LS.V3 System Design

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Date: 10/04/2023

Overview

You are supposed to have a system that controls some LEDs lighting sequence according to button pressing.

System design for LS_V3 in Sprint number 3.

Requirements

1. Read System Requirements Specifications
    1. *Description*
        1. *Hardware Requirements*
            1. Four LEDs (LED0, LED1, LED2, LED3)
            2. Two buttons (BUTTON0 and BUTTON1)
        2. *Software Requirements*
            1. Initially, all LEDs are OFF
            2. Once BUTTON_0 is pressed, LED0 will blink with BLINK_1 mode
            3. Each press further will make another LED blinks BLINK_1 mode
            4. At the fifth press, LED0 will changed to be OFF
            5. Each press further will make only one LED is OFF
            6. This will be repeated forever
            7. The sequence is described below
                1. Initially (OFF, OFF, OFF, OFF)
                2. Press 1 (BLINK_1, OFF, OFF, OFF)
                3. Press 2 (BLINK_1, BLINK_1, OFF, OFF)
                4. Press 3 (BLINK_1, BLINK_1, BLINK_1, OFF)
                5. Press 4 (BLINK_1, BLINK_1, BLINK_1, BLINK_1)
                6. Press 5 (OFF, BLINK_1, BLINK_1, BLINK_1)
                7. Press 6 (OFF, OFF, BLINK_1, BLINK_1)
                8. Press 7 (OFF, OFF, OFF, BLINK_1)
                9. Press 8 (OFF, OFF, OFF, OFF)

10. Press 9 (BLINK_1, OFF, OFF, OFF)

8. When BUTTON1 has pressed the blinking on and off durations will be changed
    1. No press → BLINK_1 mode (ON: 100ms, OFF: 900ms)
    2. First press → BLINK_2 mode (ON: 200ms, OFF: 800ms)
    3. Second press → BLINK_3 mode (ON: 300ms, OFF: 700ms)
    4. Third press → BLINK_4 mode (ON: 500ms, OFF: 500ms)
    5. Fourth press → BLINK_5 mode (ON: 800ms, OFF: 200ms)
    6. Fifth press → BLINK_1 mode
9. USE EXTERNAL INTERRUPTS

Layered architecture

It divides the system into a set of layers, each of which has a specific responsibility and interacts with other layers in a well-defined way.

The **MCAL** which contains the microcontroller drivers.

The **ECUAL** which contains the connected electronics components that will use the microcontroller drivers.

The **APP** Layer that will contain code application that performs the desired functionalities.

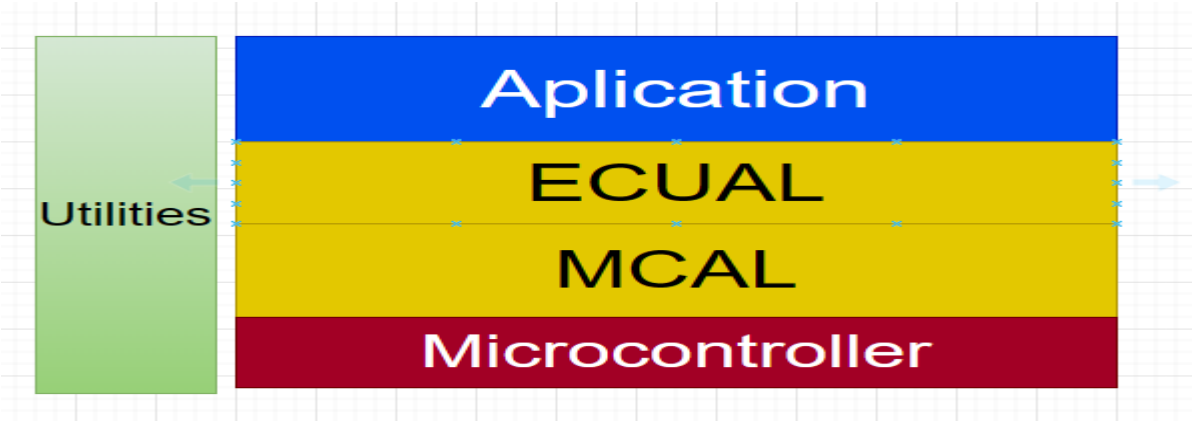


Figure 1: System Layered Architecture

System modules/drivers

It shows the different modules that will be used inside each layer.

