Mastering Embedded System Online Diploma

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First Term (Final Project 1)

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➢ Case Study: A Pressure Detection System

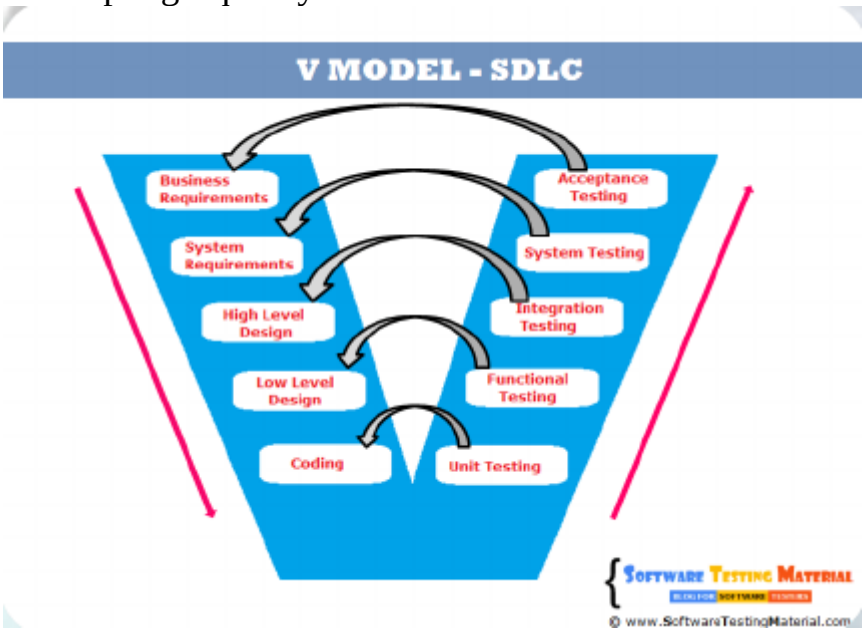
➢ Specification from the Client

- ➢ A Pressure Detection informs the crew of a cabin with an alarm when the pressure exceeds 20 bars in the cabin.
- ➢ The alarm duration equals 60 Seconds.

➢ Method:

There are a lot of method used in a software development life cycle, and I decided to choose The **V Model – SDLC**.

- ➢ SDLC is **Software Development Life Cycle**
  - ➢ It is the sequence of activities carried out by Developers to design and develop high-quality software.

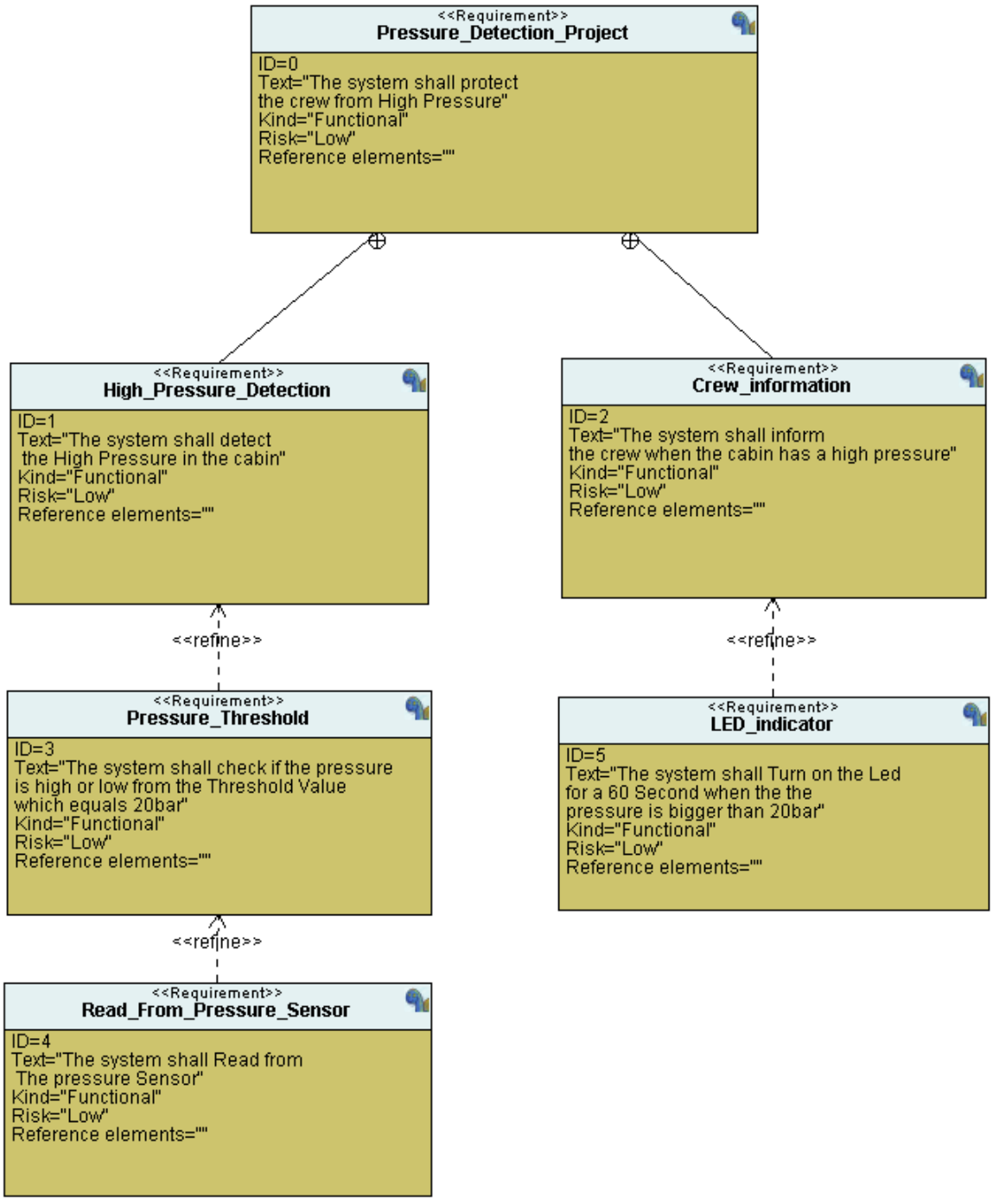


➢ Space Exploration:

The Multinational Companies use tools to know the number of ECU for the system. In our case for small application, I will use the **STM32F103** to Run the software of the Pressure detector System.

