First Term (Final Project No.1)

Pressure Controller

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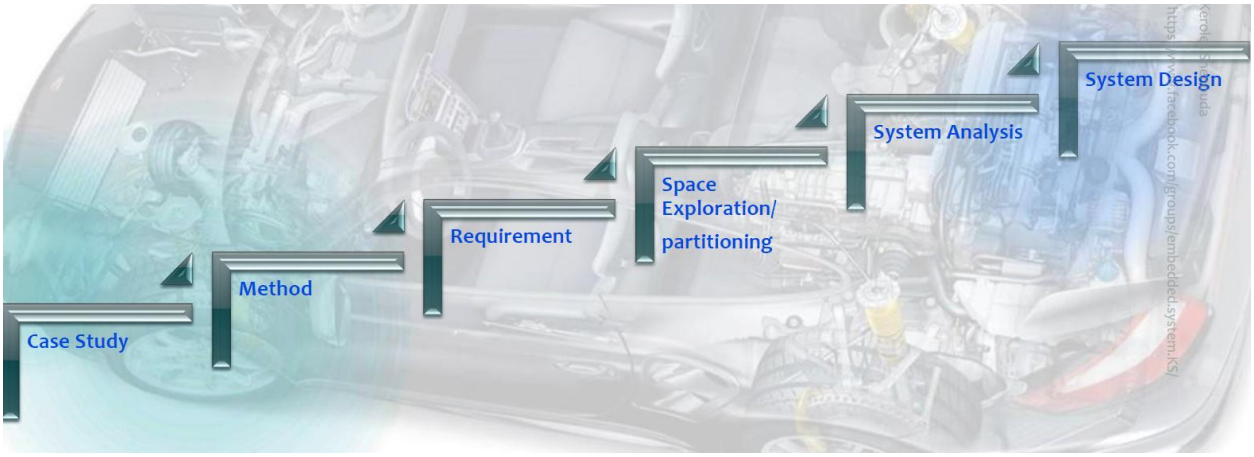
Development of a Pressure Monitoring System for Airplane Cabinets

The aim is to design and implement a pressure monitoring system for airplane cabinets to ensure the safety and comfort of passengers and crew during flight. The system will utilize advanced sensors to continuously monitor the pressure within the airplane cabinets and provide real-time data to the flight crew.

In the event of any deviations from the optimal pressure range, the system will trigger alerts and notifications to prompt appropriate corrective actions.

I followed a design sequence to model the system:



Case study

Pressure controlling system

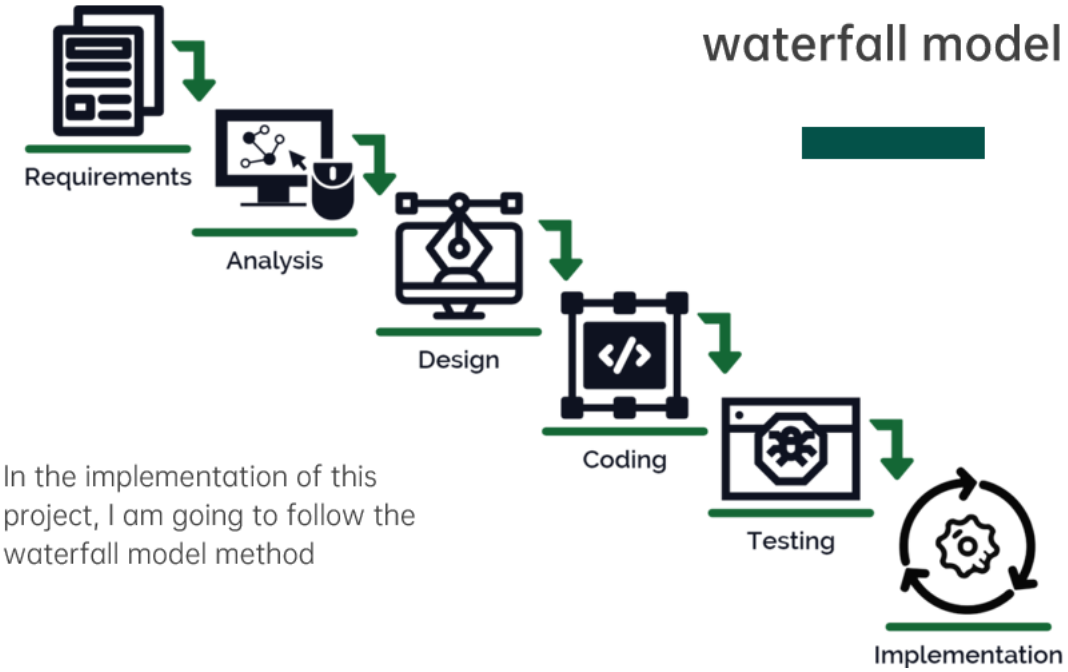
A "client" expects you to deliver the software of the following system:

