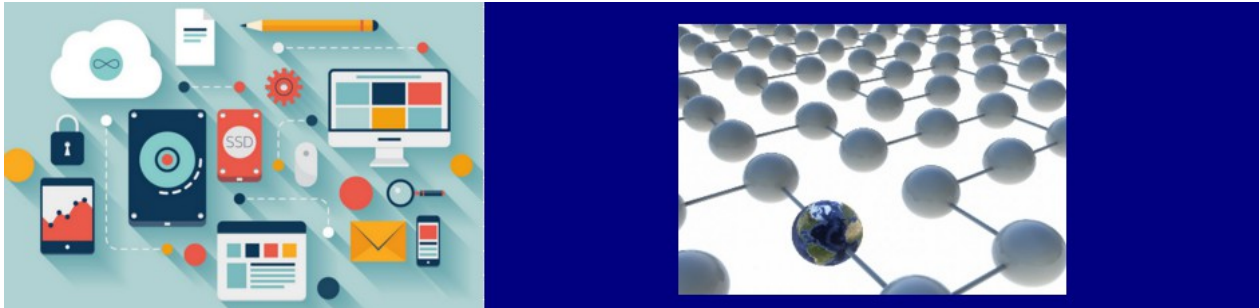




ARM XMC - experiment No. 2



- **E2.1 Name:**

Infineon ARM XMC 4500 Relax Kit – I/O ports

- **E2.2 Overview and purpose**

This experiment aims to provide the opportunity to explore reinforcing elements / output structure on XMC4500 Relax kit . They tracked the ability to configure the ports of entry and their use for generating events.

At the end of the experiment you will have detailed information about how to use the I/O ports for developing applications.

