

REPORT

PRESSURE DETECTION

struments



Prepared For :
First Term - Project1

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1-Case Study

A pressure controller informs the crew of a cabin with an alarm when the pressure exceeds 20 bars in the cabin. The alarm duration equals 60 seconds.



Assumptions:

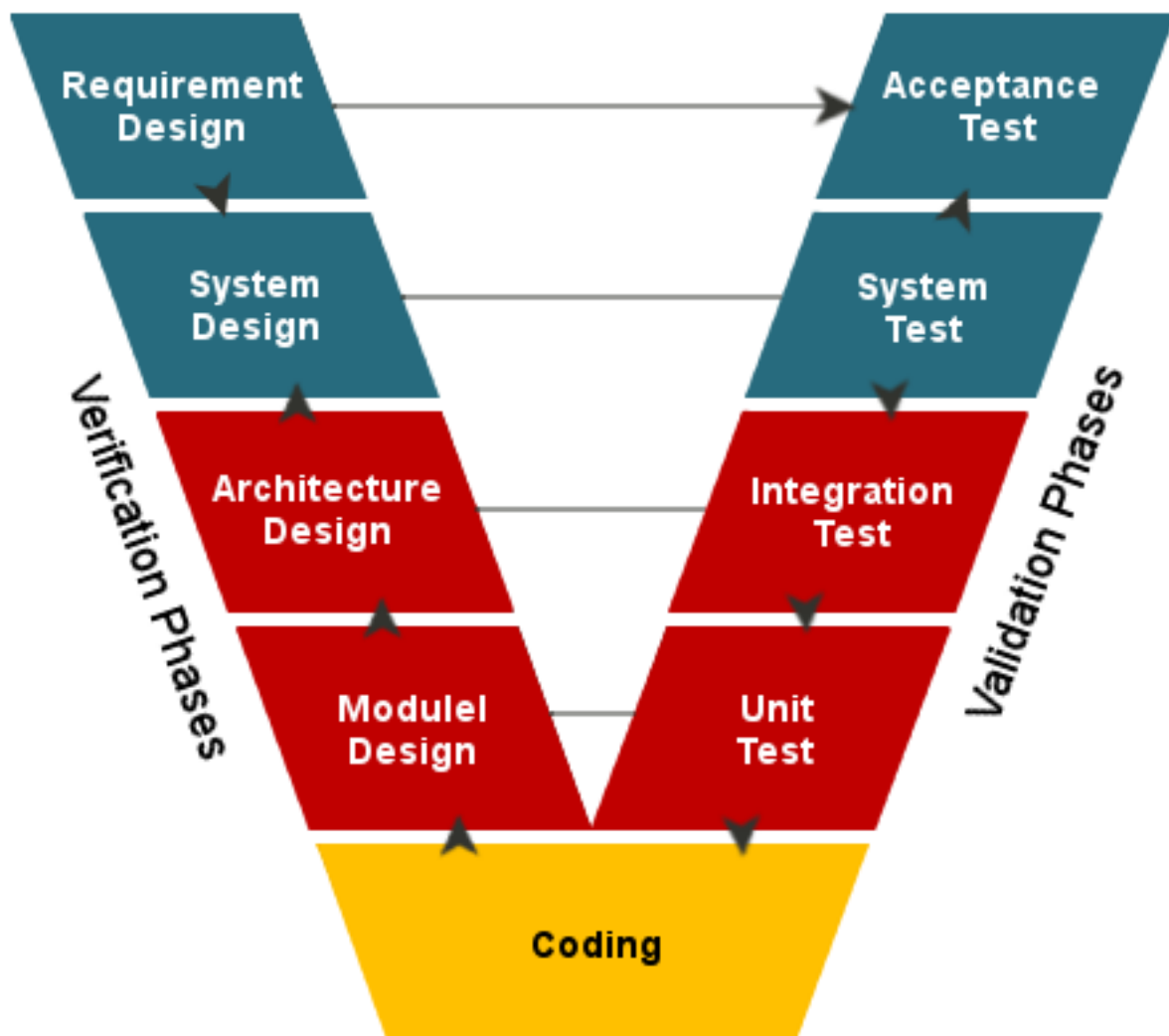
- The system setup and shutdown procedures are not modeled.
- The system maintenance is not modeled.
- The pressure sensor never fails.
- The alarm never fails.
- The system never faces power cut.
- Store in Flash is not modeled in any diagram.