➢ Requirements:

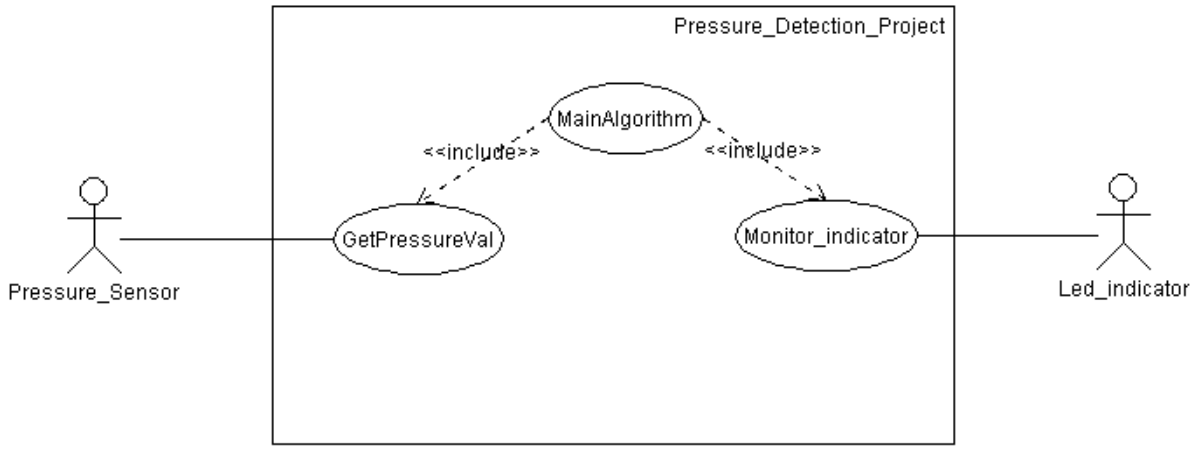
After talking with the customer, I got the requirements of this project and then I show the requirements diagram to the customer to ensure its right or not.



➢ System Analysis:

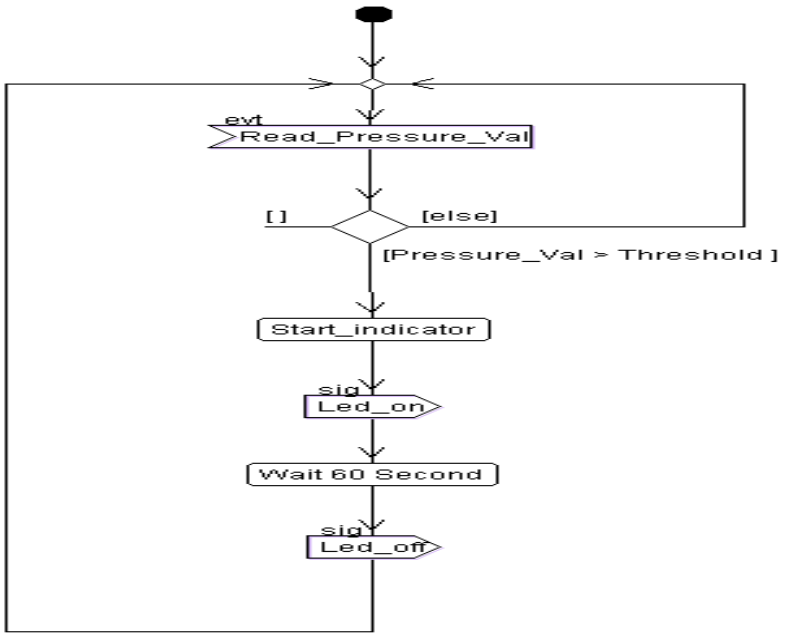
➢ Use Case Diagram

- ➢ System boundary and main functions.
- ➢ Not describe step by step algorithm.



