+” sign next to “Source”.
4. Set each of the following source code files as follows:
    a. divide.c Include (do NOT check)
    b. divide.s exclude (CHECK)
    c. main.c Include (do NOT check)
5. To compile the program, right-click on “Lab10Unsigned64x32Division” and select “Rebuild All”. The build should complete with no errors or warnings.
6. Connect the LM3S811 board to a USB port on your computer. This provides both power (as indicated by the power LED) and a download connection to the device. From the drop-down menus, select “Project > Download > Download active application” to start the download.
7. To run the program, press the reset button (the one closest to the thumbwheel) on the LM3S811 evaluation board. Press the other button to sequence through all the test cases. Verify that it behaves as expected.

PART III: Division (implementing your ARM code in file divide.s)

1. Change each of the following source code files as follows:
    a. divide.c exclude (CHECK)
    b. divide.s Include (do NOT check)
2. Edit divide.s to implement the algorithm described in divide.c.
3. Recompile the program, download it to the board, and verify that it works properly.
4. Demonstrate your working program and submit your source code of divide.s to the teaching assistant according to his instructions.