2-Method

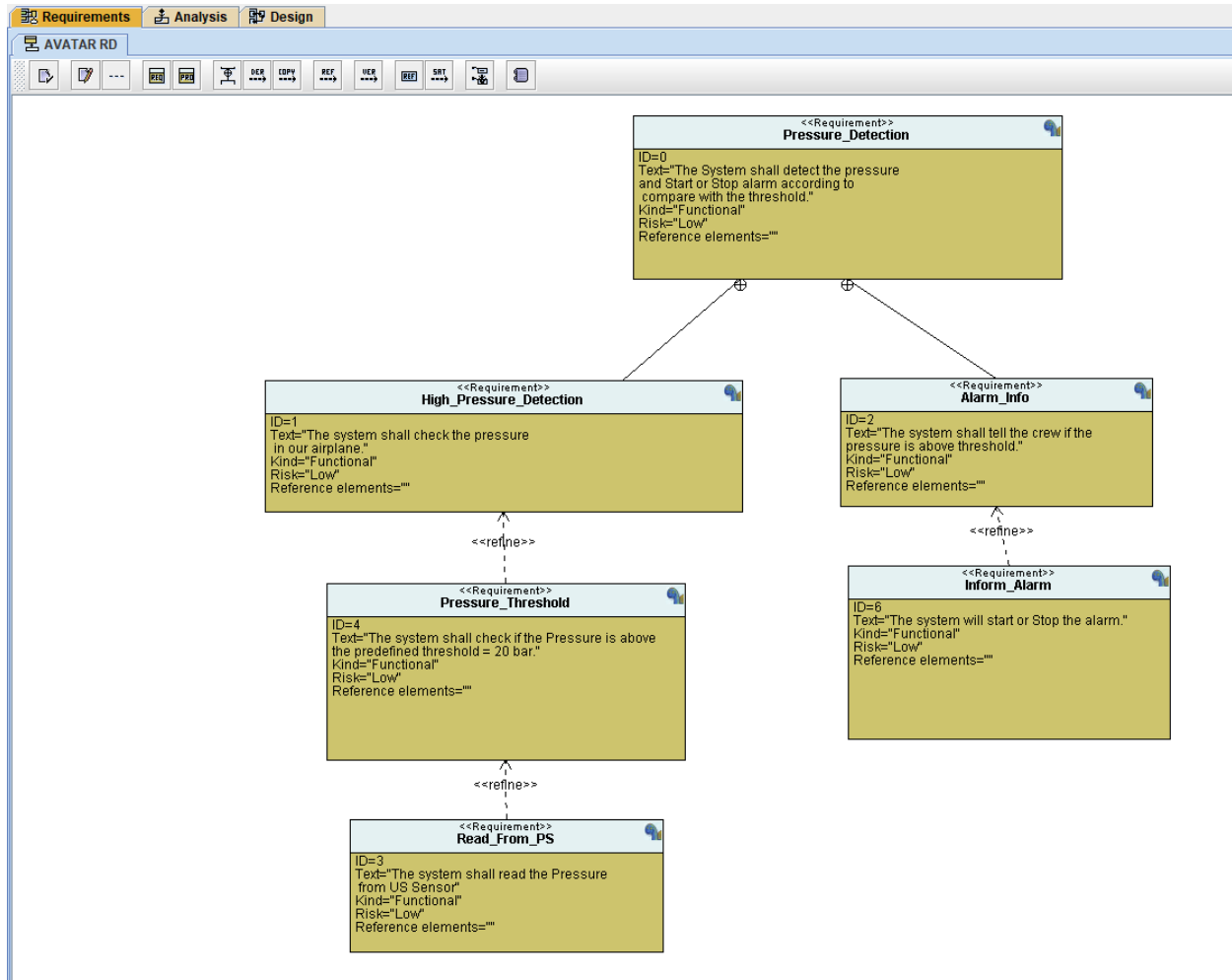
V-Model

Where this system has many modules that is very difficult in the Integration so that a test for every module was worked as a whole and collected them Finally.

Verification stages on one side of the Validation stages on the opposite side. The confirmation and Validation process is joined by coding gradually works in V-shape.



3-Requirement Diagram



Hint :

Store data in flash is optional...may be implemented in future versions.