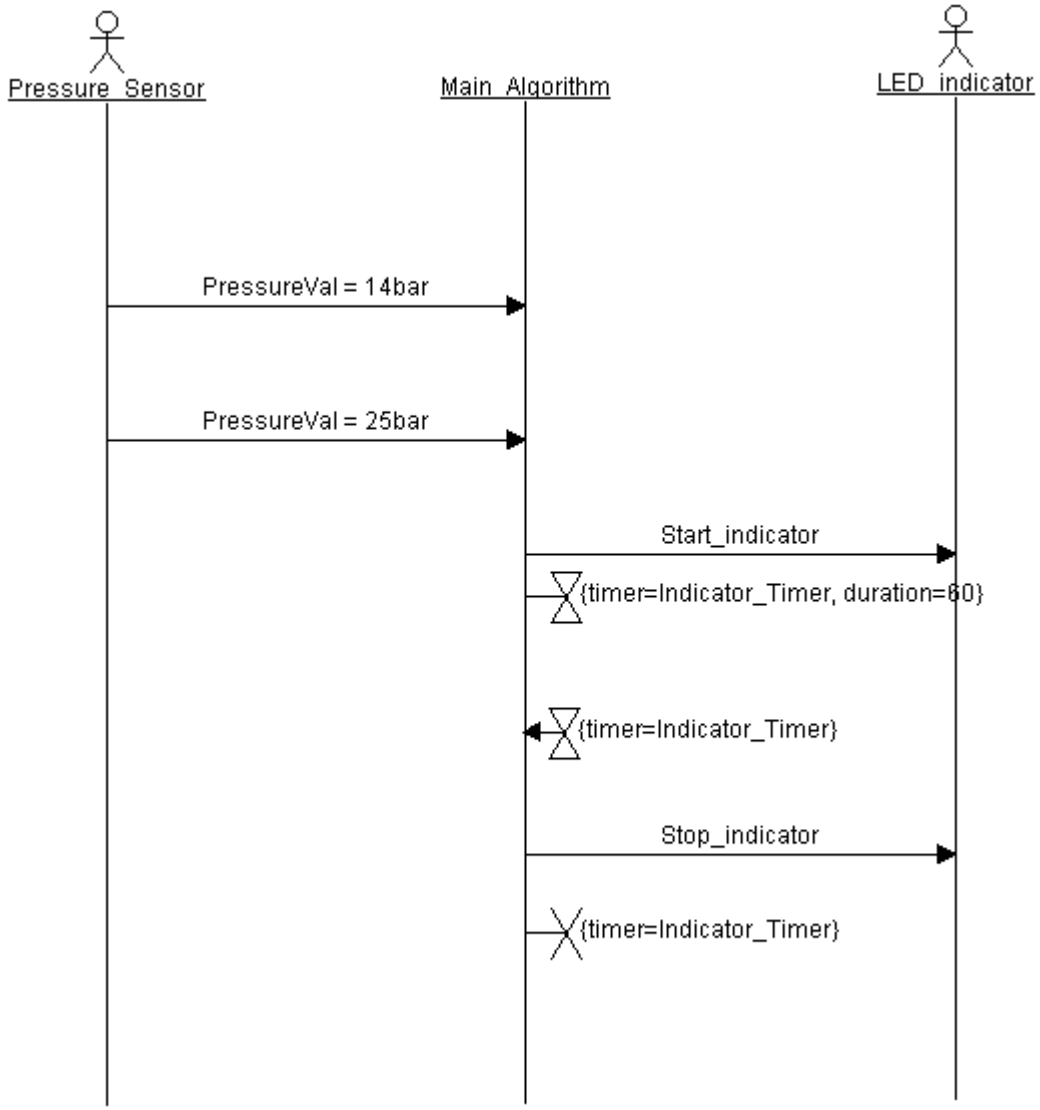
➢ Activity Diagram

- ➢ Describe the workflow behavior of a system.

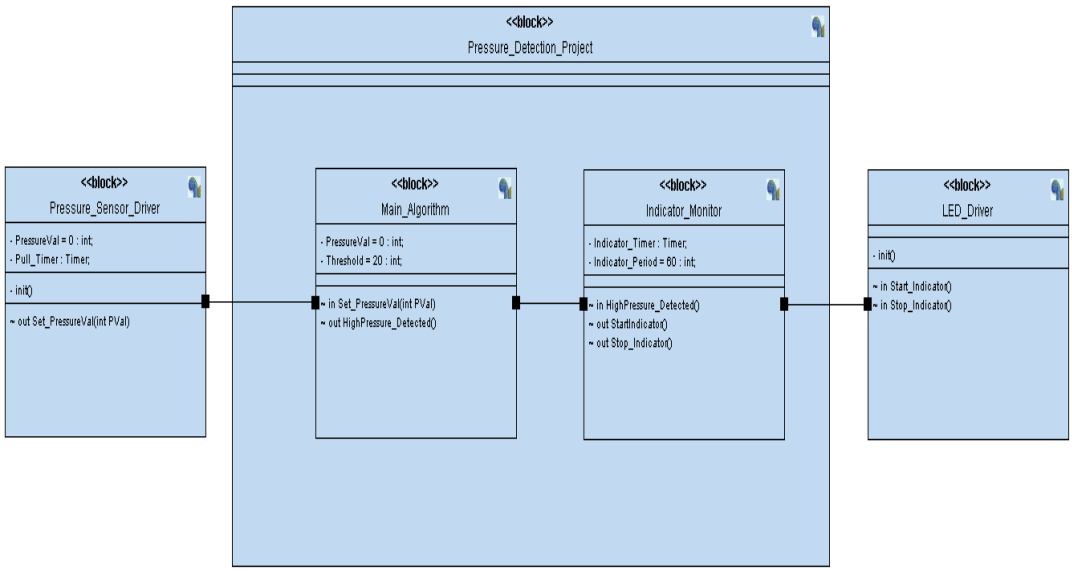


- **Sequence Diagram**

  If Pressure Value is bigger than 20bar the indicator will start and wait for 60 seconds.