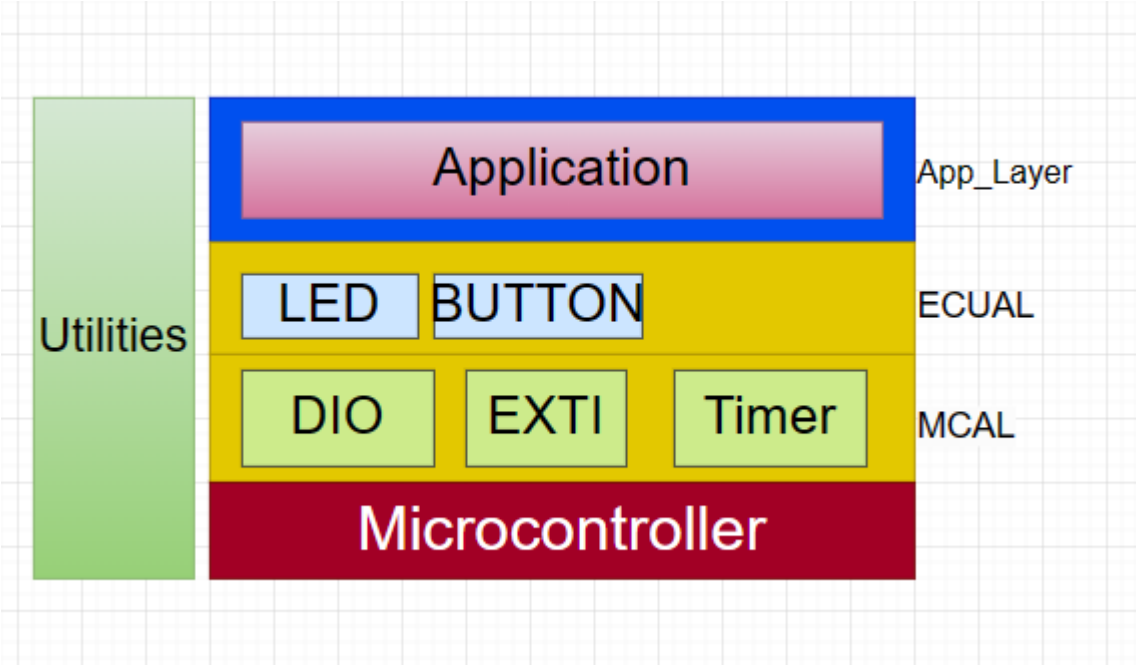
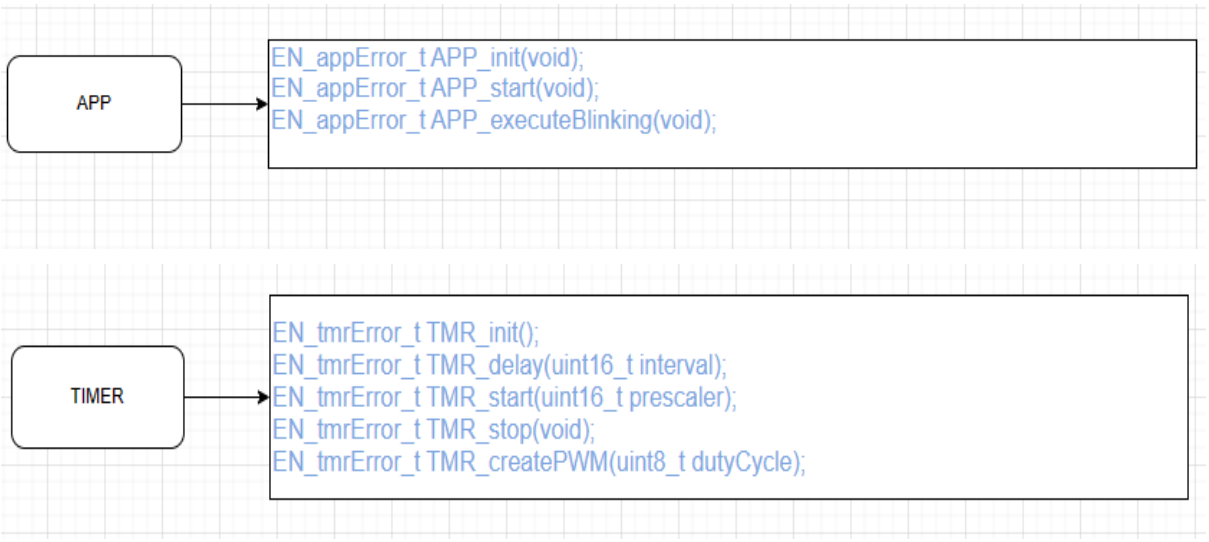


