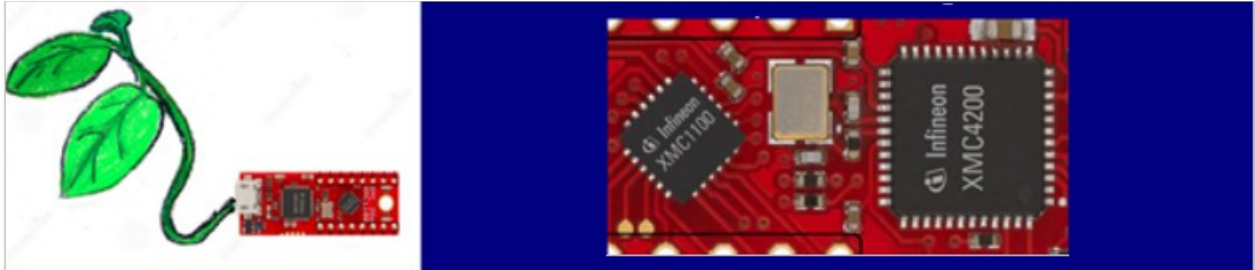# ARM XMC - experiment No. 3

- **E3.1 Name:**

Infineon ARM Cortex - DAVE 4 components for XMC 2Go I/O ports

- **E3.2 Overview and purpose**

This experiment aims to explore DAVE apps for using IO ports and also offers the possibility to experiment the usage of the IO extension pins form XMC 2Go development platform.

At the end of this experiment, you will have detailed information IO ports for XMC ARM Cortex M0 family and also about the applications development possibility using certain DAVE apps modules.

- **E3.3 Resources**

Hardware   XMC2Go development platforms
Extension pins
Breadboard
micro switch
oscilloscope

Software   DAVE 4.1

- **E3.4 Software example:**

```
/*
 * Experiment no. 2
```

```c
 * Control incoming events
 * micro switch - P2.1 – input pin with pull-up resistor
 * LED - P1.0
 */

#include <DAVE.h>

int main(void)
{
    /* Declarations */
    uint32_t in;
    DAVE_STATUS_t status;

    /* Initializations */
    status = DAVE_Init(); // DAVE Apps initialzation

    /* Validations */
    if(status == DAVE_STATUS_FAILURE)
    {
        /* Placeholder for error handler code. The while loop below can be
replaced with an user error handler. */
        XMC_DEBUG("DAVE APPs initialization failed\n");

        while(1U)
        {
            ;
        }
    }


    /* The main code*/
    while(1U)
    {
        in = DIGITAL_IO_GetInput(&buton);
        if(in == 0)  // button pressed
        {
            DIGITAL_IO_SetOutputHigh(&led); // LED on
        }
        else
        {
            DIGITAL_IO_SetOutputLow(&led); // LED off
        }
    }
}
```

- **E3.5 Method of running experiment:**

  - Examine the user manual and implementation scheme of XMC2GO platform (http://www.infineon.com/dgdl/Board_Users_Manual_XMC_2Go_Kit_with_XMC1100_R1.0.pdf?fileId=db3a3043444ee5dc014453d6c75078c6&ack=t);

  - Identify the signal distribution for the Input/Output ports to the connectors X1 and X2;

  - Study the CPU and Input/Output chapters from the given documentation;

  - Explore the DAVE apps and include in the prototype project the apps for button and LED and configure them as showed in figure 3 and 4.
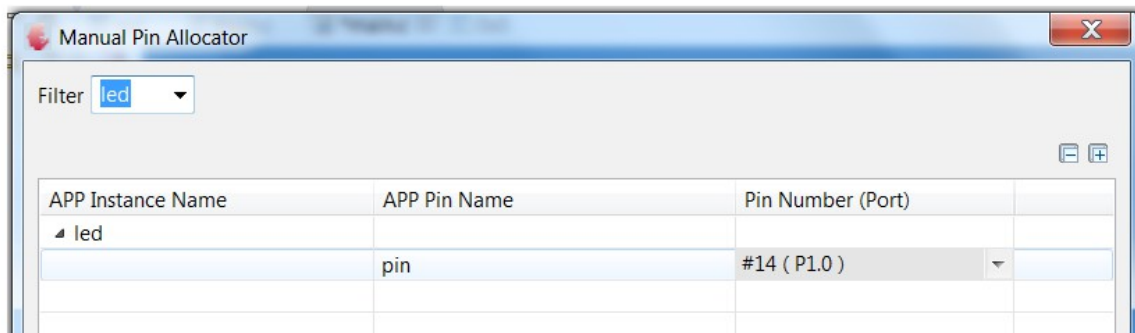