- 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.
- keeps track of the measured values.

Pressure Controller: Assumptions

- The controller set up and shutdown procedures are not modeled
- The controller maintenance is not modeled
- The pressure sensor never fails
- The alarm never fails
- The controller never faces power cut
- Versioning "keep track of measured value" option is not modeled in the first version of design.

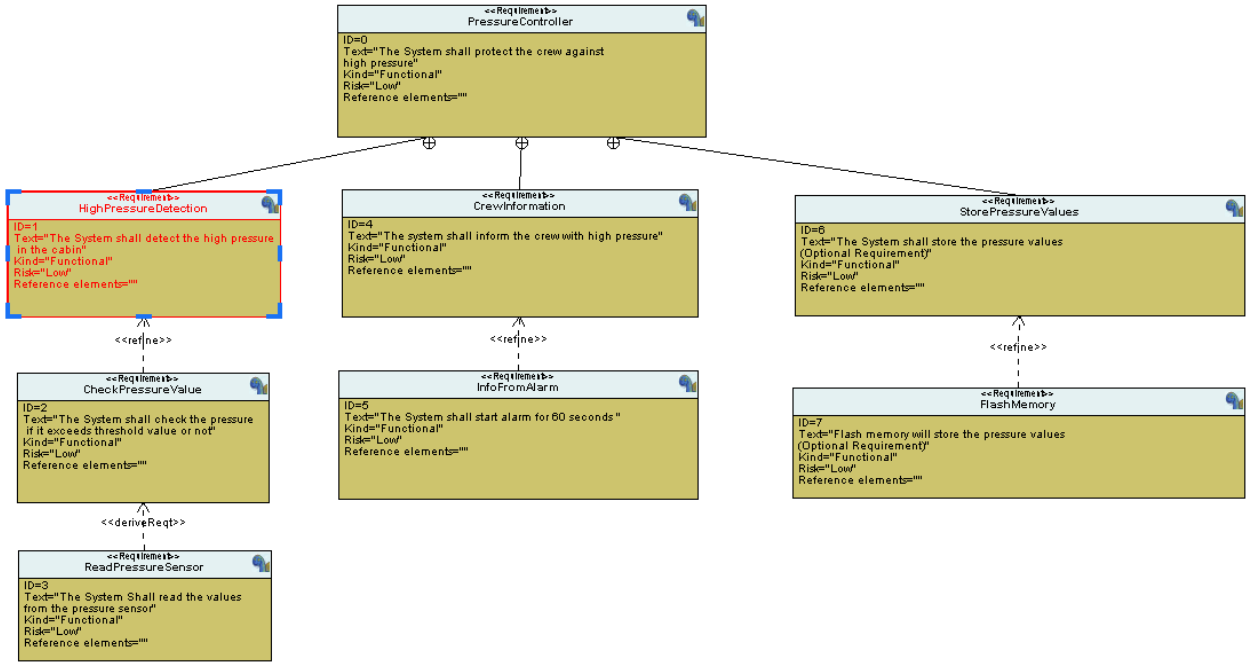
Method



System requirements

A requirement node identifies a requirement by:

- unique identifier (so as to achieve traceability)
- A description in plain text
- A type (functional, non-functional, performance, security).



