

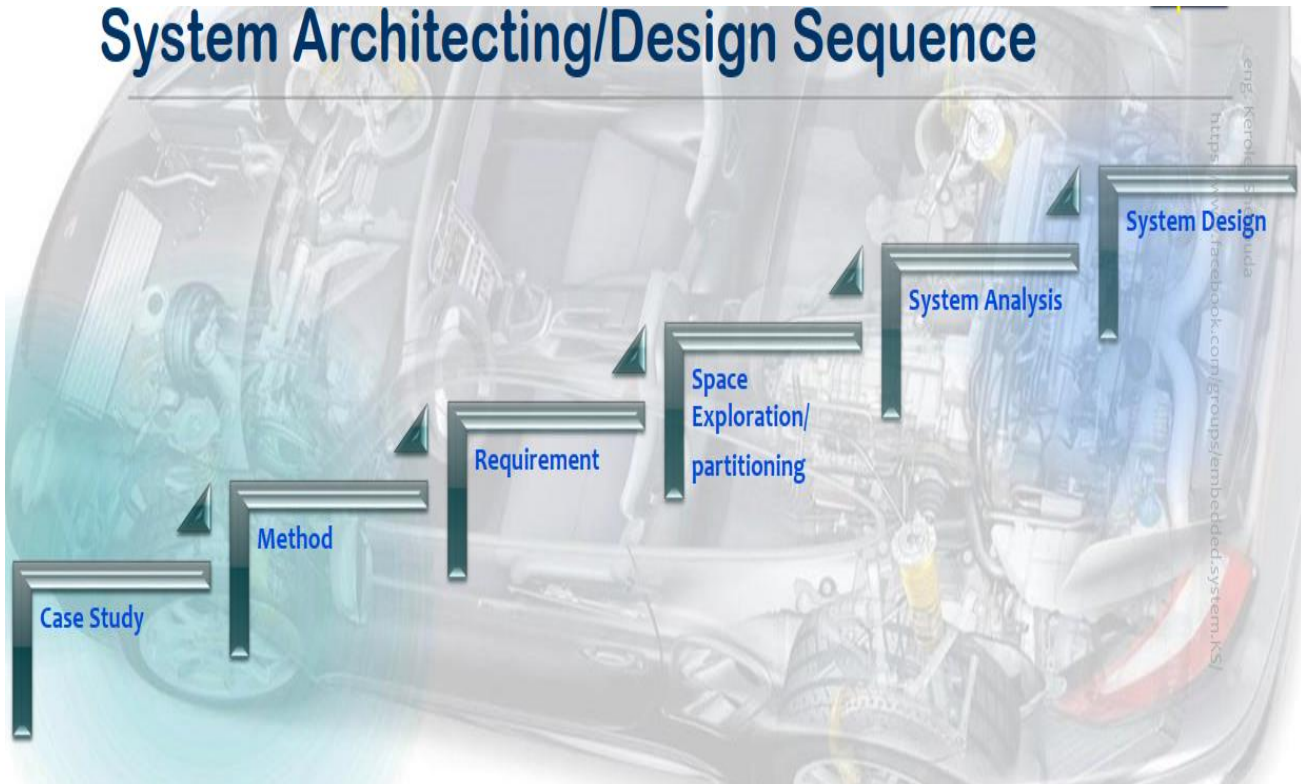
MASTERING EMBEDDED SYSTEM
PROJECT 1
PRESSURE CONTROLLER

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Introduction

A pressure controller project in embedded systems involves the design and development of a system that can monitor and control the pressure of fluids or gases in real-time using embedded hardware and software. It aims to regulate and maintain a specific pressure setpoint within a defined range. It involves the integration of pressure sensors, actuators, microcontrollers, and software algorithms to achieve accurate and reliable pressure control. The use of embedded systems in pressure control offers several advantages, including compact size, low power consumption, real-time response, and flexibility in customization for specific applications. The project requires a combination of hardware design, firmware development, and system integration to create a robust and efficient pressure control solution.