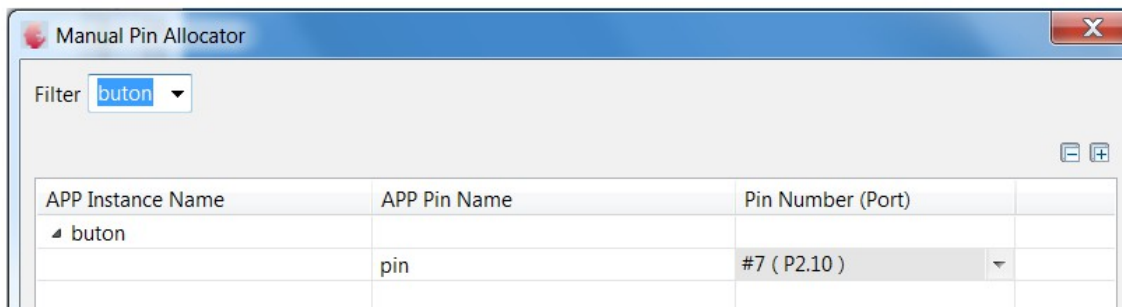*Figure 3.3 LED configuration*

Figure 3.4 button configuration

  - Attach the XMC2Go platform to a Breadboard and connect the micro switch to P1.10 pin and GND pin;

  - Create a similar project with the prototype one using the "generate code" method to obtain a "Generated" folder in your project as shown in figure 5.
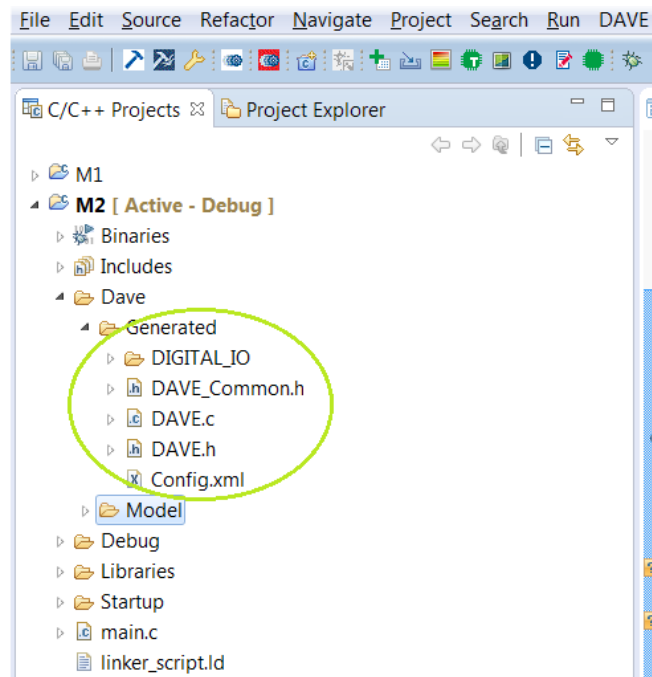
Figure 3.5 the location of the "Generated" folder in a DAVE project

- Press the DEBUG button and test/execute your code on XMC2Go platform.

- **E3.6 Problems proposed:**

1. Create a project that sets the LED on for 2 or 3 times for every button pressed event;

2. Create a program that allows to increment the LED on duration for every button pressed event;

3. Study the internal structure of the input port (Figure 3.6) where is connected the K button and create a solution to remove the oscillations at the button pressed event;
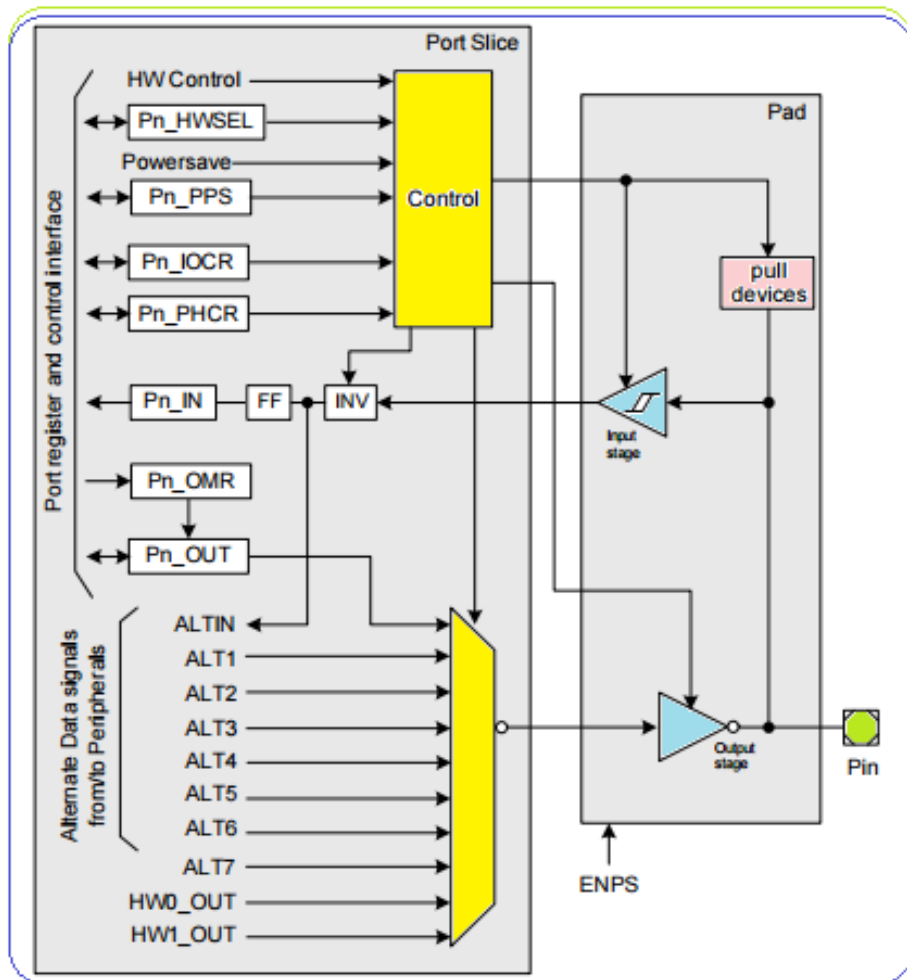
Figure 3.6 the input pin configuration