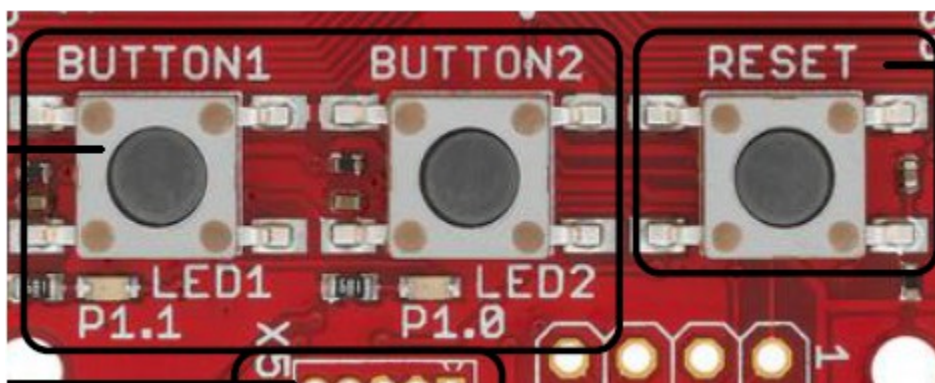


Figure 2.1 The entry button

- **E2.3 Resources**

Hardware XMC 4500 Relax Kit development platform,
extension pins,

oscilloscope

Software

DAVE4.1

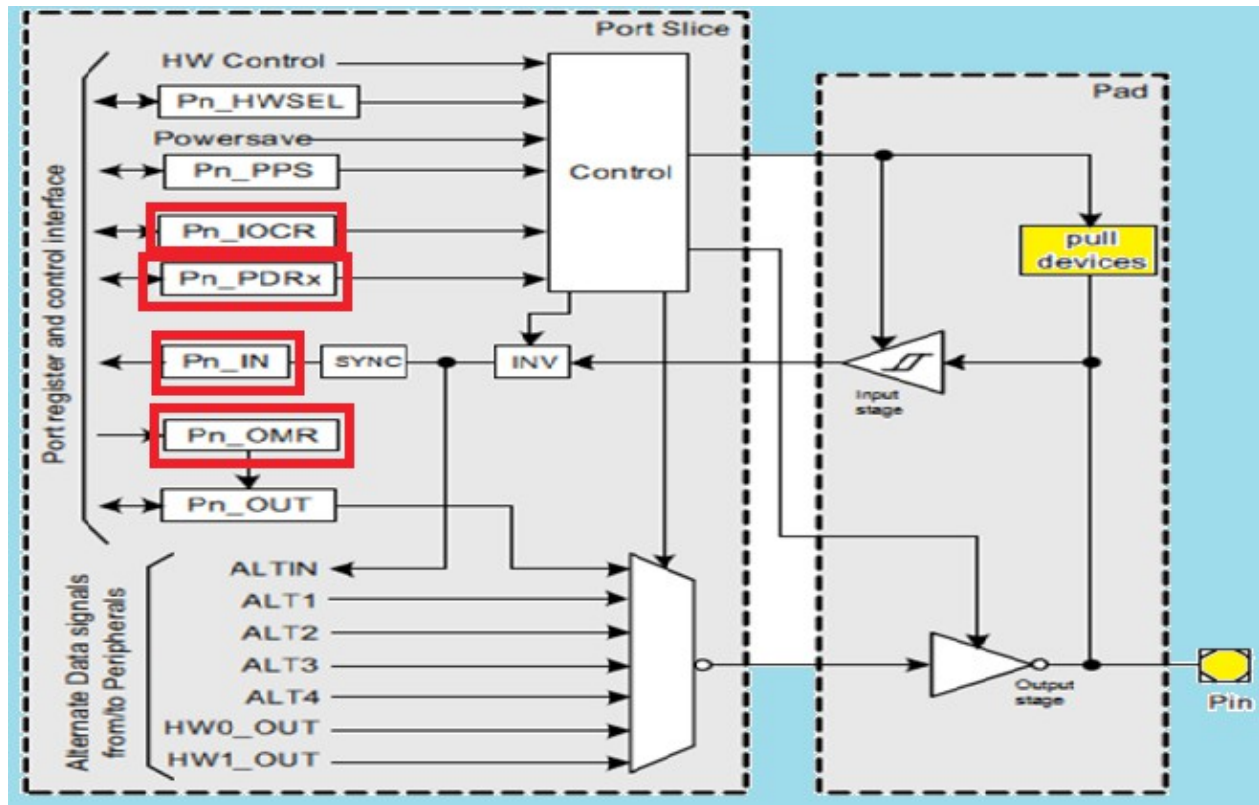


Figure 2.2 General I/O port architecture

• **E2.4 Software example:**

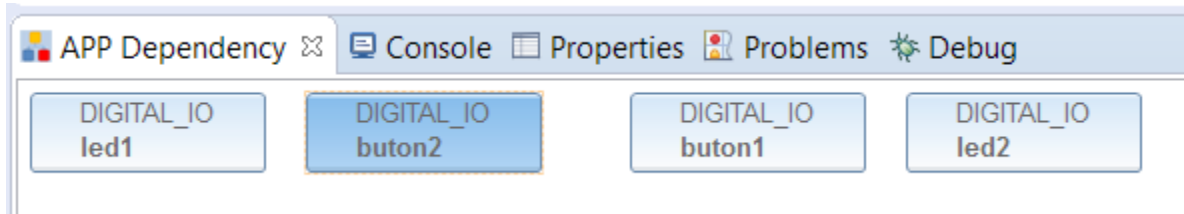


Figure 2.3 The DAVE app dependency window

```

/*
 *Experiment no. 2
 * Using keyboards
 *
 * Led1- P1.1
 * Led2- P1.0
 * Buton1- P1.14
 * Buton2- P15

```



```
*/

#include <DAVE.h>

int main(void)
{
    uint32_t t;    // for delay
    DAVE_STATUS_t status;

    status = DAVE_Init(); /* Initialization of DAVE APPs */

    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)
        {
            ;
        }

        /* Placeholder for user application code. The while loop below can be
        replaced with user application code. */
        while(1U)
        {
            if(!DIGITAL_IO_GetInput (&buton1))    // buton1 pressed
                DIGITAL_IO_SetOutputHigh (&led1); // led1 on
            else
                DIGITAL_IO_SetOutputLow (&led1); // led1 off

            if(!DIGITAL_IO_GetInput (&buton2))    // buton2 pressed
                DIGITAL_IO_SetOutputHigh (&led2); // led2 on
            else
                DIGITAL_IO_SetOutputLow (&led2); // led2 off
        }
    }
}
```

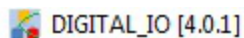
• E2.5 Method of running experiment:

- Examine the instruction manual of the Relax Kit platform;
(http://www.infineon.com/dgdl/Board_Users_Manual_XMC4500_Relax_Kit-V1_R1.2_released.pdf?fileId=db3a30433acf32c9013adf6b97b112f9&ack=t)
- Identify the extension pins at the connectors X1 and X2 (Figure 4)