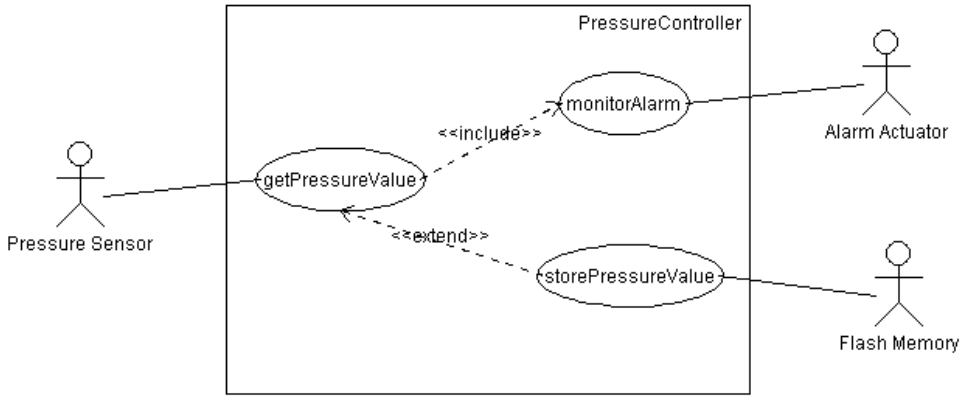
System analysis

Analysis Understanding what a client wants. So, it does not mean "creating a system", but rather "understanding the main functionalities" of the system to be designed. It can be performed before or after the partitioning stage.

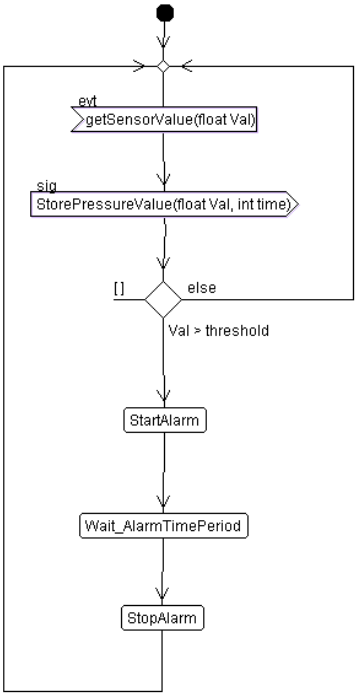
Analysis method:

- System boundary and main functions→ Use Case Diagram
- Relations between main functions → Activity Diagram
- Communications between main system entities and actors → Sequence Diagram

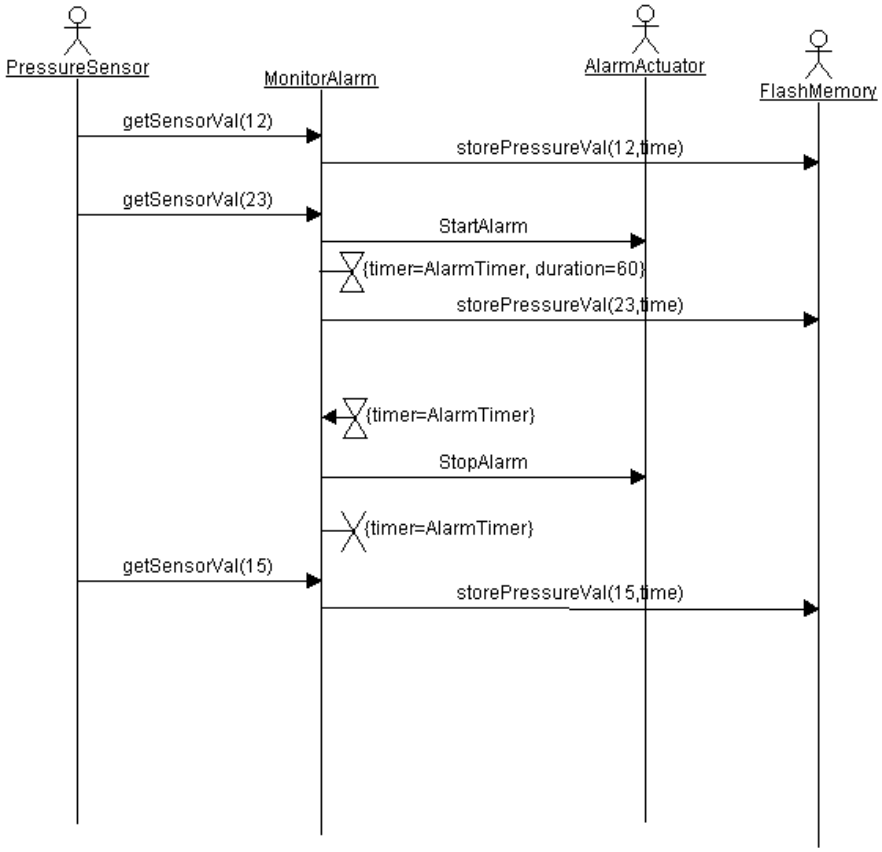
Use Case Diagram:



Activity Diagram



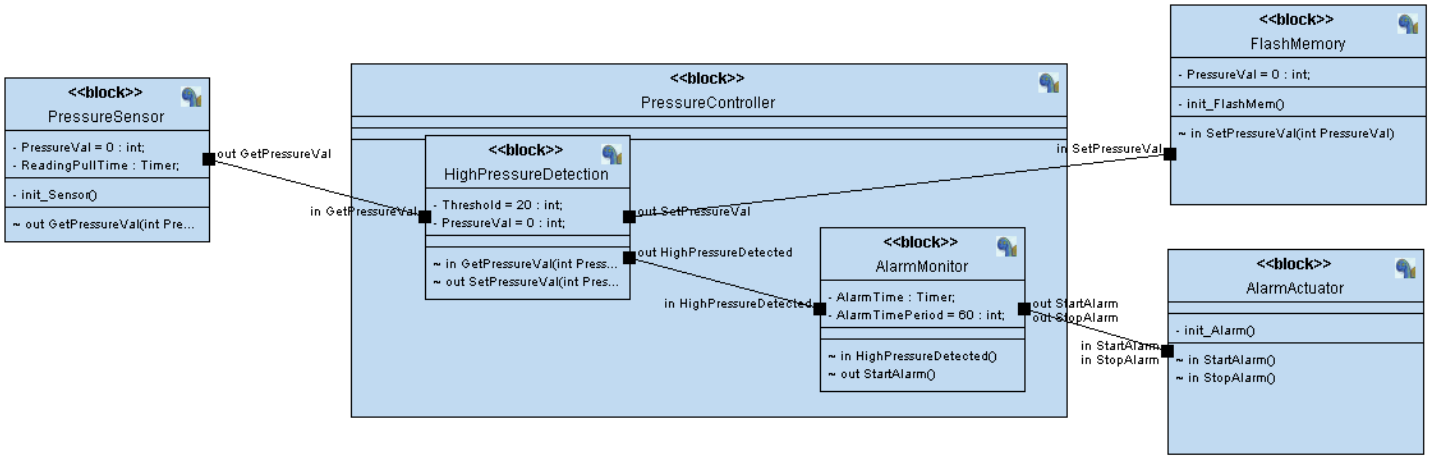
Sequence Diagram



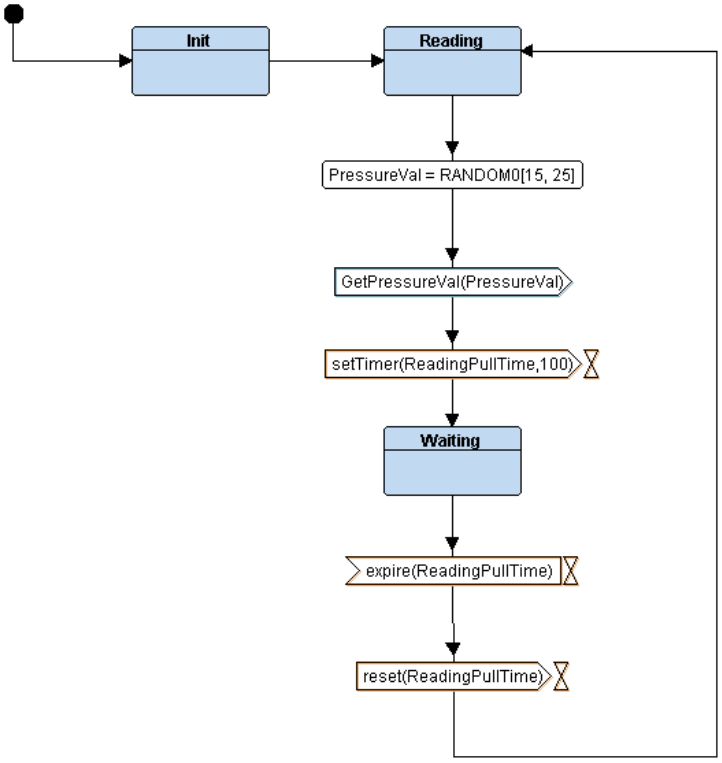
System Design

Making what a client wants ("creating a system" that complies