4. Study the internal memory distribution for XMC1100-Q024X006 processor and create in ASM (assembly language) an equivalent program with the prototype one;

XMC 1100 Memory Map

Address space	Address Range	Description	Access Type	
			Read	Write
System Peripherals (cont'd)	40040000$_H$ - 4004007F$_H$	Port 0	U, PV	U, PV
	40040080$_H$ - 400400FF$_H$	reserved	BE	BE
	40040100$_H$ - 4004017F$_H$	Port 1	U, PV	U, PV
	40040180$_H$ - 400401FF$_H$	reserved	BE	BE
	40040200$_H$ - 4004027F$_H$	Port 2	U, PV	U, PV
	40040280$_H$ - 4004FFFF$_H$	reserved	BE	BE
	40050000$_H$ - 400500DF$_H$	Flash Registers	U, PV	U, PV
	400500E0$_H$ - 47FFFFFF$_H$	reserved	BE	BE

Figure 3.7 the internal memory distribution for XMC1100-Q024X006 processor

5. Create an interruption based method for the button pressed events;

- **E3.7 The experiment can be extended to be used for:**

- Design "smart" devices;

- Design command panels with buttons;

- Design HMI interfaces;

- Design intelligent light processors;

- Developelopment of industrial, medical or educational applications ;

The general project process cycle is shown in Figure 3.8.
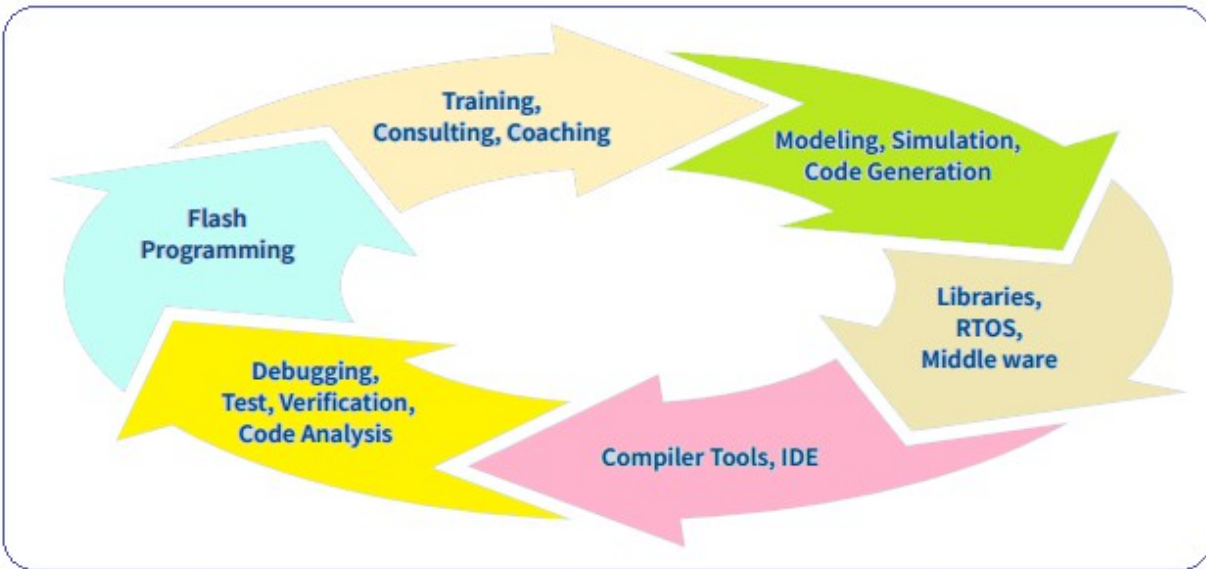
Figure 3.8 The general project process cycle

- **E3.8 More helpful information:**

  1. **Infineon DAVE apps for ARM XMC** -
     http://www.infineon.com/cms/en/product/promopages/aim-mc/dave_downloads.html

  2. **ARM Infineon processors** - http://www.infineon.com/dgdl/Infineon-XMC_32-Bit-Industrial-Microcontrollers-Brochure_2015-BC-v00_00-EN.pdf?fileId=db3a30434441da190144442189d3003c

  3. **ARM Keil Infineon MKD** - http://www2.keil.com/infineon/mdk/

  4. **ARM Keil IDE for Infineon XMC** - http://www2.keil.com/mdk5