System Architecting/Design Sequence



1-Case study

Pressure controlling system

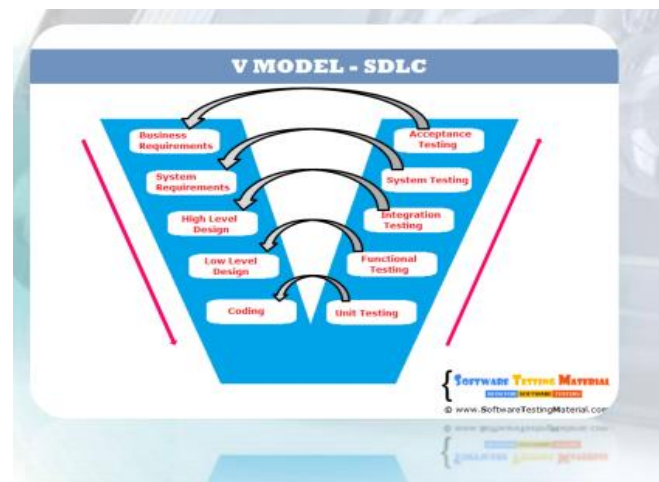
A "client" expects you to deliver the software of the following system:

- 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.

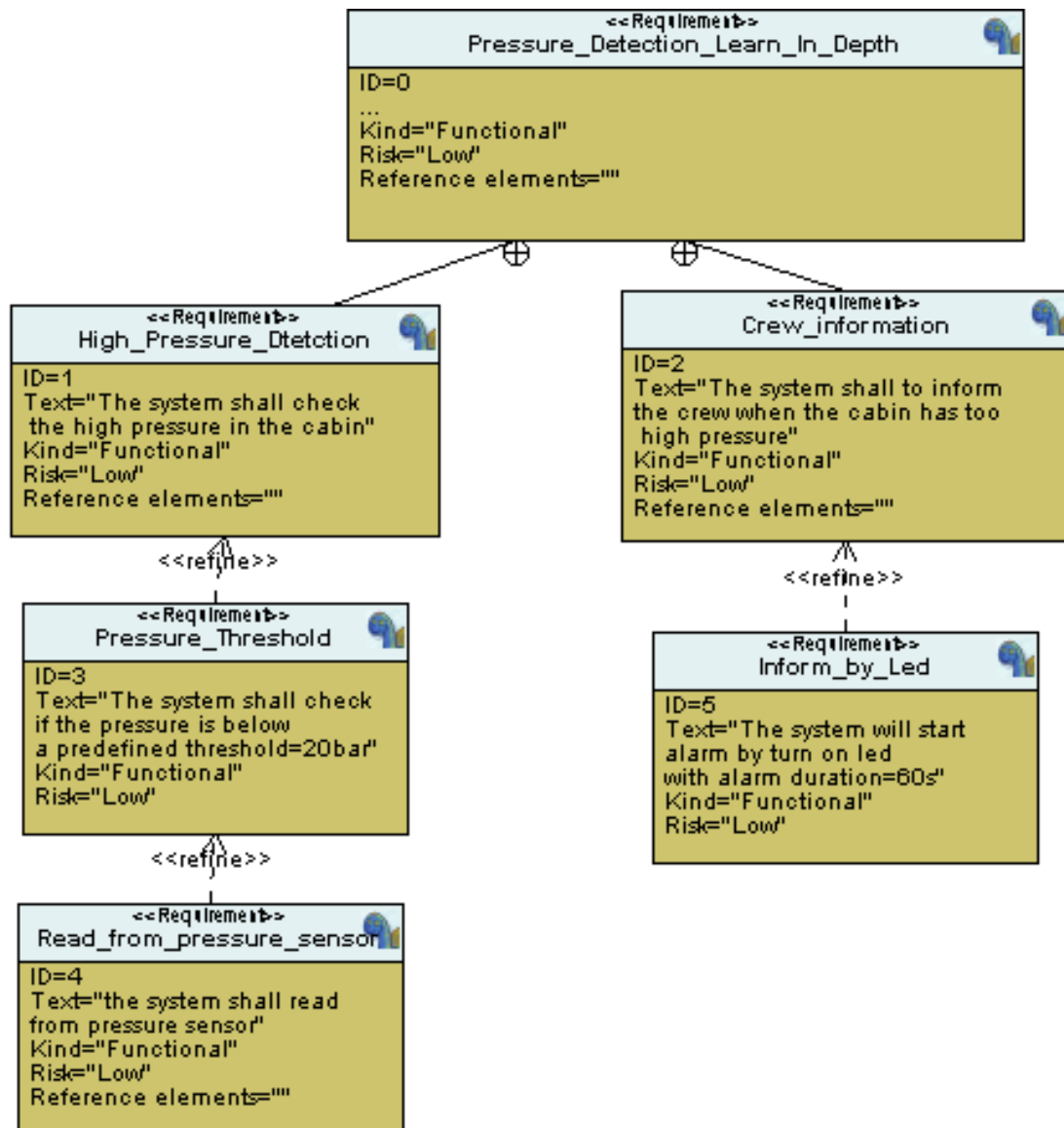
2-Method



3-System requirements

A requirement node identifies a requirement by:

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



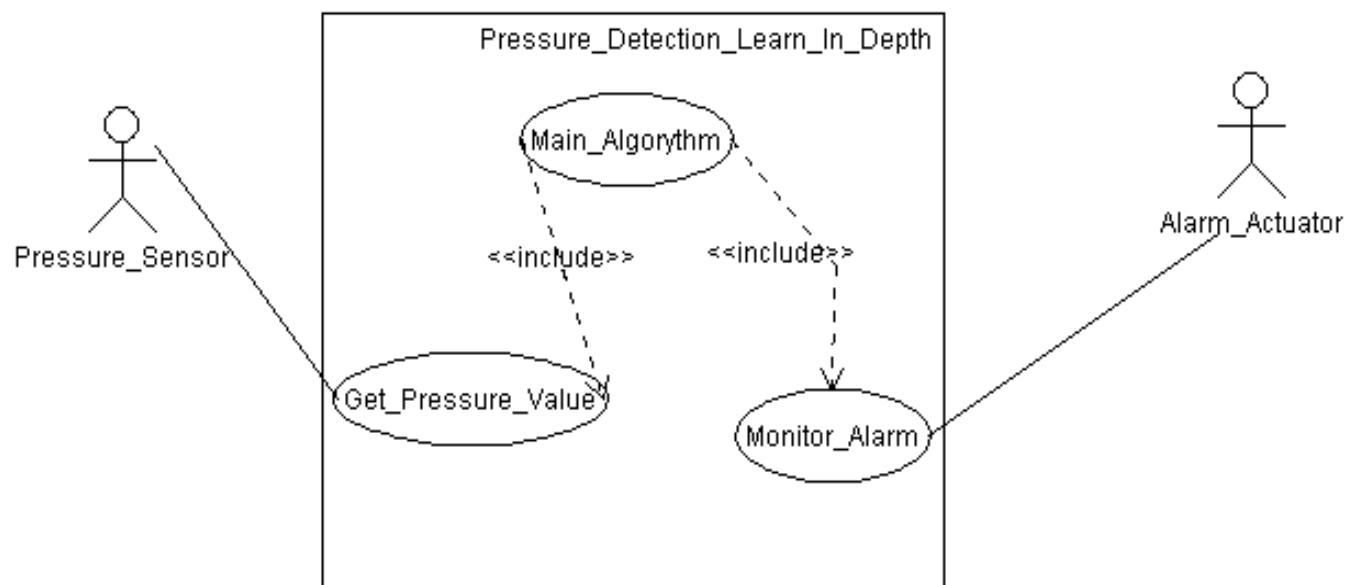
4-System analysis

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

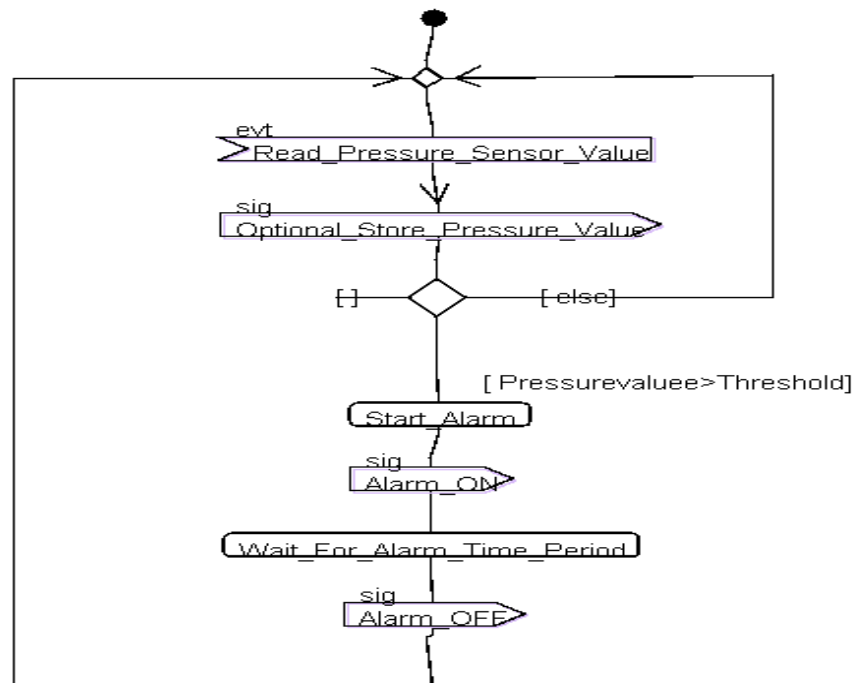
❖ Analysis method:

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

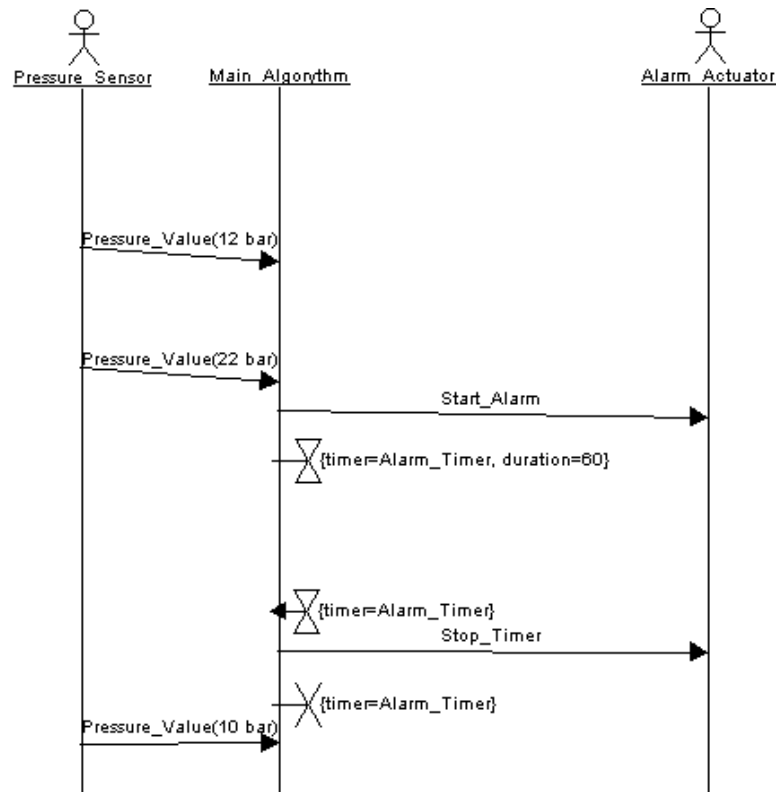
❖ Analysis using case diagram:



❖ Analysis using activity diagram:



❖ Analysis using Sequence diagram:



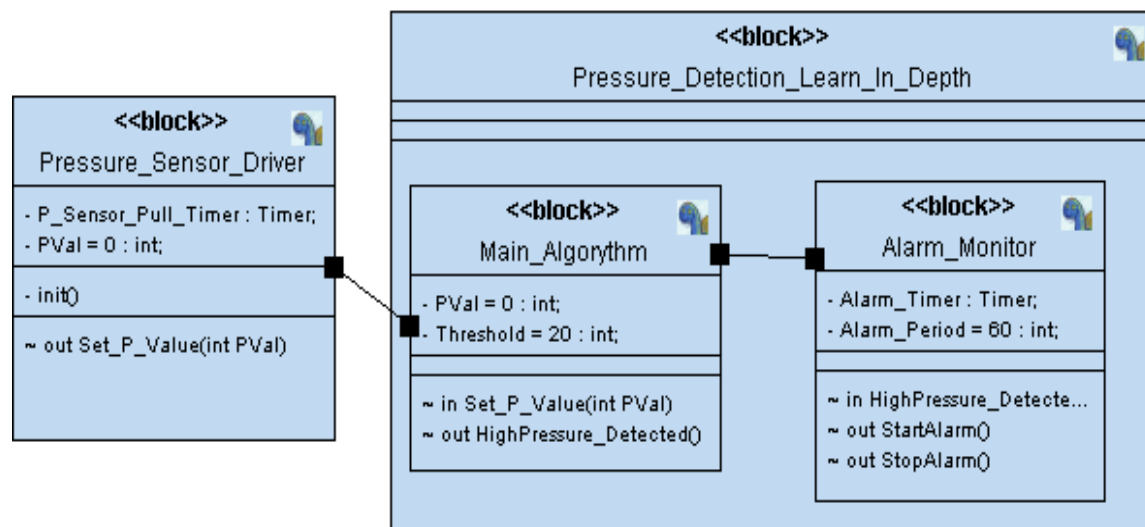
5-System Design:

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

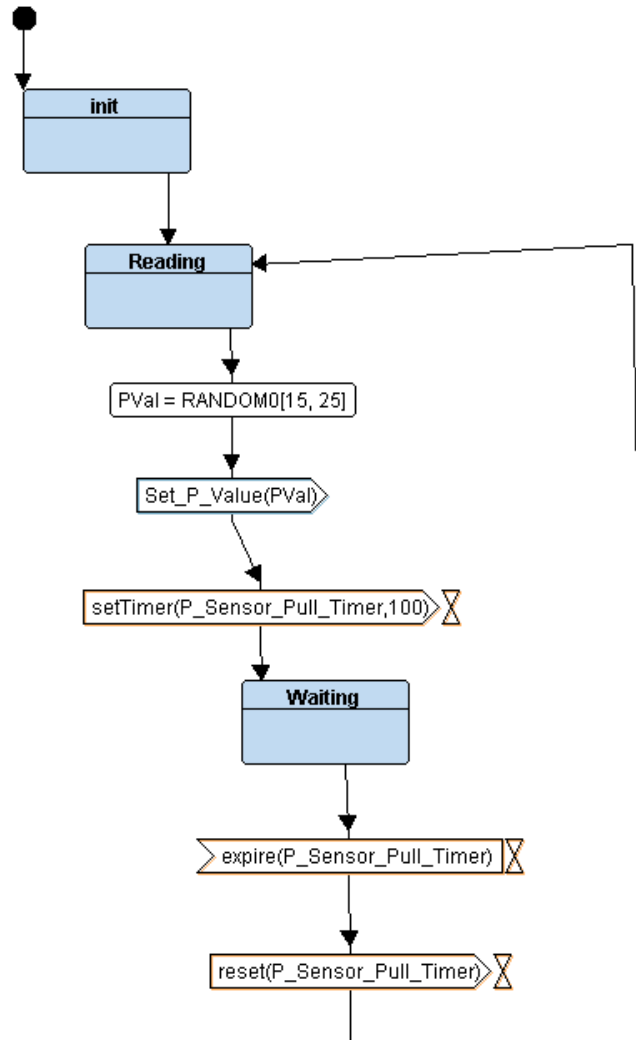
System architecture → Block Definition Diagram and Internal Block Diagram