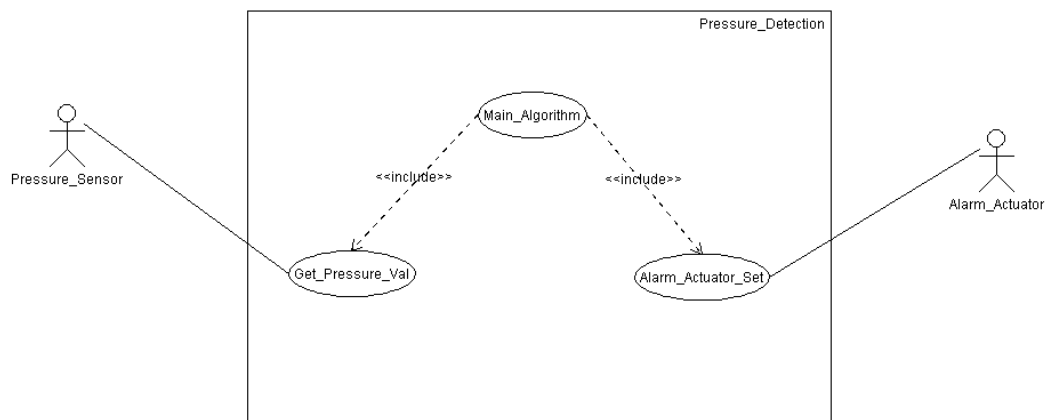
4-Space Exploration/Partitioning

Hardware will be STM32F103C6 MCU

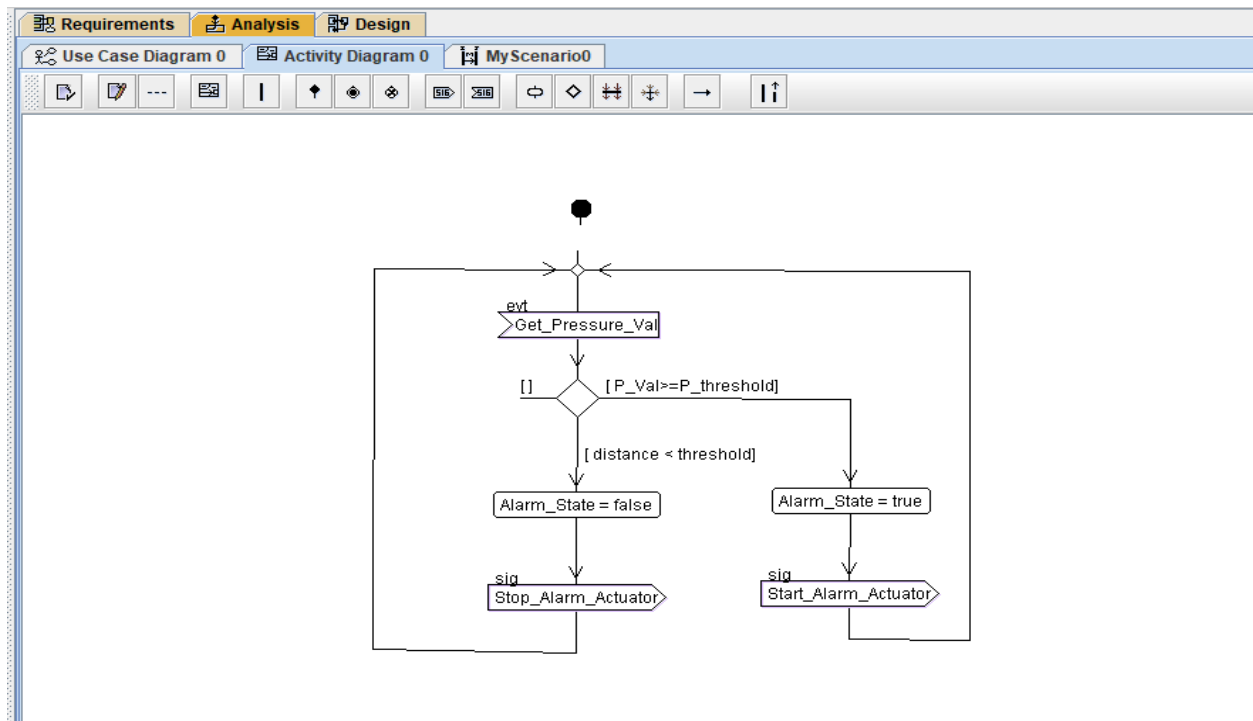
Based on ARM Cortex-M3 processor.