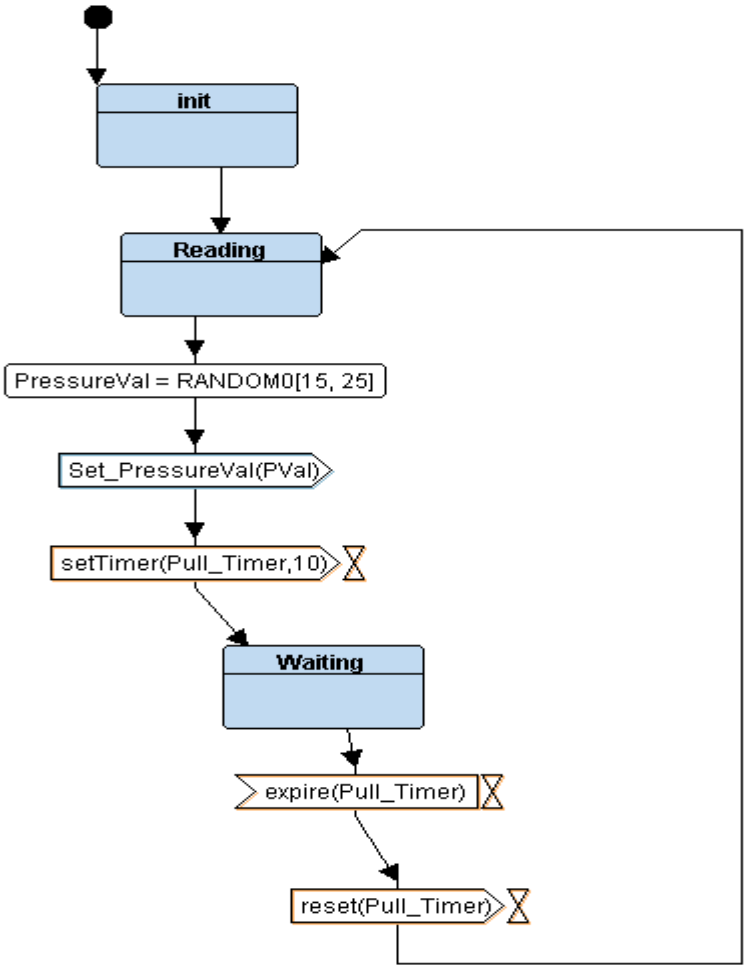


➢ System Design

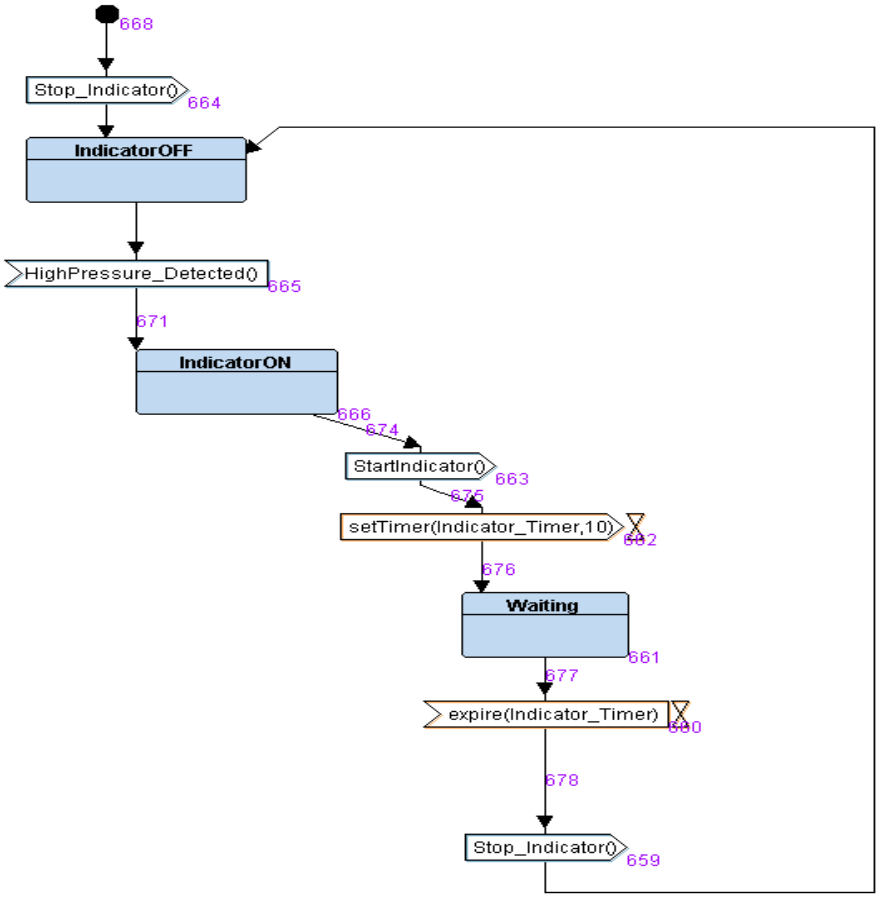


➢ Pressure Sensor Block

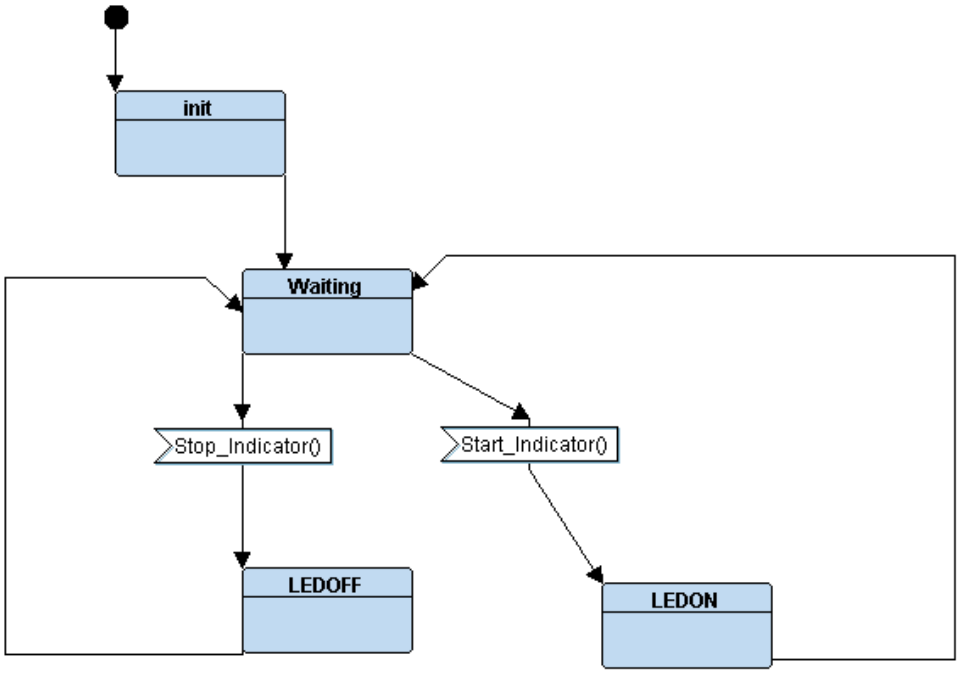
The time in Set Timer is 60 instead of 10.