Figure 2: System Modules for each layer

APIs for each module

It defines the high level interface of each module/component.



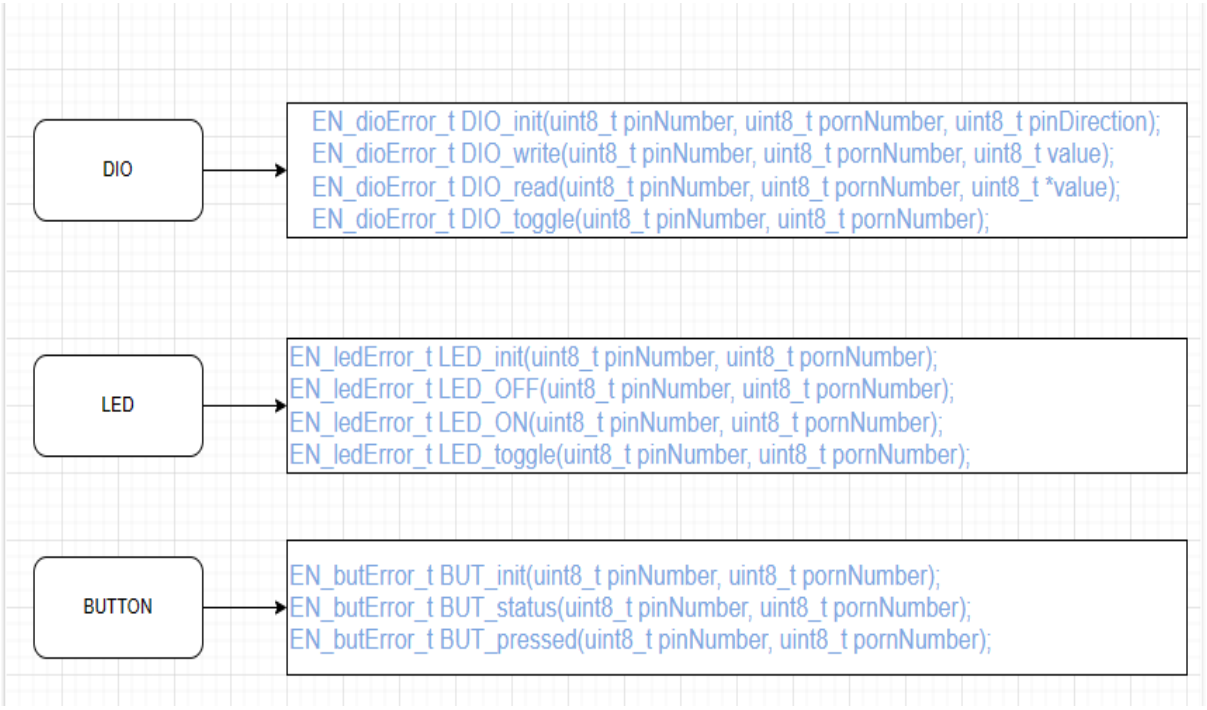
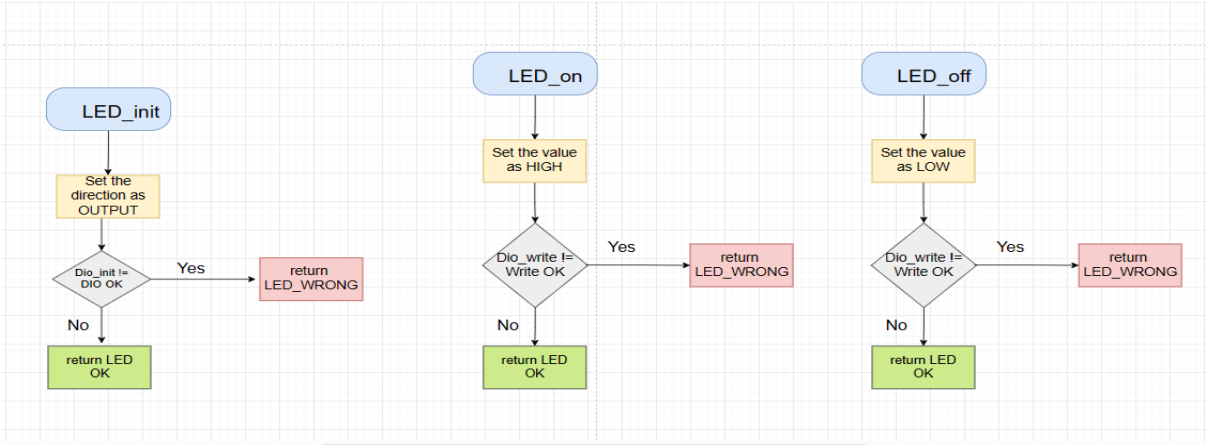
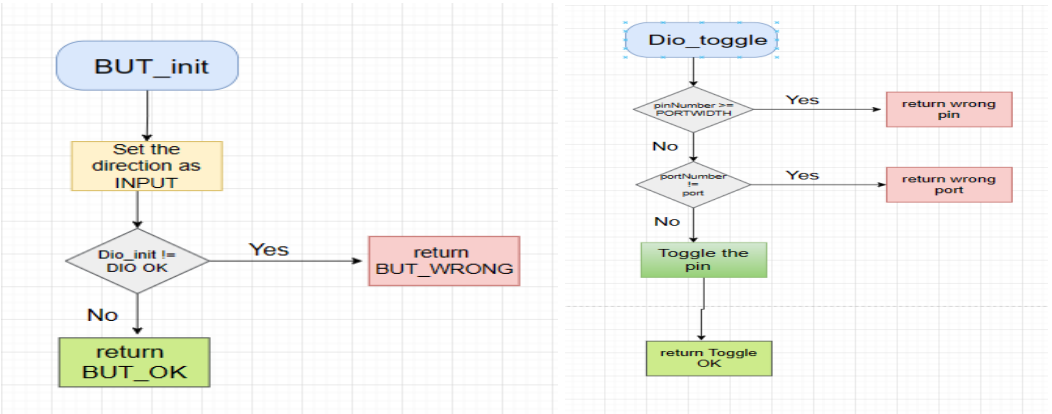