5-System Analysis

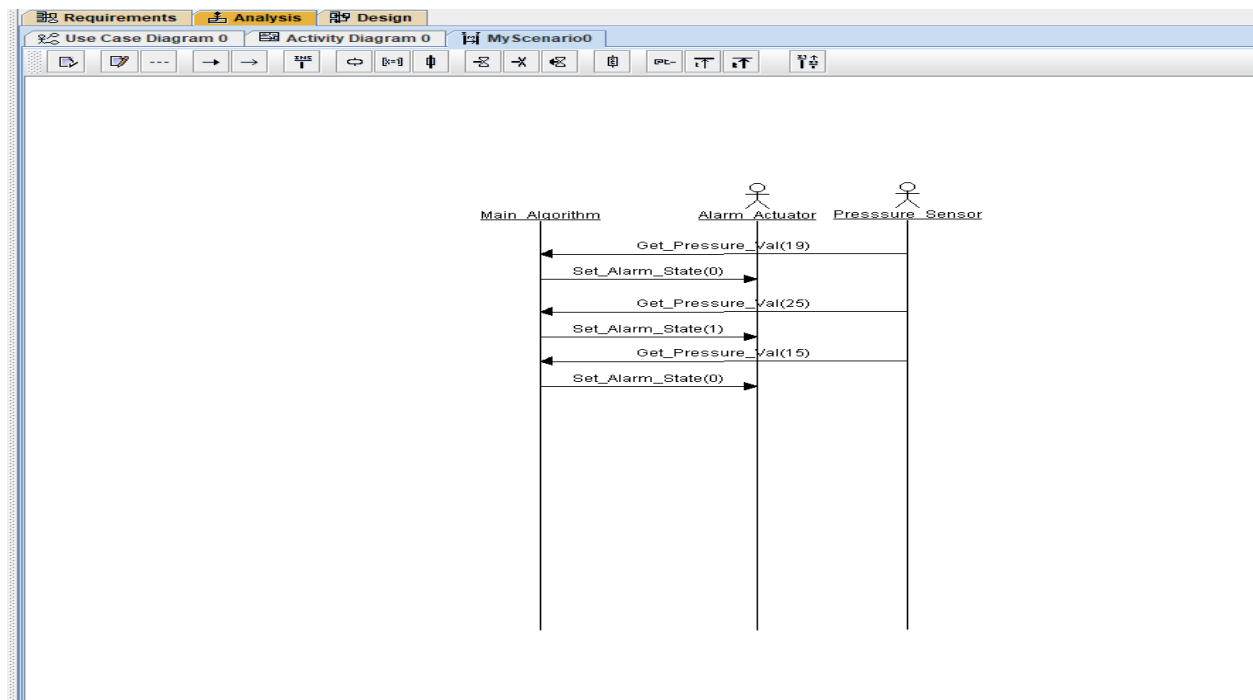
1)Use Case Diagram



2)Activity Diagram

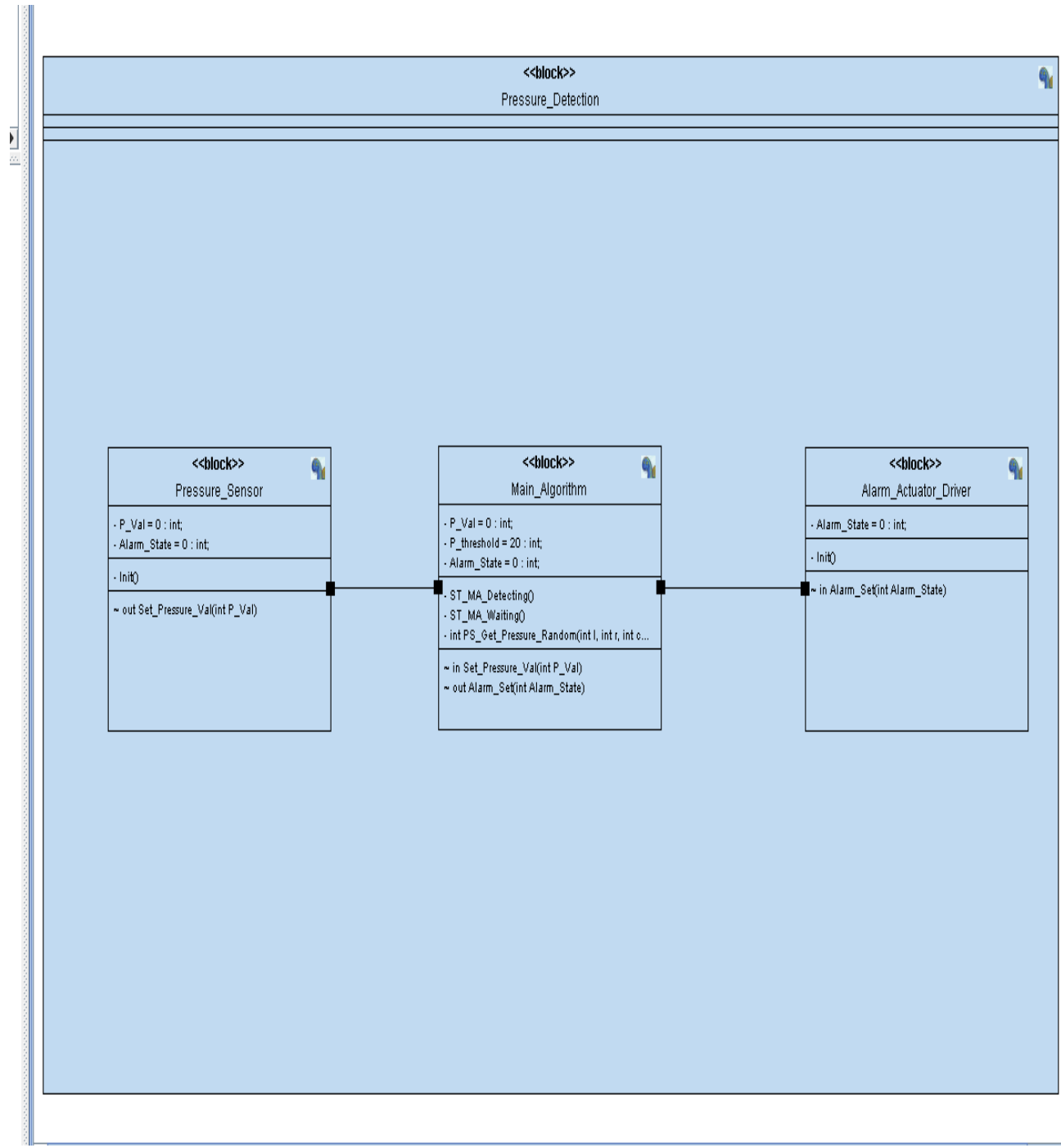


3)Sequence Diagram



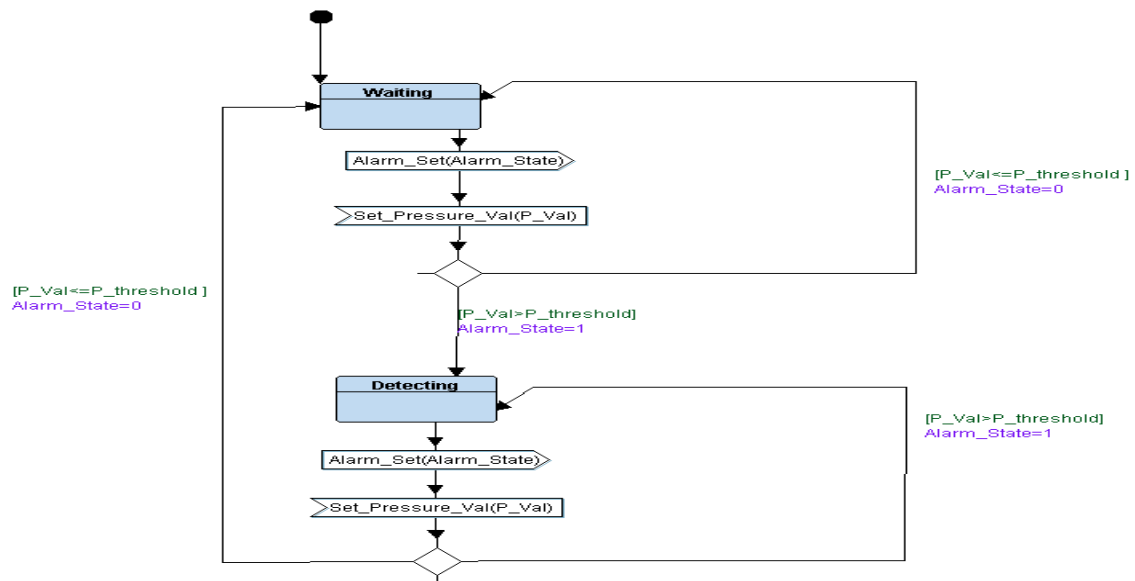
6-System Design

1)System Block Diagram

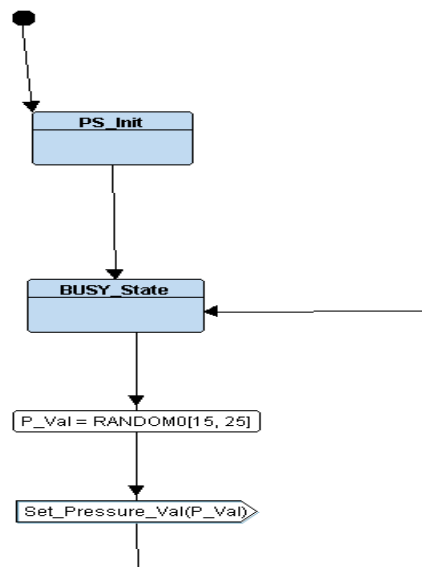


2)System Flow Charts

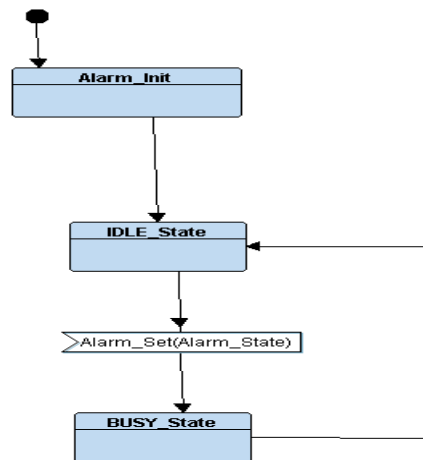