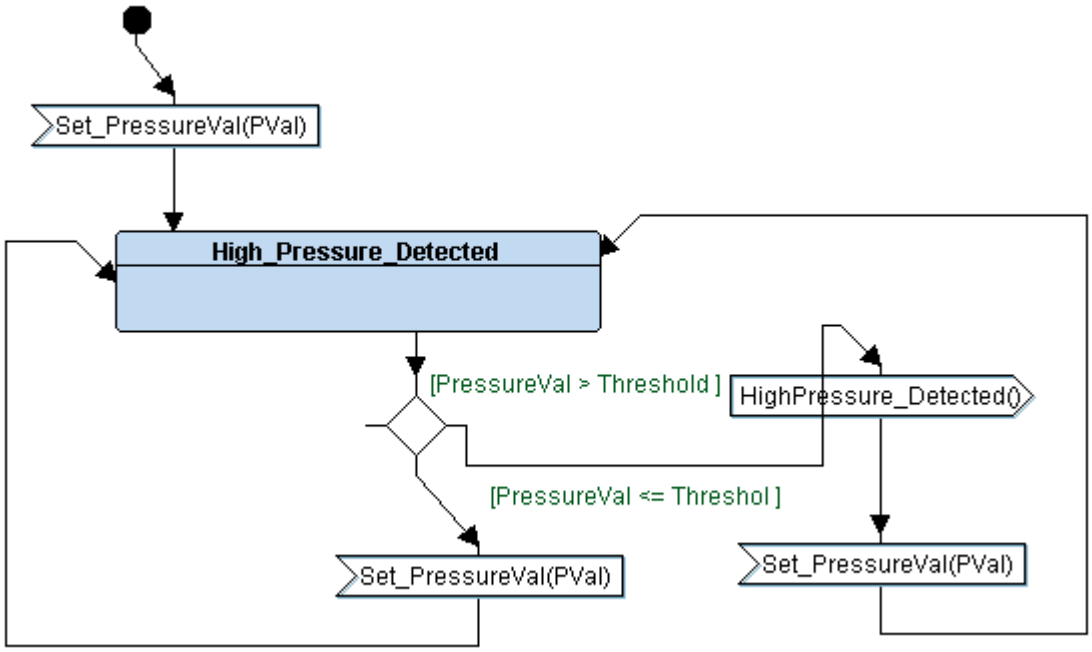
➢ Indicator Monitor



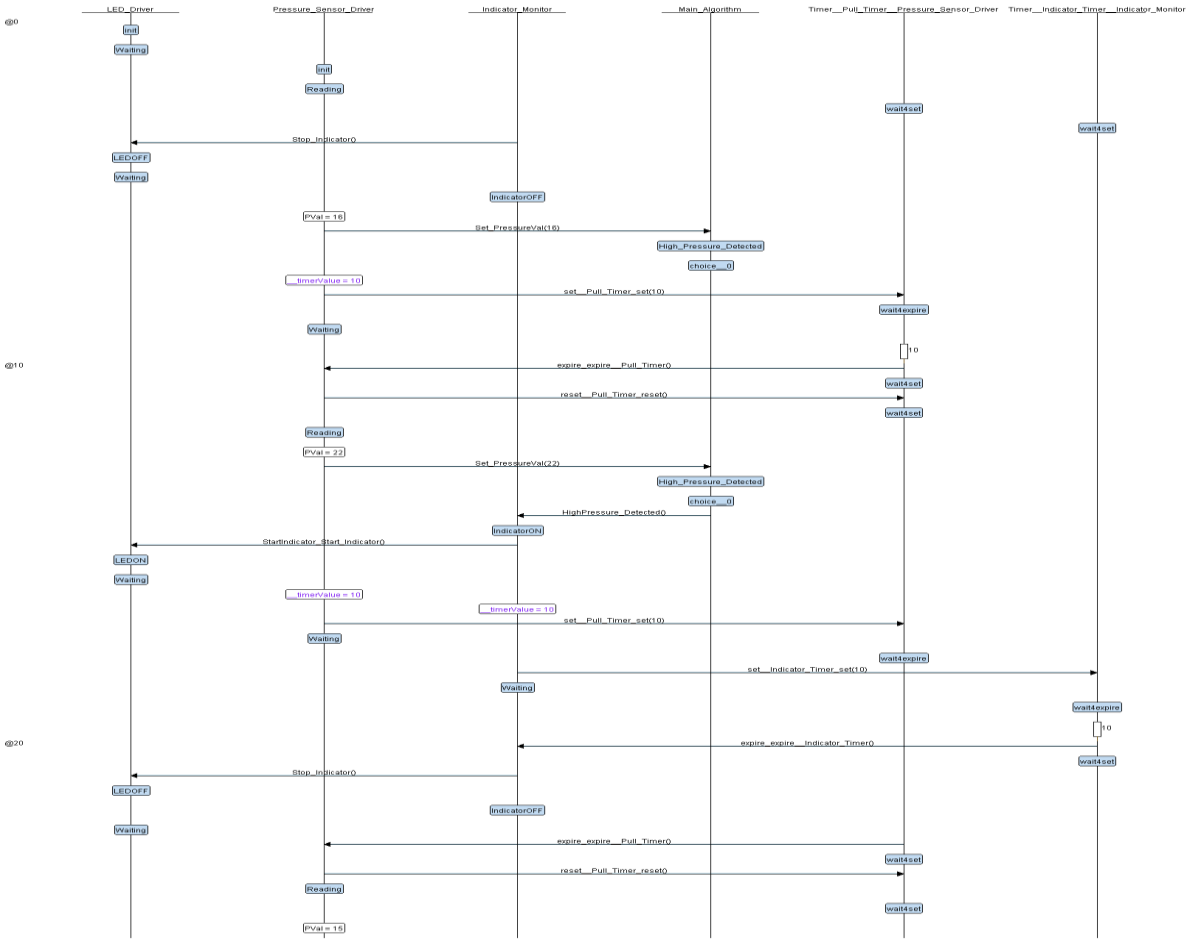
➢ LED Driver



➢ Main Algorithm

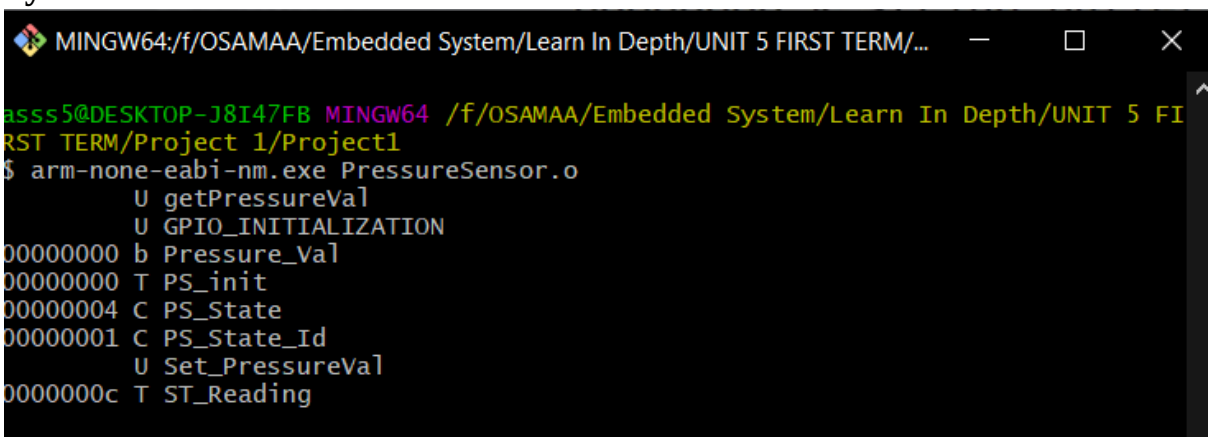


➢ Analysis and Timing Diagram

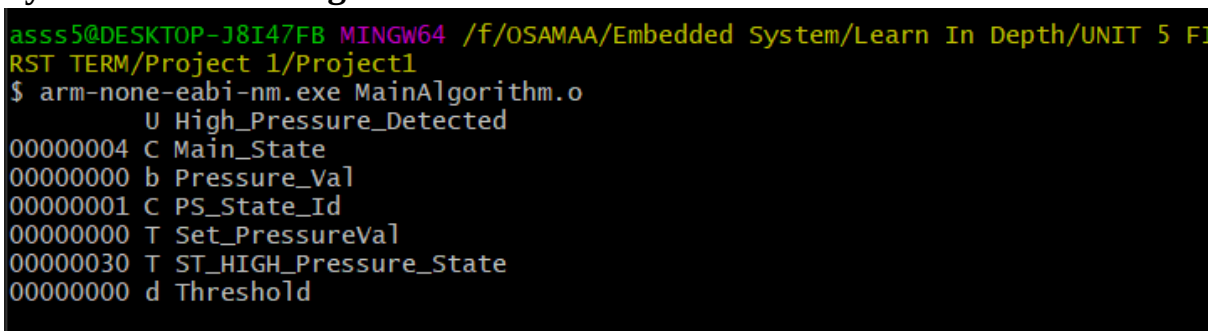


➢ Symbols for each block

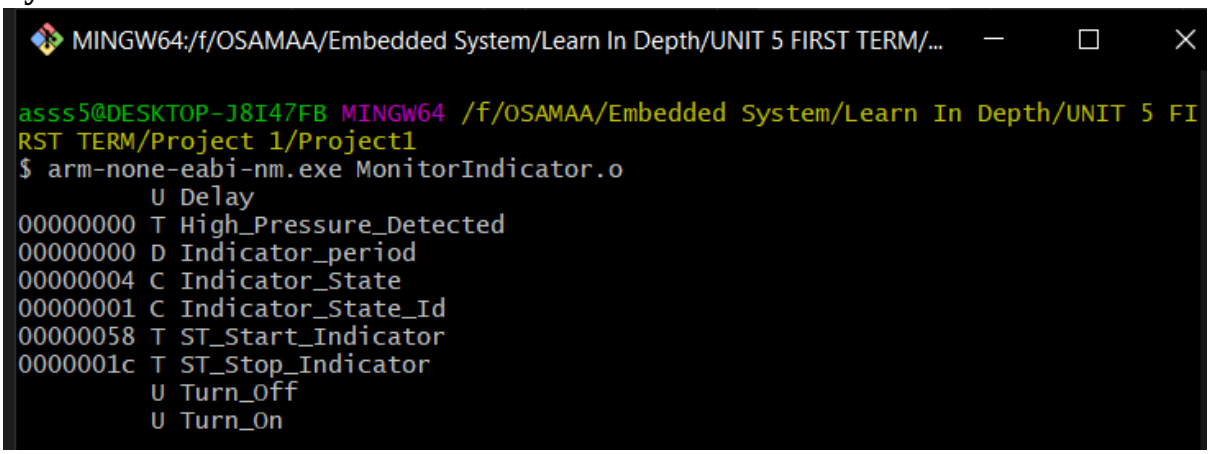
➢ Symbols for PressureSensor.o