Figure 3: APIs_with_documentation_1

APIs flowcharts





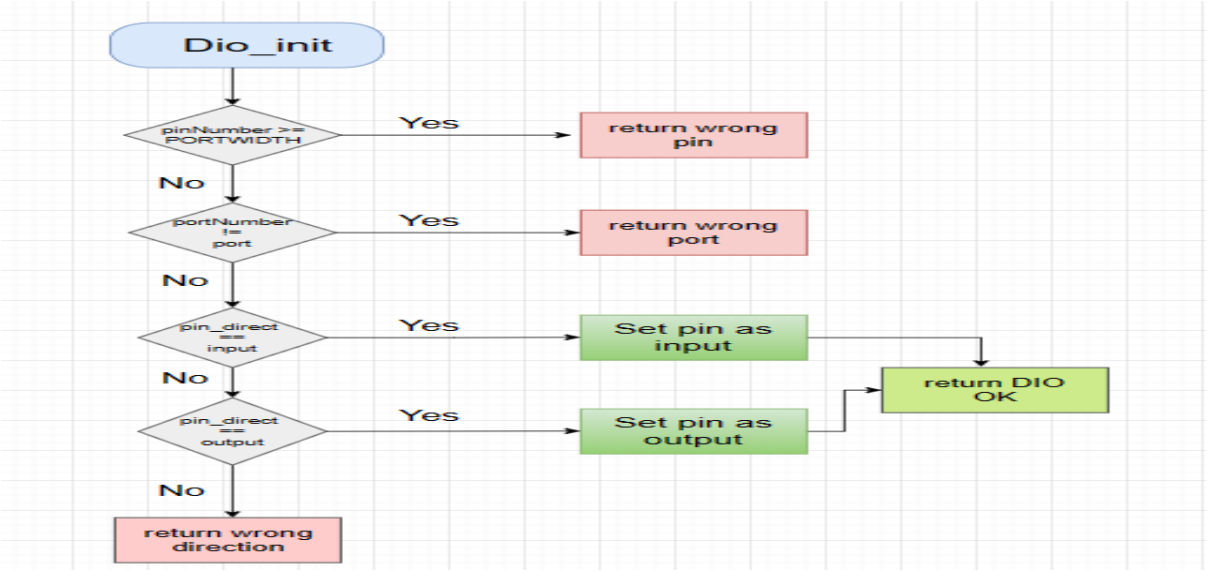


Figure 4: APIs_Flowcharts

Project State Machine

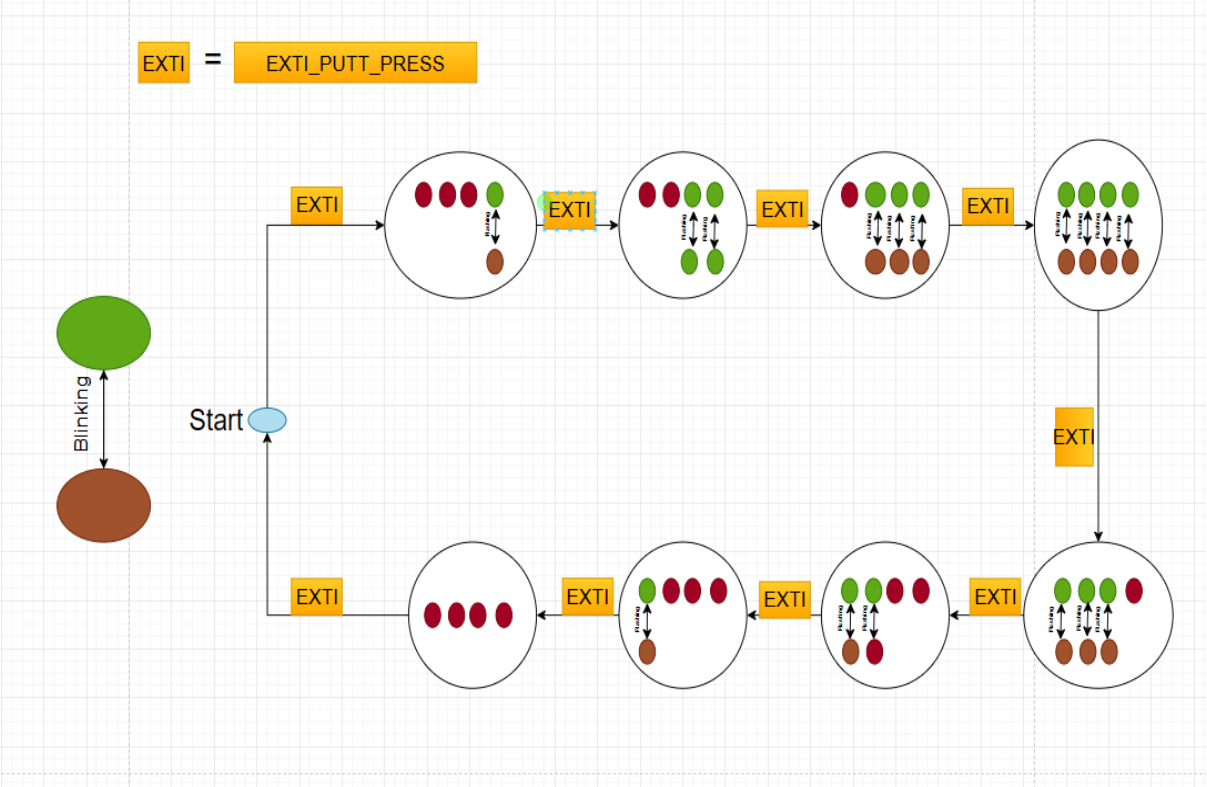


Figure 5: LS_V.1_State_Machine