第13次實習課

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Priority(8 implemented bits)

EX：In an 8-bit wide (8 implemented bits) Interrupt-Priority register with priority group set to 4(x),

(a) give all group (preemption) priority levels.

(b) give all sub-priority levels.

(Hint：Priority Group 4, Group (Preemption) Priority Field：Bit[7:5](Bit[7:x+1]),
Sub-priority Field：Bit[4:0](Bit[x:0]).)

Ans：

(a) All group priority values

0x00、0x20、0x40、0x60、0x80、0xA0、0xC0、0xE0

(b) All subpriority values

		Subpriority values within group priority
0x00~0x0F	0x10~0x1F	0x00
0x20~0x2F	0x30~0x3F	0x20
.	.	.
.	.	.
0xE0~0xEF	0xF0~0xFF	0xE0

	Group priority	Subpriority (within the group)
00000000	0	0
00100000	0x20	0x20
00101011	0x20	0x2B
01000000	0x40	0x40
01001011	0x40	0x4B
…	…	…
11100000	0xE0	0xE0

Priority(5 implemented bits)

EX：In an 5-bit wide (5 implemented bits, 3 un-implemented bits) Interrupt-Priority register with priority group set to 4(x),

(a) give all group (preemption) priority levels.

(b) give all sub-priority levels.

(Hint：Priority Group 4, Group (Preemption) Priority Field：Bit[7:5](Bit[7:x+1]),
Sub-priority Field：Bit[4:0](Bit[x:0]).)

Ans：

(a) All group priority values

0x00、0x20、0x40、0x60、0x80、0xA0、0xC0、0xE0

(b) All subpriority values

				Subpriority values within group priority
0x00	0x08	0x10	0x18	0x00
0x20	0x28	0x30	0x38	0x20
.	.	.	.	.
.	.	.	.	.
0xE0	0xE8	0xF0	0xF8	0xE0

	Group priority	Subpriority (within the group)
00000000	0	0
00001000	0	0x08
00010000	0	0x10
00011000	0	0x18
00100000	0x20	0x20
00101000	0x20	0x28
01000000	0x40	0x40
01001000	0x40	0x48
…	…	…
11100000	0xE0	0xE0

Priority(3 implemented bits)

EX：In an 3-bit wide (3 implemented bits, 5 un-implemented bits) Interrupt-Priority register with priority group set to 2(x),

(a) give all group (preemption) priority levels.

(b) give all sub-priority levels.

(Hint：Priority Group 2, Group (Preemption) Priority Field：Bit[7:3](Bit[7:x+1]),
Sub-priority Field：Bit[2:0](Bit[x:0]).)

Ans：

(a) All group priority values

0x00、0x20、0x40、0x60、0x80、0xA0、0xC0、0xE0

(b) All subpriority values

	Subpriority values within group priority
0x00	0x00
0x20	0x20
.	.
.	.
0xE0	0xE0

	Group priority	Subpriority (within the group)
00000000	0	0
00100000	0x20	0x20
01000000	0x40	0x40
01100000	0x60	0x60
…	…	…
11100000	0xE0	0xE0

Priority(4 implemented bits)

EX：In an 4-bit wide (4 implemented bits, 4 un-implemented bits) Interrupt-Priority register with priority group set to 4(x),

(Hint：Priority Group 4, Group (Preemption) Priority Field：Bit[7:5](Bit[7:x+1]),
Sub-priority Field：Bit[4:0](Bit[x:0]).)

If the 8-bit Interrupt Priority register of an IRQ = 10110110(10110000), give

(a) the group priority of the IRQ

(b) the sub-priority of the IRQ

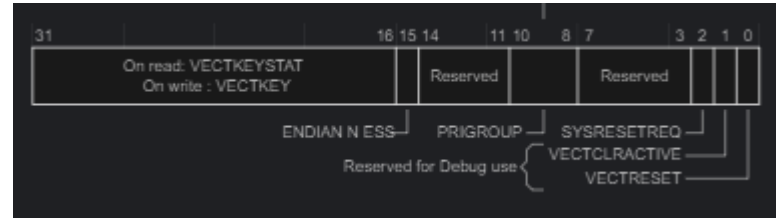
Ans：

(a) 0xA0

(b) 0xB0

Group Number Setting

- To set the priority group number to 4 using the AIRCR register (bits[10:8] at address 0xE000ED0C).