Behavior of the system → State Machine Diagram

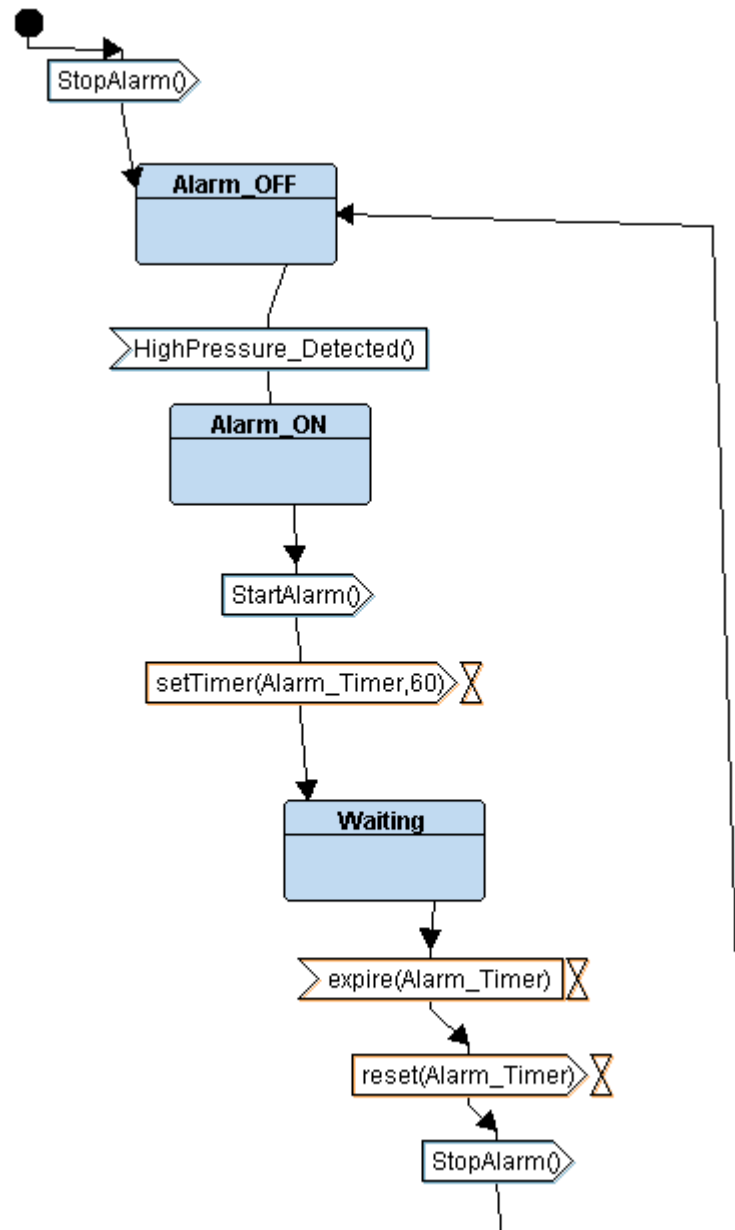
❖ Block diagram



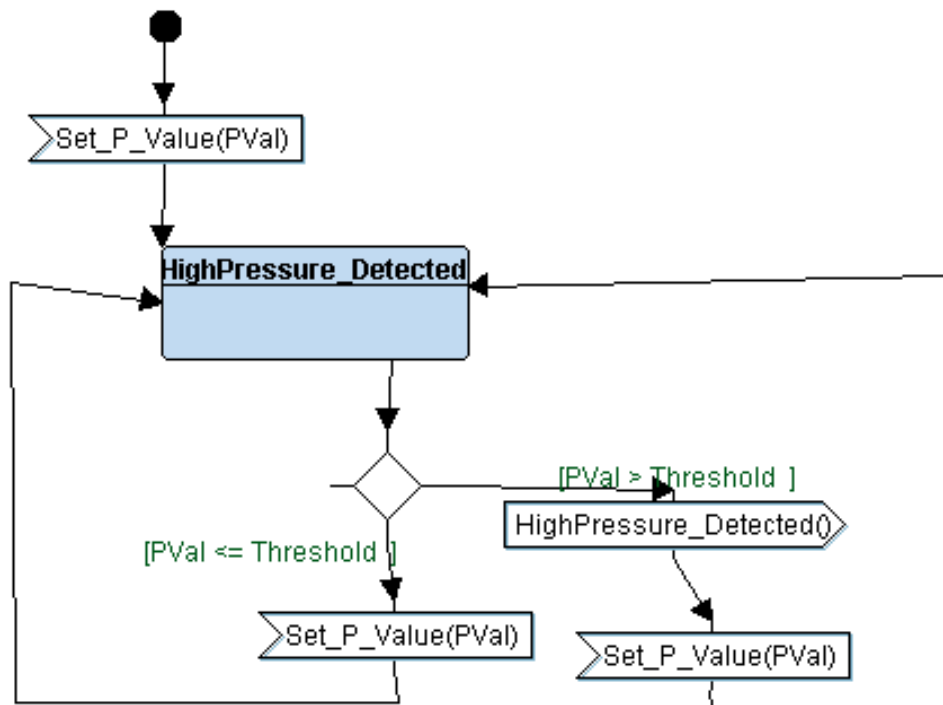
Pressure sensor design



❖ Alarm monitor design



❖ Main algorithm design:



6-Simulation:

