

## Homework 4

1. In general terms, what is the most important difference between a simple jump or branch and a subroutine call?

The subroutine call must include a mechanism for returning to the calling code.

2. What is the difference between the BL and BLX instructions (which is also the difference between the B and BX)?

The BLX instruction has a scratchpad register as its operand so it can branch to anywhere in the 32-bit address space. The BL instruction encodes the branch target address as a PC-relative offset within the instruction itself, so the operand provided to this instruction would be the target address (usually we use a label that has been given the desired address value).

3. Consider the Thumb2 assembly code below.

What are the hexadecimal values loaded into the PC and LR by the BL instruction at address 0x1004?

PC=0x1028 or 0x1029, LR=0x1009

(b) What are the hexadecimal values loaded into the PC and LR by the BL instruction at address 0x1010?

PC=0x1028 or 0x1029, LR=0x1015

(c) What are the hexadecimal values loaded into the PC and LR by the BLX instruction at address 0x101C?

PC= 0x2220 or 0x2221, LR=0x1021

0 x1000 movw r0, #0 x2221

0 x1004 BL mysubroutine

0 x1008 EOR r2 , r1

0 x100C EOR r2 , r1

0 x1010 BL mysubroutine

0 x1014 EOR r2 , r1

0 x1018 EOR r2 , r1

0 x101C BLX r0

0 x1020 EOR r2 , r1

forever :

0 x1024 B forever

mysubroutine :

0 x1028 EOR r2 , r1

15 0x102C BX LR

4. What do we mean when we say that the ARM Cortex-M stack is descending?

The stack pointer is decremented before pushing data, so as more data is pushed onto the stack the stack pointer changes from a high value (a large address) to a lower value (a smaller address).

5. If you have not already, finish lab 1, part 4.

no sln.