2		X2	1	2		X1	1
	GND		GND		GND		GND
4	GND		GND	4	GND		GND
6	P5.7		P2.6	6	RESET#		GND
8	P5.1		P5.2	8	P2.10		P2.1
10	P1.15**		P5.0	10	P14.8		P2.14
12	P1.13		P1.14**	12	P14.9		P2.15
14	P1.11		P1.12	14	P14.0		VAREF
16	P1.5***		P1.10***	16	P14.2		P14.1
18	P1.3***		P1.4***	18	P14.4		P14.3
20	P1.1*		P1.2***	20	P14.6		P14.5
22	P1.9		P1.0*	22	P14.12		P14.7
24	P0.8		P1.8***	24	P14.14		P14.13
26	P3.4		P0.7	26	P15.2		P14.15
28	P0.12		P3.3	28	HIB_IO_0		P15.3
30	P0.6		P0.11	30	P3.0		HIB_IO_1
32	P0.2		P0.5	32	P3.2		P3.1
34	P0.4		P0.3	34	P0.1		P0.9
36	GND		GND	36	P0.0		P0.10
38	VDD3.3		VDD3.3	38	VDD3.3		VDD3.3
40	VDD5		VDD5	40	VDD5		VDD5

Figure 2.4 Realx Kit - extension connectors

- Identify the interconnection mode for LEDs and buttons;
- Explore the DAVE apps and add to the project the DIGITAL_IO module for LEDs and buttons;



- Configure pins P1.0 and P1.1 as digital output for LED 1 and LED 2;
- Generate code;
- Build project;
- Press the DEBUG button and test/execute your code on XMC;

E2.6 Problems proposed:

1. Create a sequence program that will make LED 1 blink at button 1 activation;
2. Make a program that will make LED1 blink, action started by buton1 and stopped by buton2;



3. Make a program that will highlight the maximum frequency of a square wave that can be generated from an output port;
4. Insert pin on the extension connectors and put out maximum frequency of a signal that can be generated from an output pin;
5. Connect a limit switch and a buzzer entry P1.x piezo-ceramic exit P1.y. Make a program that will beep when the limiter is closed.

UART	UART-1	UART-2	UART-3	UART-4
TX	P0.1 / U1C1.DOUT0	P1.5 / U0C0.DOUT0	P5.1 / U0C0.DOUT0	P0.5 / U1C0.DOUT0
RX	P0.0 / U1C1.DX0D	P1.4 / U0C0.DX0B	P5.0 / U0C0.DX0D	P0.4 / U1C0.DX0A

Figure 2.5 UART ports on XMC 4500 relax kit

• **E2.7 The experiment can be extended to be used for:**

- WEB servers for instrumentations through Internet;
- WEB servers for Internet of Things;
- Industrial controller for motors;
- Renewable Energy.

• **E2.8 More helpful information:**

1. **Trusted Platform Module** - http://www.trustedcomputinggroup.org/files/resource_files/8D42F8D4-1D09-3519-AD1FFF243B223D73/How_to_Use_TPM_Whitepaper_20090302_Final_3_.pdf
2. **DAVE Apps** - http://www.infineon.com/cms/en/product/promopages/aim-mc/DAVE_3_Support_Portal/DAVE_Apps_download.html
3. **Download DAVE apps list** - http://www.infineon.com/cms/en/product/promopages/aim-mc/DAVE_3_Support_Portal/DAVE_Apps_download.html
4. **Internet for Instrumentation** - http://www.infineon.com/dgdl/Infineon-XMC_32-Bit-Industrial-Microcontrollers-Brochure_2015-BC-v00_00-EN.pdf?fileId=db3a30434441da190144442189d3003c
5. **IoT for instrumentation Fundamentals** - <http://www.lxistandard.org/Documents/LXI%20Primer/The%20LXI%20Primer%201.2b%202015.pdf>



6. **Intelligent lightning** -
http://www.infineon.com/dgdl/Infineon_General_Lighting_Brochure_2014_v1.pdf?fileId=db3a304327b897500127f76de0b2654b
7. **Development platforms** - <http://www.infineon.com/cms/en/product/microcontroller/32-bit-industrial-microcontroller-based-on-arm-registered-cortex-registered-m/32-bit-xmc1000-industrial-microcontroller-arm-registered-cortex-registered-m0/xmc-development-tools-kits-and-boards/channe>
8. **DAVE app** - <http://www.infineon.com/cms/en/product/channel.html?channel=db3a30433580b37101359f8ee6963814>
9. **Infineon XMC2GO release** - <https://www.youtube.com/watch?v=gvsR-10HP6o>
10. **ARM Keil IDE for Infineon XMC** - <http://www2.keil.com/mdk5>