

BITWISE OPERATIONS in C

&, |, ^, ~, <<, >>  
 AND, OR, XOR, NOT, LS, RS

& = FFFF0000 *setto 16 MSB dell'operando a 1*  
 ~setto 16 LSB dell'operando a 0

| = 000000FF *setto 8 LSB dell'operando a 1*  
 | = 1 << 20 *setto al 20° LSB a 1*  
 | = ~ (1 << 20) *setto al 20° LSB a 0*

*altri esempi:*  
 & (1 << 17) == 0  
 & (1 << 17) == 1  
 ~ (1 << 17) == 1  
 ~ (1 << 17) == 0

# Progetto NXP LPC 1768

- 1) STARTUP LPC 17xx.S → Back Config
- Heap Config
  - Interrupt Vector Table + Interrupt Handler (main)
  - User Initial Stack & Heap
- RESET HANDLER Bx

- 2) main.c
- include h (chiusi, LPC17xx.h, led.h, button.h)
  - definire variabili globali / Global Flag e led - value

## System Init()

### 3) lib Sol. board

- System LPC 17xx.C
- Gestione dei clock + interrupt
  - SCS - System Control and Status Register
  - CLKCR2 - Clock Source Select Register
  - OSC-CLK (oscillator) 32 MHz
  - PLLE-CLK (PLL) 4 MHz
  - PLLO, 1 Config
  - CPU Clock Speed
  - VSR
  - PERIPHERALS REGIO 1
  - Power Control
  - Clock output
  - Misura quanto impiega il sistema a eseguire 1000 NOP
  - e solo allora configurazioni dei timer
  - per addizionali alla conoscenza del microcontrollore: TIMERS e init(0, 25000000)
  - 25M
  - Perk=15MHz
  - 25M
  - 455992

- Caratteristiche Exceptions numbers
- LPC17xx Interrupt numbers
- include lib unich, system LPC17xx.h
- strutture dei registri delle periferiche
- LPC\_SC\_TypeDef, LPC\_PINCON\_TypeDef, LPC\_GPIO\_TypeDef, LPC\_GPIOINT\_TypeDef, LPC\_TIM\_TypeDef, LPC\_PWM\_TypeDef, UART, UART2, SPI, SSP, I2C, I2S, RIT, RITC, WDT, AD, ADC, MCPWM, QEI, CAN, CAN2, canes
- MEMORY MAP delle periferiche
- INDIR1 BASE (LPC\_AHB RAM 0 BASE)
- INDIR2 APB0 (LPC\_PINCON BASE = 0x2000)
- INDIR3 APB1
- INDIR4 APB2
- INDIR5 APB3
- INDIR6 APB4
- INDIR7 APB5
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# • LED\_Blink()

4) lib - led.c

• LED\_init()

• LPC\_PINCON → PINSSEL & = 0xF0000000

• PC - GPIO2 → FIODIR |= 0x000000FF

• PC - GPIO2 → FIOCLR & = 0x000000FF

• led\_value = 0

• led\_blink()

• PC - GPIO2 → FIODIR & = 0xFFFF0000

1) Imposta i pin di output

PORTAL PIN0

2) Imposta i pin di output

3) Imposta la direzione dei pin

4) Setta i pin di output

1)

# • BUTTON\_init()

5) lib - button.c

• BUTTON\_init()

• LPC\_PINCON → PINSSEL |= 1 << 20

• LPC\_GPIO2 → FIODIR & = 0x000000FF

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1) Imposta i pin di output

2) Imposta i pin di output

3) Imposta i pin di output

4) Imposta i pin di output

5) Imposta i pin di output

6) Imposta i pin di output

7) Imposta i pin di output

8) Imposta i pin di output

9) Imposta i pin di output

10) Imposta i pin di output

11) Imposta i pin di output

12) Imposta i pin di output

13) Imposta i pin di output

14) Imposta i pin di output

6) lib - button.c

7) EINT0 - IRQ HANDLER()

• LED\_ON(0)

• LPC\_SC → EXTINT & = 0x00000001

8) EINT1

• LED\_ON(1)

• LPC\_SC → EXTINT & = 0x00000002

9) EINT2

• LED\_ON(2)

• LPC\_SC → EXTINT & = 0x00000004

FUNCTION led.c

• LED\_NUM

• led\_mask

• led\_value

• LED\_ON(0)

• LED\_ON(1)

• LED\_ON(2)

• LED\_ON(3)

• LED\_ON(4)

• LED\_ON(5)

• LED\_ON(6)

• LED\_ON(7)

1) Imposta i pin di output

2) Imposta i pin di output

3) Imposta i pin di output

4) Imposta i pin di output

5) Imposta i pin di output







