Lab4-1 Report

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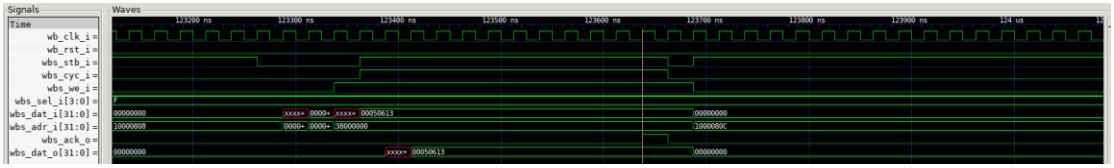
- Explanation of your firmware code
  - How does it execute a multiplication in assembly code
    根據 firmware code 轉換後的 RISC-V assembly code
    “counter_la_fir.out”，其中定義了 fir 的乘法函數如下:

```
38000000 <__mulsi3>:
38000000: 00050613            mv  a2,a0
38000004: 00000513            li  a0,0
38000008: 0015f693            andi  a3,a1,1
3800000c: 00068463            beqz  a3,38000014 <__mulsi3+0x14>
38000010: 00c50533            add a0,a0,a2
38000014: 0015d593            srli  a1,a1,0x1
38000018: 00161613            slli  a2,a2,0x1
3800001c: fe0596e3            bnez  a1,38000008 <__mulsi3+0x8>
38000020: 00008067            ret
```

    其中 a1 是乘數，a2 是被乘數，以迴圈方法每次將 a1 右移、a2 左移，直到 a1 為 0，過程中累加結果位於 a0。
  - What address allocate for user project and how many space is required to allocate to firmware code
    根據 sections.lds 中 MEMORY 之定義:
    flash : ORIGIN = 0x10000000, LENGTH = 0x01000000
    mprj : ORIGIN = 0x30000000, LENGTH = 0x00100000
    mprjram : ORIGIN = 0x38000000, LENGTH = 0x00400000
    user-project 地址為 0x30000000~0x30100000，以及 0x38000000~0x38400000
    firmware code 可用地址為 0x10000000~0x11000000，共 10MB
- Interface between BRAM and wishbone
  - Waveform from xsim



  - FSM

- Synthesis report
  - BRAM

2. Memory

Site Type	Used	Fixed	Prohibited	Available	Util%
Block RAM Tile	1	0	0	140	0.71
RAMB36/FIFO*	1	0	0	140	0.71
RAMB36E1 only	1				
RAMB18	0	0	0	280	0.00

  - Primitives

7. Primitives

Ref Name	Used	Functional Category
OBUF	176	IO
IBUF	67	IO
OBUFT	64	IO
LUT2	20	LUT
FDRE	17	Flop & Latch
LUT4	8	LUT
CARRY4	4	CarryLogic
LUT6	3	LUT
LUT3	2	LUT
RAMB36E1	1	Block Memory
LUT5	1	LUT