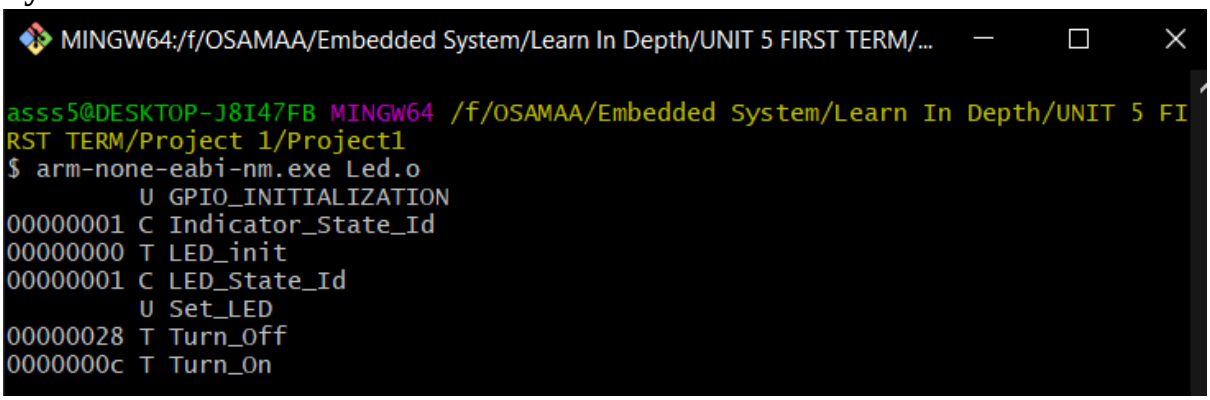
➢ Symbols for MainAlgorithm.o



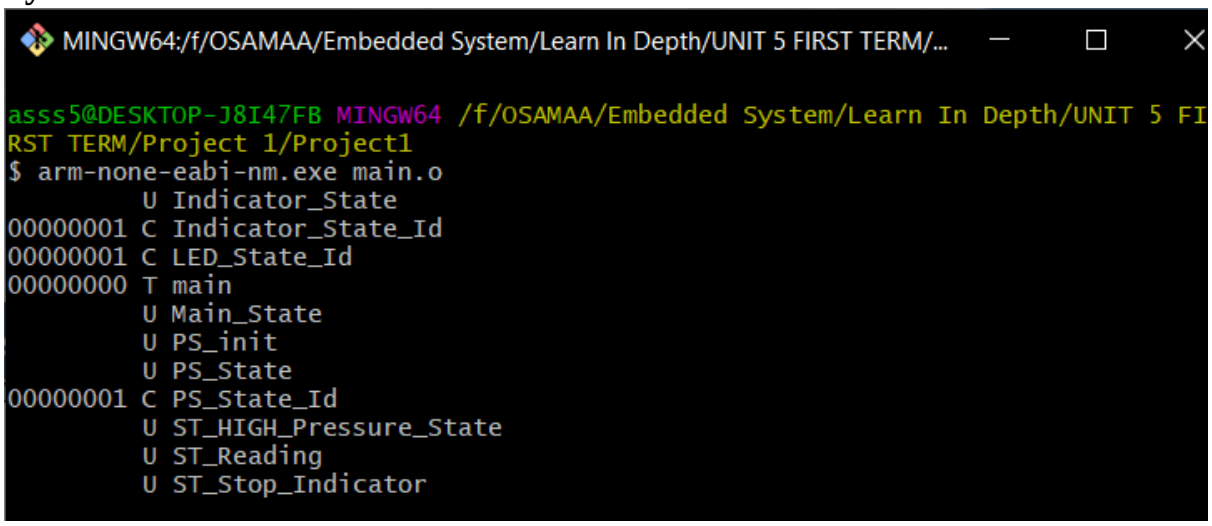
➢ Symbols for MonitorIndicator.o



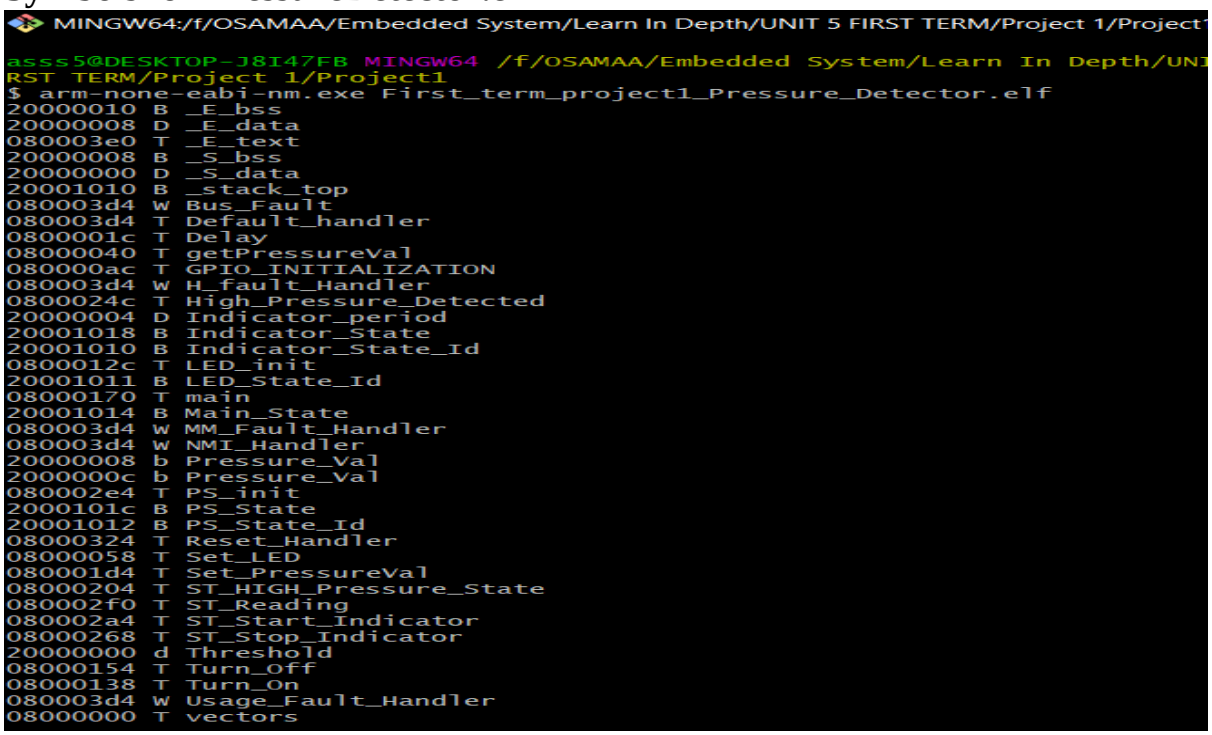
- **Symbols for Led.o**



- **Symbols for main.o**



- **Symbols for PressureDetector.elf**



➢ Sections for each Block

➢ Section for PressureSensor.o

```
RST TERM/Project 1/Project1
$ arm-none-eabi-objdump.exe -h PressureSensor.o

PressureSensor.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000040  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000074  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000004  00000000  00000000  00000074  2**2
                  ALLOC
```