with the client requirements.)

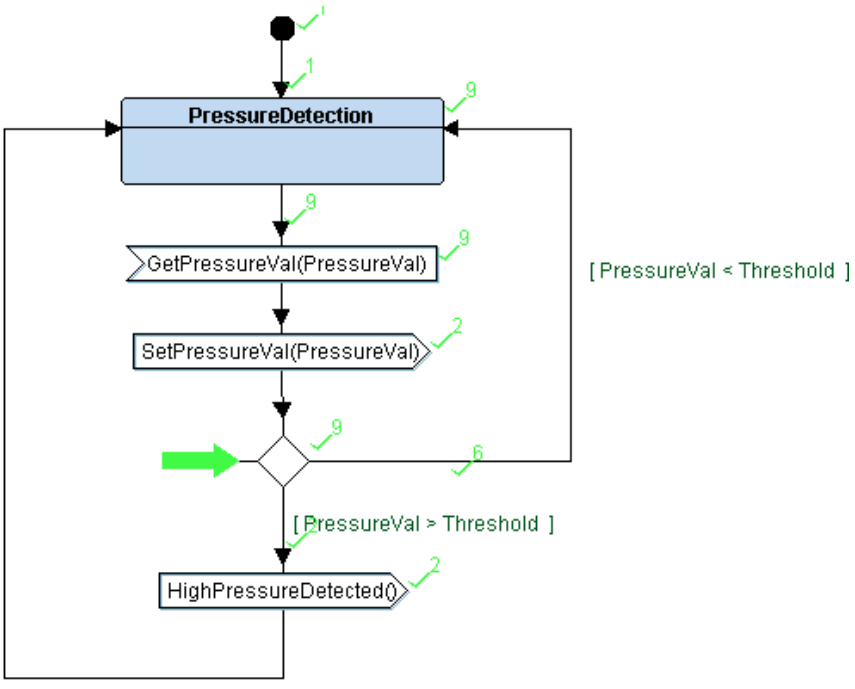
- System architecture → Block Definition and Internal Block Diagram
- Behavior of the system →State Machine Diagram



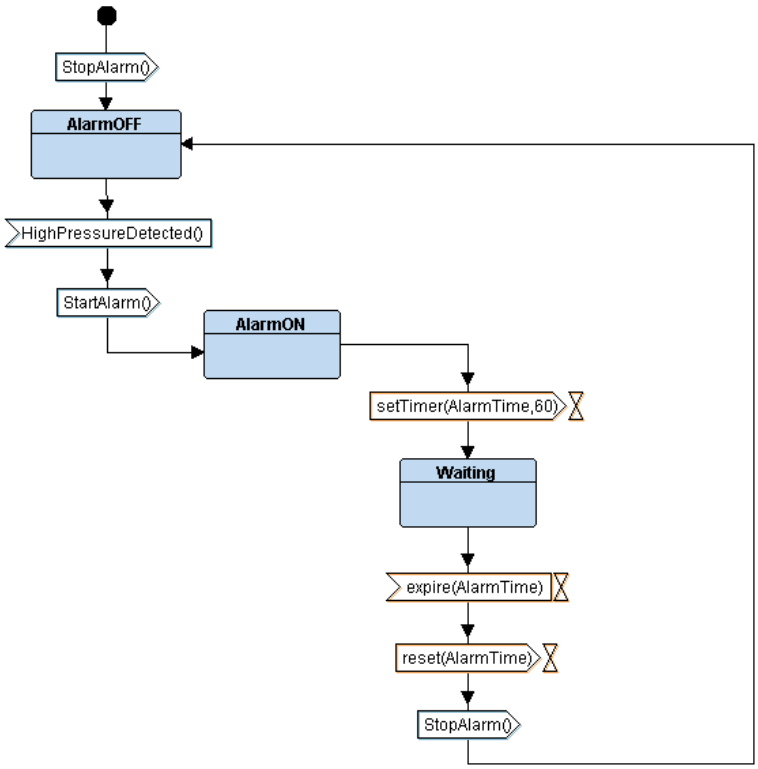
Pressure sensor design



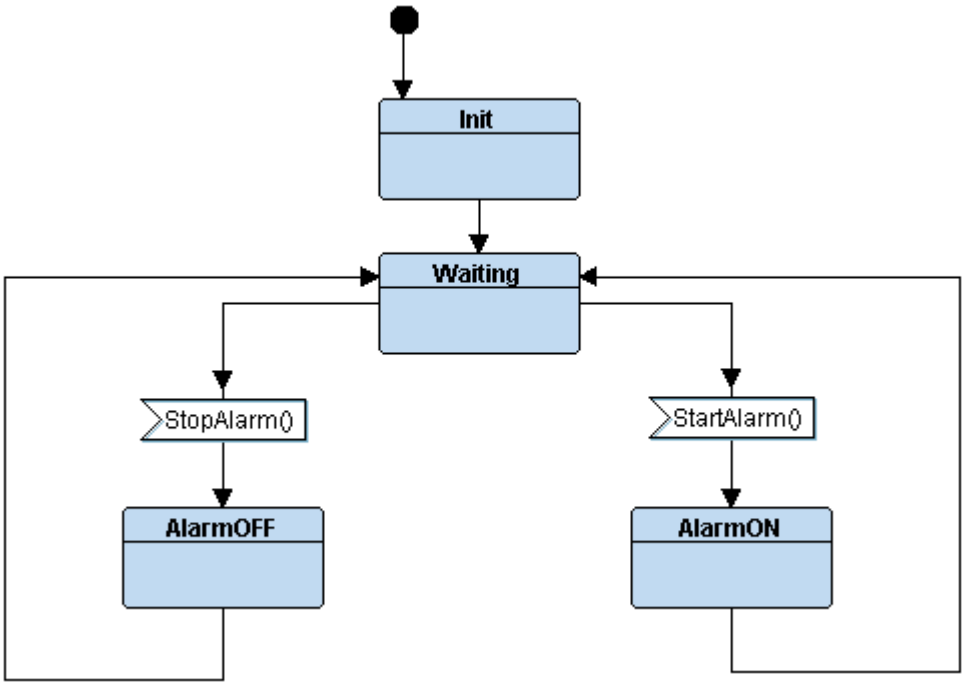
Pressure detection design



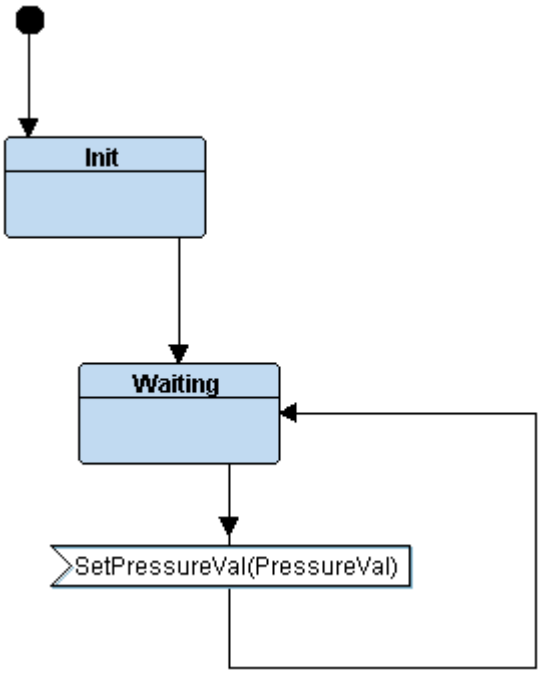
Alarm Monitor design



Alarm Actuator design

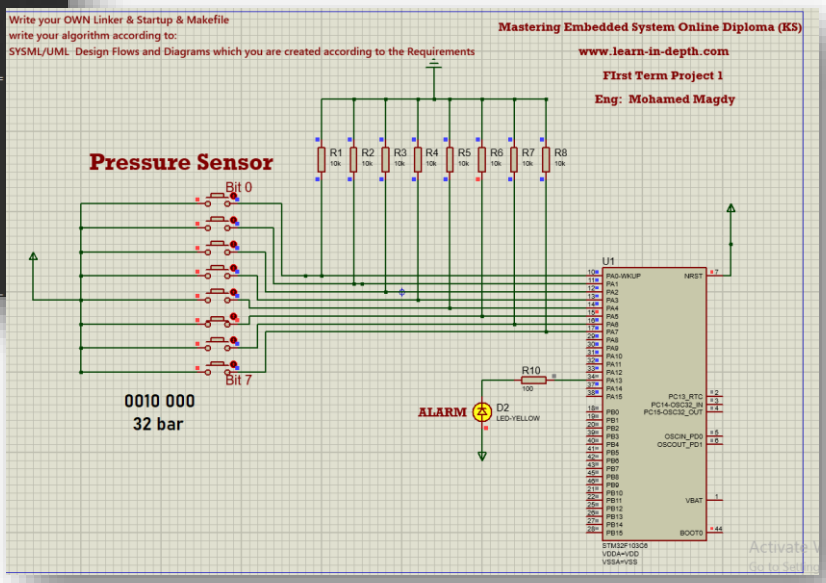


Flash Memory design



You will find simulation using proteus also trace the code with eclipse

```
PS_Reading -------- Pressure = 23 ------> PS_Waiting
Sensor Waiting....
====================> High Pressure Detected <==================
=======> Alarm started <=======
Alarm ON
=======> Alarm Waiting.... <=======
Alarm OFF
=======> Alarm stopped <=======
PS_Reading -------- Pressure = 24 ------> PS_Waiting
Sensor Waiting....
====================> High Pressure Detected <==================
=======> Alarm started <=======
Alarm ON
=======> Alarm Waiting.... <=======
Alarm OFF
=======> Alarm stopped <=======
PS_Reading -------- Pressure = 24 ------> PS_Waiting
Sensor Waiting....
====================> High Pressure Detected <==================
=======> Alarm started <=======
Alarm ON
=======> Alarm Waiting.... <=======
Alarm OFF
=======> Alarm stopped <=======
PS_Reading -------- Pressure = 16 ------> PS_Waiting
Sensor Waiting....
=================> No High Pressure Detected <================
Alarm OFF
=======> Alarm stopped <=======
PS_Reading -------- Pressure = 22 ------> PS_Waiting
Sensor Waiting....
====================> High Pressure Detected <==================
```



Also, there Simulation Trace on ttool to present the sequence