

Software Engineering

Books or notes are **not** allowed.

Write only on these sheets. **Concise** and **readable** answers please.

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Home security system

A home security system (HSS) has the goal of monitoring a home and recognizing harmful events (intrusion, fire, etc).

An HSS system is composed of:

-a number of sensors: they can be

open / close sensor (to be installed on windows or doors, to recognize if they are opened closed)

infrared sensor (to be installed in rooms, they recognize if a person is / is not in a room)

fire sensor (to be installed in rooms, they recognize fire and smoke)

CO2 sensor (measures the concentration of CO2 and other harmful gases)

all sensors are powered by a battery, and connected via wifi to the controller

-controller: a computer that monitors all sensors and implements the security logic (ex do something if a door is opened or a person is detected). The computer acts as a wifi hot spot and is connected to all sensors. The computer has no user interface (in terms of screen, keyboard, mouse). The computer is connected to the internet

-app: an application running on a smartphone, used to interact with the controller via internet. In particular the user can activate / dis-activate the HSS, configure it, view the log of events (door opened, door closed etc), receive important notifications (ex intrusion detected, battery low on a certain sensor, sensor dead or ill functioning, etc).

The HSS is installed and configured by a technician, then the home owner uses it on a regular basis via the app. However, the home owner could also install and configure it.

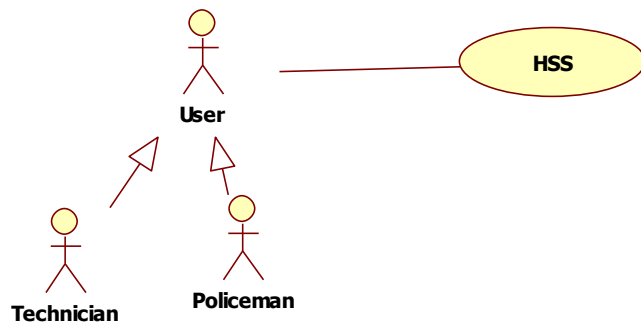
The HSS can also be connected (via Internet) to a security company or the police, that can intervene physically in case of a harmful event.

In the following you should analyze and model the HSS system.

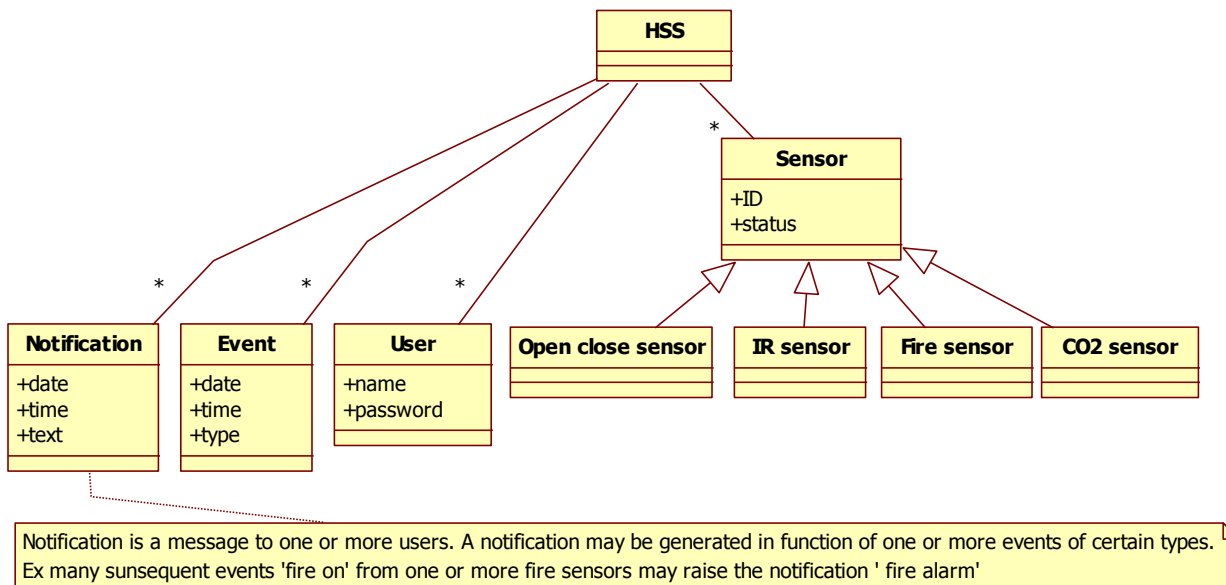
1 – a. Define the **context diagram** (including relevant interfaces)