➢ Section for MainAlgorithm.o

```
asss5@DESKTOP-J8I47FB MINGW64 /f/OSAMAA/Embedded System/Learn In Depth/UNIT 5 F
RST TERM/Project 1/Project1
$ arm-none-eabi-objdump.exe -h MainAlgorithm.o

MainAlgorithm.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000078  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000004  00000000  00000000  000000ac  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000004  00000000  00000000  000000b0  2**2
                  ALLOC
```

➢ Section for MonitorIndicator.o

```
MINGW64:/f/OSAMAA/Embedded System/Learn In Depth/UNIT 5 FIRST TERM/...
asss5@DESKTOP-J8I47FB MINGW64 /f/OSAMAA/Embedded System/Learn In Depth/UNIT 5 FI
RST TERM/Project 1/Project1
$ arm-none-eabi-objdump.exe -h MonitorIndicator.o

MonitorIndicator.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000098  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000004  00000000  00000000  000000cc  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  000000d0  2**0
                  ALLOC
```

- **Section for Led.o**

```
MINGW64:/f/OSAMAA/Embedded System/Learn In Depth/UNIT 5 FIRST TERM/...
asss5@DESKTOP-J8I47FB MINGW64 /f/OSAMAA/Embedded System/Learn In Depth/UNIT 5 FIRST TERM/Project 1/Project1
$ arm-none-eabi-objdump.exe -h Led.o

Led.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000044  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000078  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000078  2**0
                  ALLOC
```

- **Section PressureDetector.o**

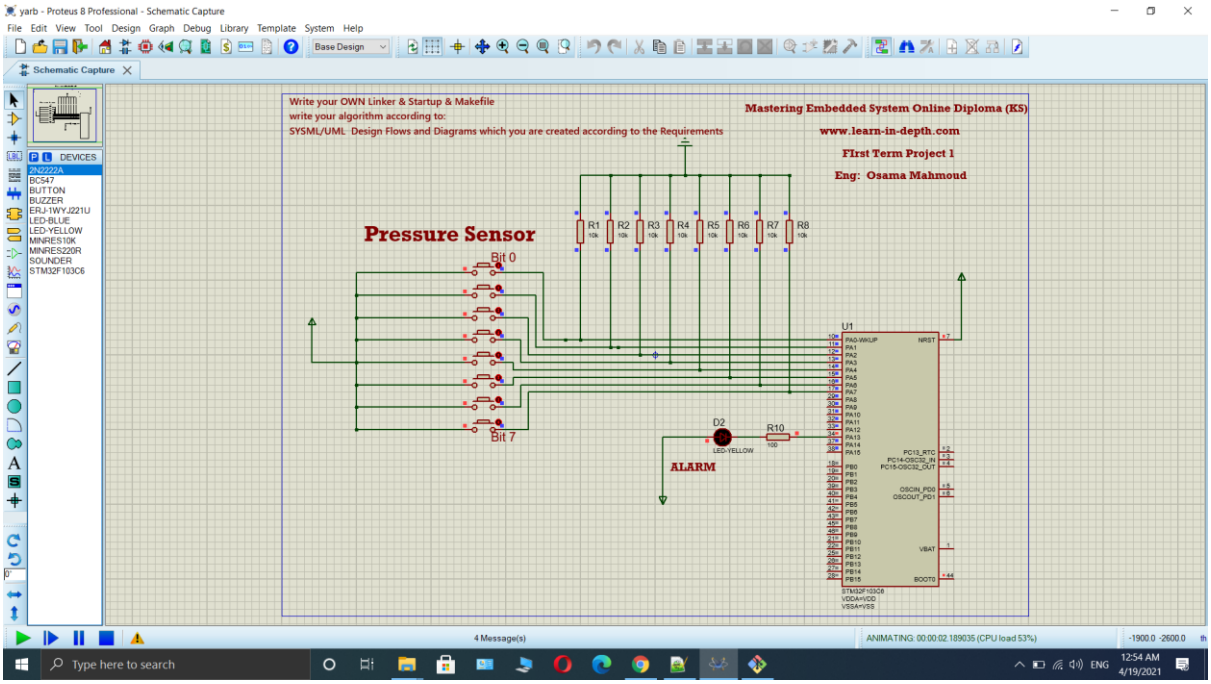
```
MINGW64:/f/OSAMAA/Embedded System/Learn In Depth/UNIT 5 FIRST TERM/...
First_term_project1_Pressure_Detector.elf:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         000003e0  08000000  08000000  00008000  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data         00000008  20000000  080003e0  00010000  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00001018  20000008  080003e8  00010008  2**2
                  ALLOC
```

- **MapFile**

```
Allocating common symbols
Common symbol        size              file

PS_State_Id          0x1               main.o
Indicator_State_Id   0x1               Led.o
LED_State_Id         0x1               Led.o
Indicator_State      0x4               MonitorIndicator.o
PS_State             0x4               PressureSensor.o
Main_State           0x4               MainAlgorithm.o

Memory Configuration

Name             Origin             Length             Attributes
flash            0x08000000         0x00020000         xr
sram             0x20000000         0x00005000         xrw
*default*        0x00000000         0xffffffff

Linker script and memory map


.text           0x08000000       0x3e0
 *(.vectors*)
 .vectors       0x08000000        0x1c startup.o
                0x08000000                vectors
 *(.text*)
 .text          0x0800001c       0x110 driver.o
                0x0800001c                Delay
                0x08000040                getPressureVal
                0x08000058                Set_LED
                0x080000ac                GPIO_INITIALIZATION
 .text          0x0800012c        0x44 Led.o
                0x0800012c                LED_init
                0x08000138                Turn_On
                0x08000154                Turn_Off
```

➢ Simulation

➢ If the pressure Value is less than 20 bar, the Led is off.



➢ If the Pressure is bigger than 20 bar, the is on for 60 Second.