1-Main Algorithm Flow Chart



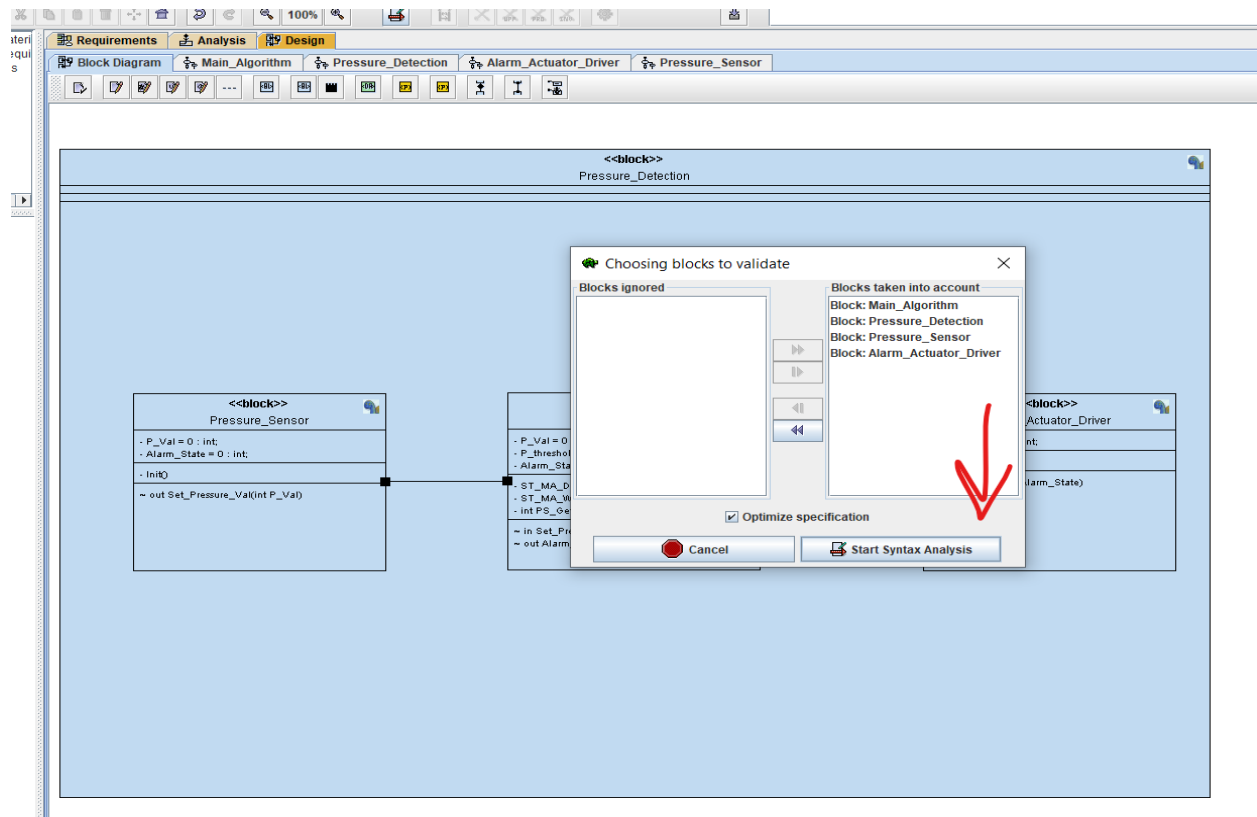
2-Pressure Sensor Flow Chart



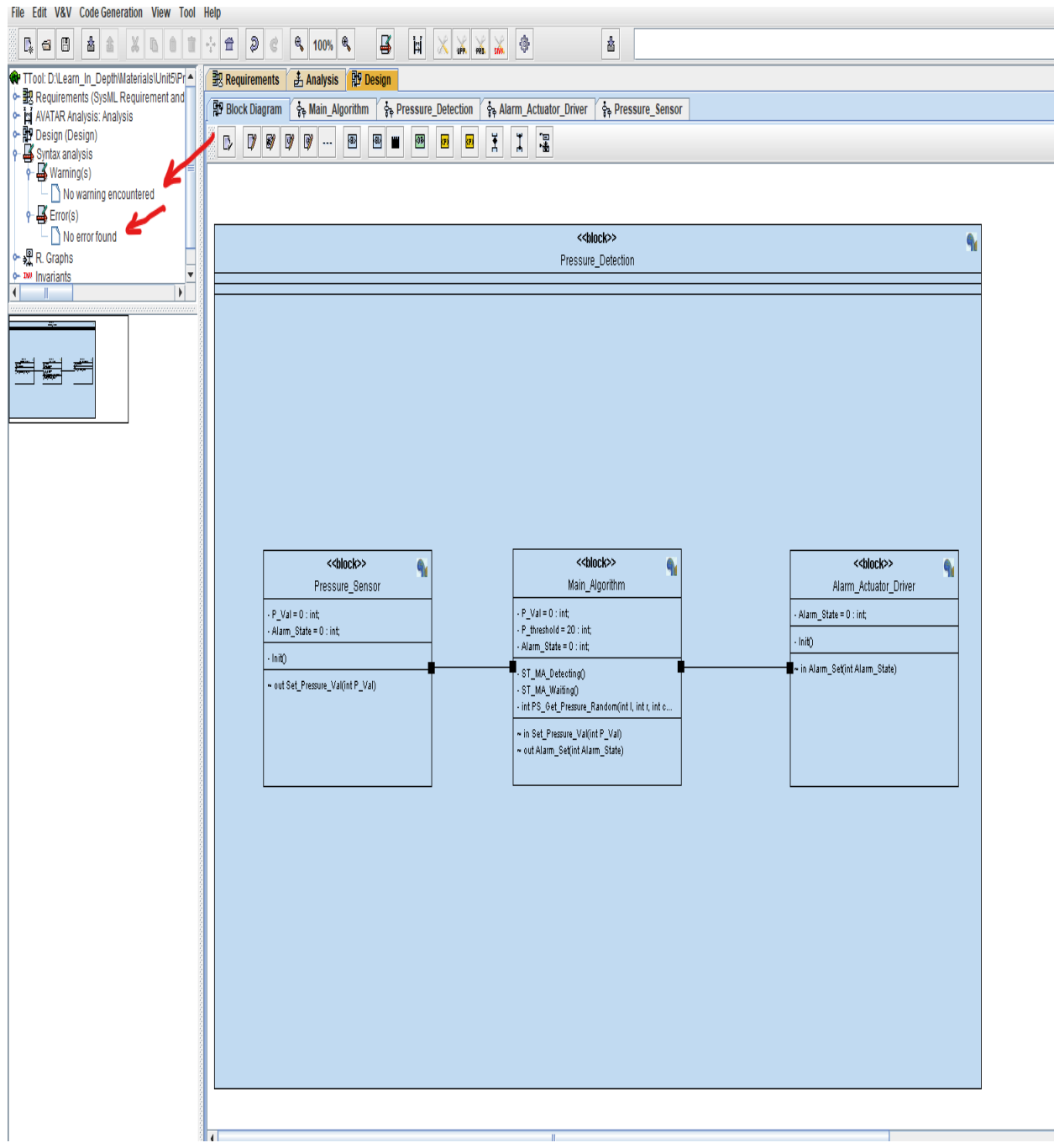
3-Alarm Actuator Flow Chart



#Check Syntax & Logic Errors



No Errors



7-SOFTWARE & TESTING

Project Files

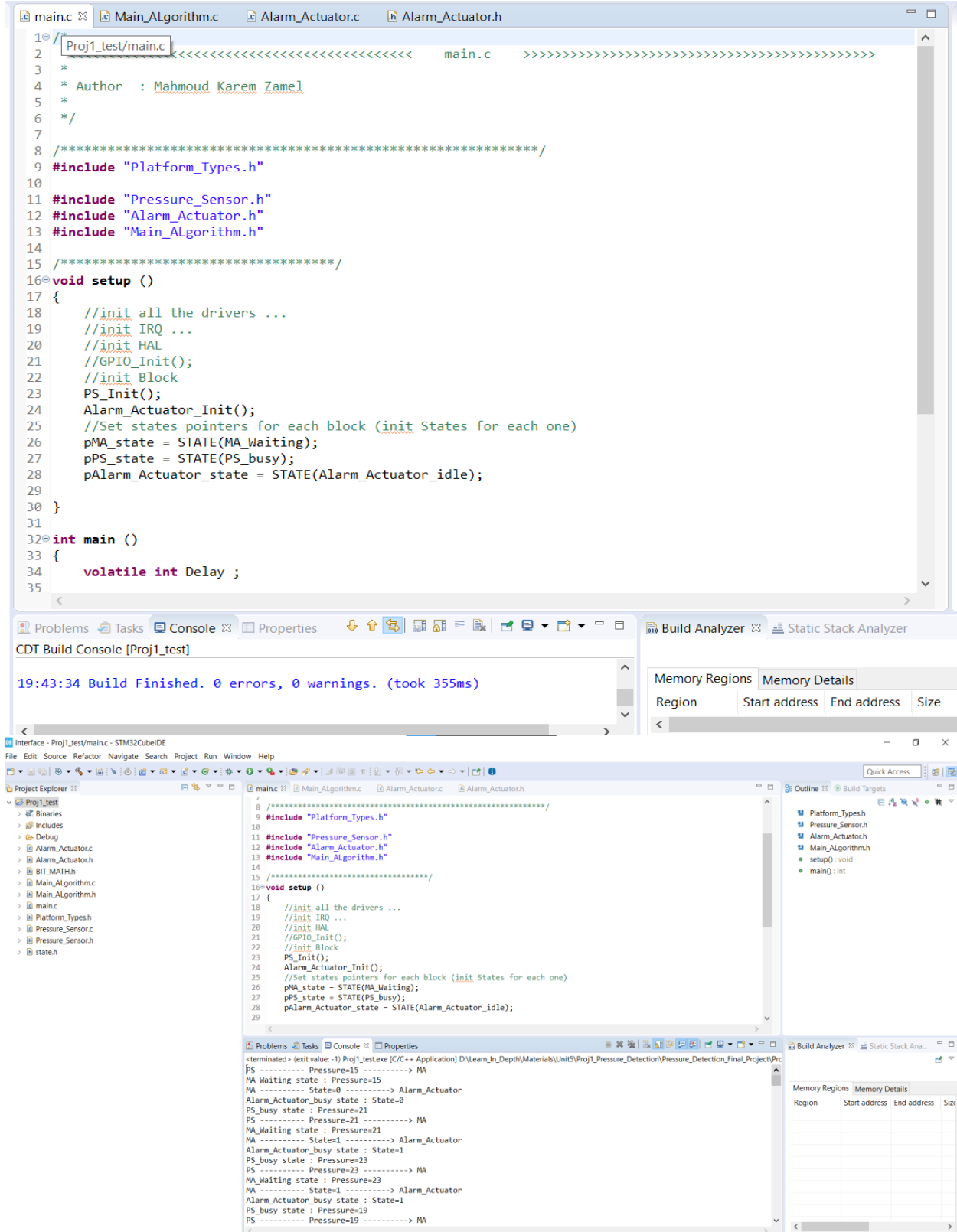
Name	Date modified	Type	Size
Simulation	8/25/2022 4:26 PM	File folder	
Alarm_Actuator.c	8/25/2022 2:39 PM	C File	2 KB
Alarm_Actuator.h	8/25/2022 3:57 PM	H File	1 KB
BIT_MATH.h	8/25/2022 2:39 PM	H File	1 KB
GPIO.c	8/25/2022 2:40 PM	C File	1 KB
GPIO.h	8/25/2022 2:40 PM	H File	2 KB
linker_script.ld	7/24/2022 12:36 AM	LD File	1 KB
main.c	8/25/2022 1:58 PM	C File	1 KB
Main_Algorithm.c	8/25/2022 3:53 PM	C File	2 KB
Main_Algorithm.h	8/25/2022 1:44 PM	H File	1 KB
Makefile	8/25/2022 3:51 PM	File	2 KB
Platform_Types.h	8/25/2022 1:44 PM	H File	2 KB
Pressure_Sensor.c	8/25/2022 2:43 PM	C File	2 KB
Pressure_Sensor.h	8/25/2022 1:44 PM	H File	1 KB
startup.c	7/24/2022 12:28 AM	C File	3 KB
state.h	8/25/2022 1:47 PM	H File	1 KB