Actor	Physical interface	Logical interface
User	Smartphone / PC	GUI

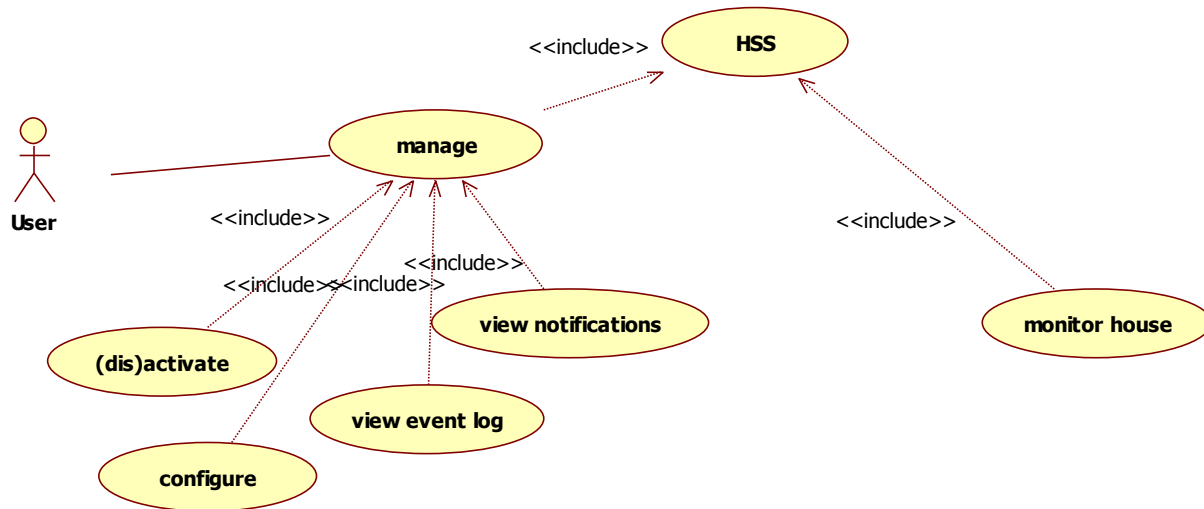
As clearly expressed in the text, sensors, controller, app are part of HSS, so they are NOT actors.



1-b Define the **glossary** (key concepts and their relationships) (UML class diagram) for the HSS System

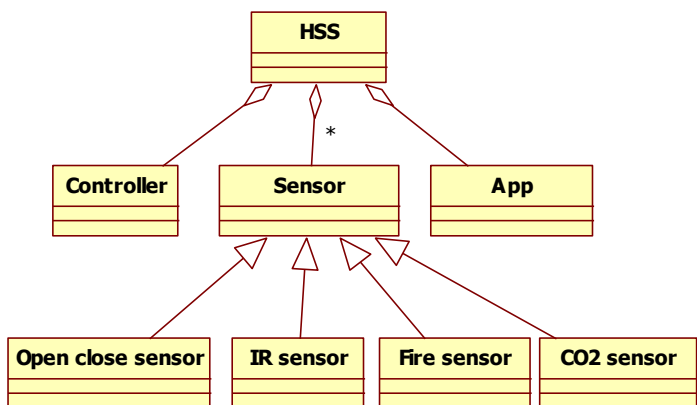


1-c Draw the Use Case Diagram for the HSS system. For each Use Case give self-explainable long names, or a short textual description



1-d Draw the system design for the HSS system

The system design shows the components (hw and sw) of HSS, so here we find controller, sensors, app



1-e Discuss the key Non Functional requirement 'security' for the HSS system

Only authorized users should be able to read / write information on HSS. Wi fi access should be protected (ex cryptography). GUI access should be protected (high level of authentication).

2 black box

Define black box tests for the following function, using equivalence classes and boundary conditions.

```
boolean checkGasSensor(int partPerMillion, int batteryCharge, int temperature)
```

The function receives the charge gas concentration (partPerMillion, can be any integer) the charge of the battery (can be 0 to 100), the outside temperature (any integer). The function returns true if the gas sensor is reliable, false otherwise, and reliable is defined as AND of these conditions

--partPerMillion ≥ 0

--the battery is well charged, so batteryCharged ≥ 50

--the temperature is in the range -20 +40

Ex checkGasSensor(100, 55, 20) \rightarrow true

checkGasSensor(100, 45, 50) \rightarrow false