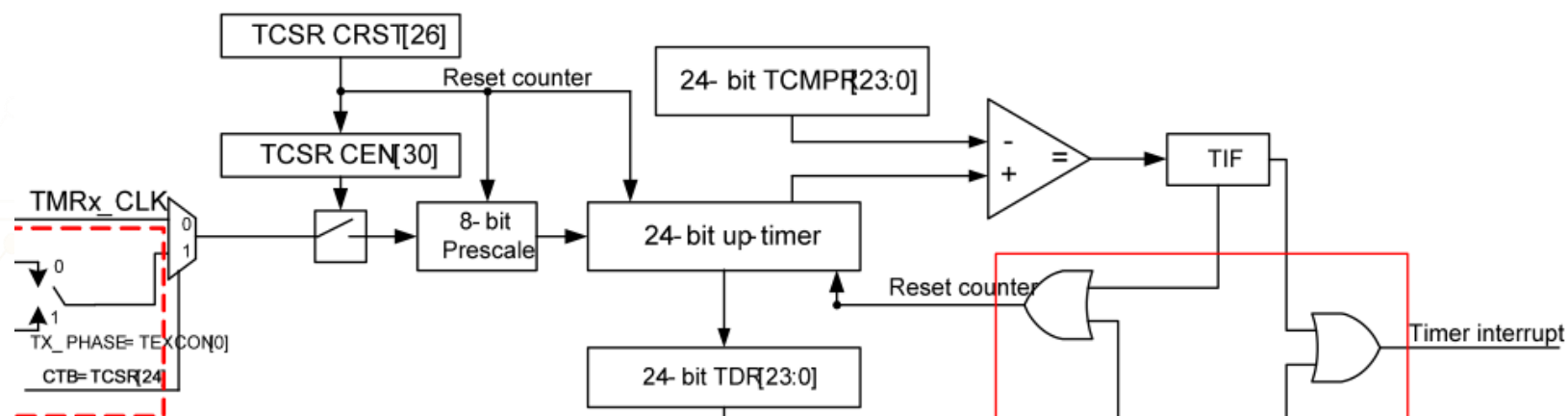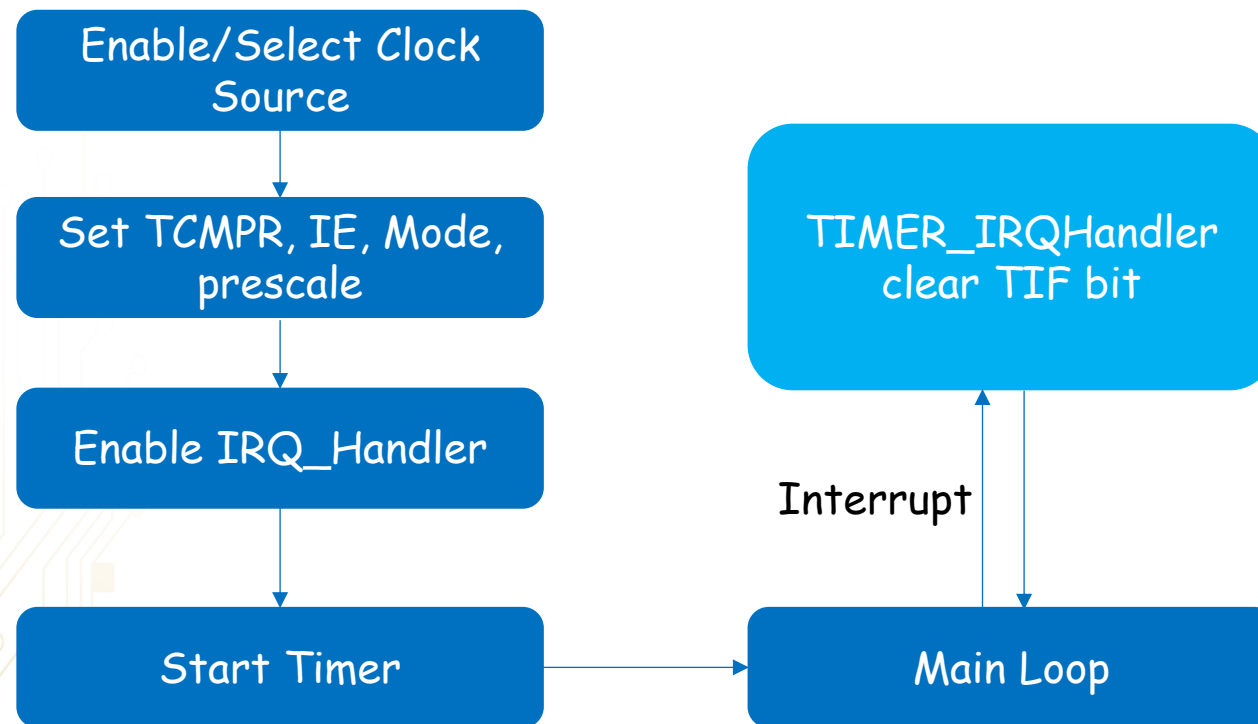# 微處理機系統與介面技術