Makefile

Name	Date modified	Type	Size
Simulation	8/25/2022 4:26 PM	File folder	
Alarm_Actuator.c	8/25/2022 2:39 PM	C File	2 KB
Alarm_Actuator.h	8/25/2022 3:57 PM	H File	1 KB
Alarm_Actuator.o	8/25/2022 7:37 PM	O File	9 KB
BIT_MATH.h	8/25/2022 2:39 PM	H File	1 KB
GPIO.c	8/25/2022 2:40 PM	C File	1 KB
GPIO.h	8/25/2022 2:40 PM	H File	2 KB
GPIO.o	8/25/2022 7:37 PM	O File	5 KB
linker_script.ld	7/24/2022 12:36 AM	LD File	1 KB
main.c	8/25/2022 1:58 PM	C File	1 KB
main.o	8/25/2022 7:37 PM	O File	9 KB
Main_Algorithm.c	8/25/2022 3:53 PM	C File	2 KB
Main_Algorithm.h	8/25/2022 1:44 PM	H File	1 KB
Main_Algorithm.o	8/25/2022 7:37 PM	O File	10 KB
Makefile	8/25/2022 3:51 PM	File	2 KB
Map_File.map	8/25/2022 7:37 PM	MAP File	10 KB
Platform_Types.h	8/25/2022 1:44 PM	H File	2 KB
Pressure_Detection_Karem.bin	8/25/2022 7:37 PM	BIN File	1 KB
Pressure_Detection_Karem.elf	8/25/2022 7:37 PM	ELF File	151 KB
Pressure_Sensor.c	8/25/2022 2:43 PM	C File	2 KB
Pressure_Sensor.h	8/25/2022 1:44 PM	H File	1 KB
Pressure_Sensor.o	8/25/2022 7:37 PM	O File	9 KB
startup.c	7/24/2022 12:28 AM	C File	3 KB
startup.o	8/25/2022 7:37 PM	O File	5 KB
state.h	8/25/2022 1:47 PM	H File	1 KB

```
MINGW32/d/Learn_In_Depth/Materials/Unit5/Proj1_Pressure_Detection/Pressure_Detection_Final_Proj...
repair@DESKTOP-E2DR04F MINGW32 /d/Learn_In_Depth/Materials/Unit5/Proj1_Pressure_Detection/Pressure_Detection_Final_Proj/Code_Proteus_STM32F103C6
$ make
arm-none-eabi-gcc.exe -c -gdwarf-2 -mcpu=cortex-m3 -I . Alarm_Actuator.c -o Alarm_Actuator.o
arm-none-eabi-gcc.exe -c -gdwarf-2 -mcpu=cortex-m3 -I . GPIO.c -o GPIO.o
arm-none-eabi-gcc.exe -c -gdwarf-2 -mcpu=cortex-m3 -I . Main_Algorithm.c -o Main_Algorithm.o
arm-none-eabi-gcc.exe -c -gdwarf-2 -mcpu=cortex-m3 -I . Pressure_Sensor.c -o Pressure_Sensor.o
arm-none-eabi-gcc.exe -c -gdwarf-2 -mcpu=cortex-m3 -I . main.c -o main.o
arm-none-eabi-gcc.exe -c -gdwarf-2 -mcpu=cortex-m3 -I . startup.c -o startup.o
arm-none-eabi-gcc.exe -T linker_script.ld -I . Alarm_Actuator.o GPIO.o Main_Algorithm.o Pressure_Sensor.o main.o startup.o -Map=Map_File.map -o Pressure_Detection_Karem.elf
arm-none-eabi-objcopy.exe -O binary Pressure_Detection_Karem.elf Pressure_Detection_Karem.bin
===== Building Process is done =====
repair@DESKTOP-E2DR04F MINGW32 /d/Learn_In_Depth/Materials/Unit5/Proj1_Pressure_Detection/Pressure_Detection_Final_Proj/Code_Proteus_STM32F103C6
$
```

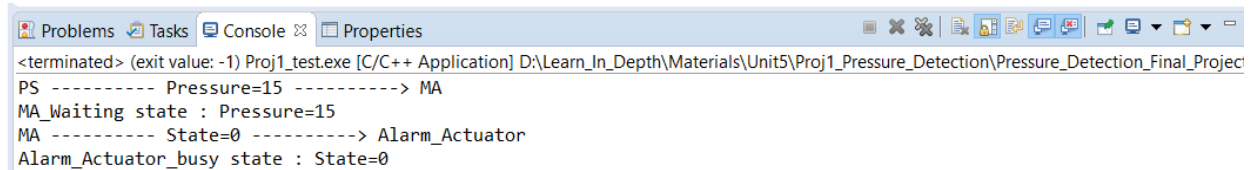
Testing the Project



Explain Testing

I made a function to generate random values to act as a pressure sensor ... So there are many test cases in this range [15:25] , threshold = 20 bar.

1st Case :



```
<terminated> (exit value: -1) Proj1_test.exe [C/C++ Application] D:\Learn_In_Depth\Materials\Unit5\Proj1_Pressure_Detection\Pressure_Detection_Final_Project
PS ----- Pressure=15 -----> MA
MA_Waiting state : Pressure=15
MA ----- State=0 -----> Alarm_Actuator
Alarm_Actuator_busy state : State=0
```

In this case the pressure =15 (Less than threshold) ... The pressure sensor sent this value to main algorithm and because it is less than 20 bar the main algorithm sent to alarm actuator to stop .

2nd Case :

```
PS_busy state : Pressure=21
PS ----- Pressure=21 -----> MA
MA_Waiting state : Pressure=21
MA ----- State=1 -----> Alarm_Actuator
Alarm_Actuator_busy state : State=1
```

In this case the pressure =21 (Bigger than threshold) ... The pressure sensor sent this value to main algorithm and because it is bigger than 20 bar the main algorithm sent to alarm actuator to Start .

8-Simulation