- Write 4 into bits 10~8 of the word at memory address 0xE000ED0C.

```
• LDR   r0, =0xE000ED0C
• LDR   r1, [r0]
• BIC   r1, #0x700          ; 0b 0111 0000 0000 ➔ 0b 0000 0000 0000
• ORR   r1, #0x400          ; 0b 0100 0000 0000
• STR   r1, [r0]
```

Group Number Reading

- To read the priority group number from AIRCR register and put the number in R1.

- To read bits[10:8] of a word at address 0xE000ED0C and put the number in R1.

  - LDR r2, =0xE000ED0C
  - LDR r1, [r2]
  - LSR r1, #8
  - AND r1, #7

Priority Register Writing

- If the group priority and the sub priority of an IRQ to be respectively set as 0xC0 and 0xD0, write a sequence of instructions to write the necessary value into the Interrupt Priority Register(address 0xE000E484)
  - 5?-bit wide, group number ?5
  - 11000000 0xC0
  - 11010000 0xD0
- Write 0xD0 into a word at memory address 0xE000E484
  - LDR r0, =0xE000E484
  - MOV r1, #0xD0
  - STR r1, [r0]

第三部分

- **寫一個程式含三個副程式分別達成以下三個目的並於主程式分別呼叫此三個副程式來達成測試：**

（副程式結果可置於自選的暫存器中，但需在截圖中框出輸出之暫存器）

- 1. 設定priority group number (用empty ascending stack暫存恢復)

(假設AIRCR暫存器位址為 0x400000C8)

(呼叫前欲設定的priority group number需先存入自選的暫存器中）

- 2. 讀取priority group number (用full ascending stack暫存恢復)

(假設AIRCR暫存器位址為 0x400000C8)

- 3. 計算某一IRQ的pre-emption priority及sub priority

(用empty descending stack暫存恢復)

(呼叫前假設的width of the interrupt priority register 、priority group number 、與該IRQ的interrupt priority register內容值需先存入自選的暫存器中）

HW2 第三部分 3. 步驟

- Step1：根據width of the interrupt priority register，把interrupt priority register不用的部分清為0。➔ sub priority
- Step2：若Group Number = x，interrupt priority register向右移x+1，再向左移x+1。➔ group priority

第四部分

- **寫一個程式含四個副程式(**皆用full descending stack暫存恢復)**分別用下列四種方式獲取**width of an interrupt priority(請假設寬度為6)，**並於主程式分別呼叫此四個副程式來達成測試：**

  1. using LSR with test pattern LSR
  2. using LSL with test pattern LSL
  3. using LSR without test pattern LSR
  4. using LSL without test pattern LSL

  (可用位址為 0x4000008C 的interrupt priority register來獲取，副程式結果可置於自選的暫存器中，但需在截圖中框出輸出之暫存器)

Priority Width Reading

- To get the width (in bits) of an Interrupt priority register (address 0xE000E484) and put the width in R1.

```
1           ;將最低8個位元存入都存入1，系統會根據設定讓Non implement的位元都為0
2           LDR r0, =0xE000E484
3           MOV r2, #0xFF
4           STRB r2, [r0]
5
6           ;將最低8個位元取出來以計算寬度
7           LDRB r2, [r0]         ;待檢測的值
8           MOV r1, #0            ;計數用，從0開始，測試的bit為1則計數器加1
9           MOV r3, #0x80         ;測試用的值
10  LOOP    CMP r1, #8           ;迴圈一開始先判斷計數是否為8，為8代表寬度最大，則跳出迴圈
11          BEQ OUT
12          TST r2, r3            ;從最高位元開始測試
13          BEQ OUT               ;假如上一步測試到的bit為0，則跳出迴圈
14          ADD r1, #1            ;如果測試到的bit為1，則計數器加1
15          LSR r3, #1            ;每次測試完後，測試用的值向右移1個bit
16  B       LOOP
17
18  OUT
```

Q&A

Thanks for your attention !!