LAB 6 － TIMER

Timer

- NUC140 has 4 sets of 32-bit timers(TIMER0~TIMER3)
- Timer mode:
  - One-Shot mode
  - Periodic mode
  - Continuous mode

Timer Flow Chart

Register Description

- TCSR
  - Timer Control Register
  - CEN, IE, MODE, PRESCALE
- TCMPR
  - Timer Compare Register
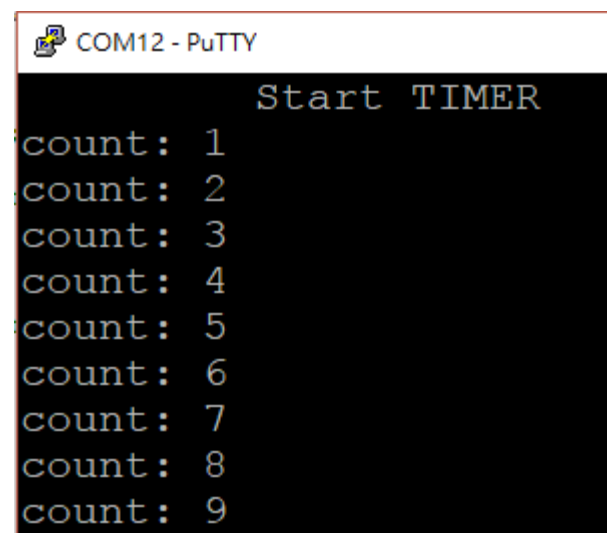- TISR
  - Timer Interrupt Status Register
  - TIF

Timer Control Register (TCSR)

Register	Offset	R/W	Description	Reset Value
TCSR0	TMR_BA01+0x00	R/W	Timer0 Control and Status Register	0x0000_0005
TCSR1	TMR_BA01+0x20	R/W	Timer1 Control and Status Register	0x0000_0005
TCSR2	TMR_BA23+0x00	R/W	Timer2 Control and Status Register	0x0000_0005
TCSR3	TMR_BA23+0x20	R/W	Timer3 Control and Status Register	0x0000_0005

31	30	29	28	27	26	25	24
DBGACK_TMR	CEN	IE	MODE[1:0]		CRST	CACT	CTB

23	22	21	20	19	18	17	16
Reserved							TDR_EN

15	14	13	12	11	10	9	8
Reserved							

7	6	5	4	3	2	1	0
PRESCALE[7:0]							

Basic

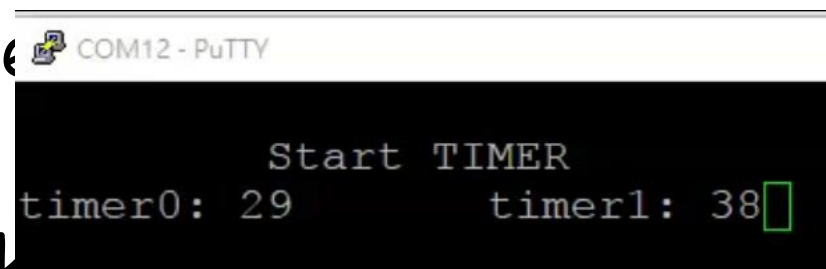- Make a counter(計數器), and print on putty for every second
- Use periodic mode

- Note:

- It is not recommended to print in the IRQ Handler, because it will take too much cycle in the IRQ, but we just for test

Bonus

- Implement two counter,
  count 2 times per second and 3 times per second

- Use two GPIO to suspend counter
  - Key1 press, suspend counter1
  - Key2 press, suspend counter2

- counter1,2 are independent,
  key1 only affect on counter1 and so do

- Demo影片

- Note: use "\r" let putty see like a clock
        ex. printf("\rXXXXX")

Tips

- 範例程式: TIMER_PeriodicINT
- 只需要看**TIMER0**的部分就好,要看懂**timer**是如何計數 TCMPR, prescale 是怎麼算出1秒
  ex. Timer clock source = 12MHz , prescale = 0
      TCMPR = 12000000 ➜ 1 interrupt per second
- Remember to clear the timer interrupt flag
- 在計算如何計數前也別忘了要看指定的CLOCK SORCE是哪個唷

```
/* Select Timer 0~3 module clock source */
CLK_SetModuleClock(TMR0_MODULE, CLK_CLKSEL1_TMR0_S_HXT, NULL);
CLK_SetModuleClock(TMR1_MODULE, CLK_CLKSEL1_TMR1_S_HCLK, NULL);
CLK_SetModuleClock(TMR2_MODULE, CLK_CLKSEL1_TMR2_S_HIRC, NULL);
CLK_SetModuleClock(TMR3_MODULE, CLK_CLKSEL1_TMR3_S_HXT, NULL);
```

Demo

- Place: 創新大樓515 找助教 潘冠豪
- Demo Time: (二)(四)下午兩點~四點半
- Report deadline: 12/20(五)

- Report title format: LABx_ID_Name.pdf

- Demo必須在Report deadline前完成
- Demo前須先上傳程式碼(上傳main所在的.c檔即可)

Graded

- Basic : 70%
- Bonus : 15%
- Report & Code : 15%