



HIGHER SCHOOL OF COMMUNICATION OF TUNIS

---

## **Design Document**

# **Fire Detection System**

---

*Author:*

Flihi Arij  
Sadkaoui Marwa

*Instructor:*

Mohamed-Bécha KAÂNICHE

November 28, 2022

Contents

1	Introduction	2
2	Conception	2
2.1	Use case diagram:	2
2.2	Sequential diagram:	3
2.3	Class diagram:	4
2.4	Deployment diagram:	5

List of Figures

1	Use case diagram	2
2	Sequence diagram	3
3	Class diagram	4
4	Class diagram	5

# 1 Introduction

Today, the security of spaces (closed and open) and of individuals has become unavoidable, as they are exposed to many dangers. Among these dangers, we can mention the fires, which cause material losses and damage the human life.

To minimize these losses due to this danger, we must be able to detect the fires at an early stage using the technologies of the Internet of Things, taking into account several factors that can facilitate the detection phase.

In case of most of the kitchens, we can see that gas and flame are important factors that can identify the fire.

We propose a system which must answer the following use cases:

- Smoke detection: this task requires a smoke gas sensor with a well determined threshold.
- flame detection: this task requires a flame sensor with a well determined threshold.
- Alert in case of fire detection (either by smoke or by flame) by a buzzer and a notification on the progressive web application (PWA).

## 2 Conception

### 2.1 Use case diagram:

A use case diagram is a way to summarize details of a system and the users within that system. It is generally shown as a graphic depiction of interactions among different elements in a system. Use case diagrams will specify the events in a system and how those events flow, however, the use case diagram does not describe how those events are implemented.

As illustrated in the figure, the user needs to have login in order to access to the data sensors, to control the fire extinguishing system and to call the emergency when the fire was detected by the system. For the administrator, he can set the house location, add and delete users from the system's database and set the users permissions. All these actions require login.

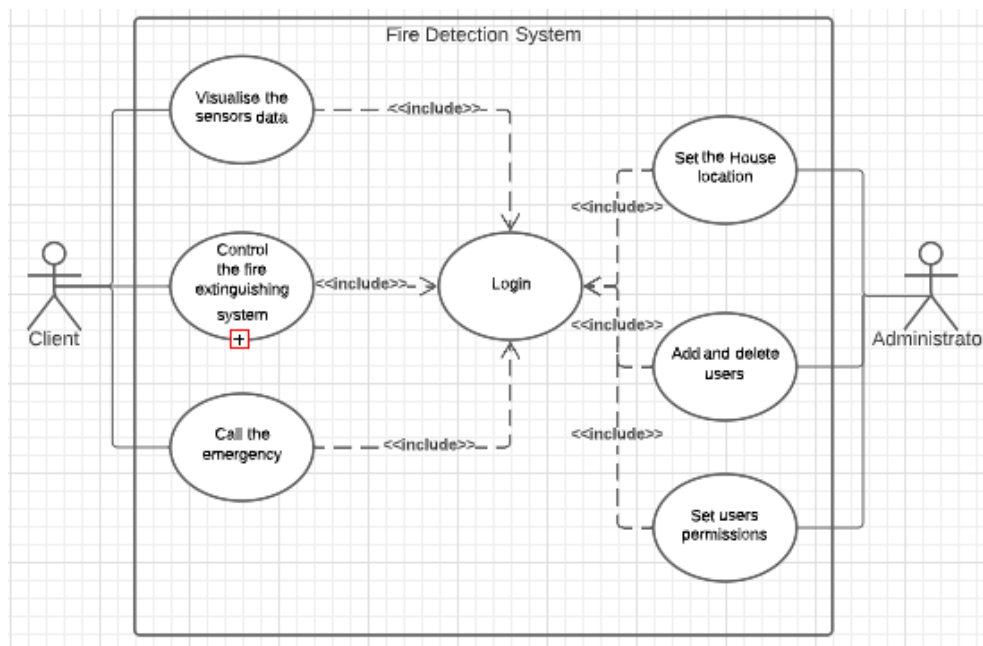


Figure 1: Use case diagram

## 2.2 Sequential diagram:

After detecting a flame or a smoke, the IoT system publish in Kitchen/Infrared and Kitchen/Smoke topic. The mosquitto will publish the values detected to Node-red, which will be responsible for sending the values to the client in a JSON format. If the values detected by the sensors are higher than thresholds, the IoT system will publish in Kitchen/fire a message "Fire detected". The client will receive an alert and publish in Kitchen/fire a message "ON" to turn on the fire extinguishing system. The diagram represented in figure 2 describes the fire detection and notification scenario.

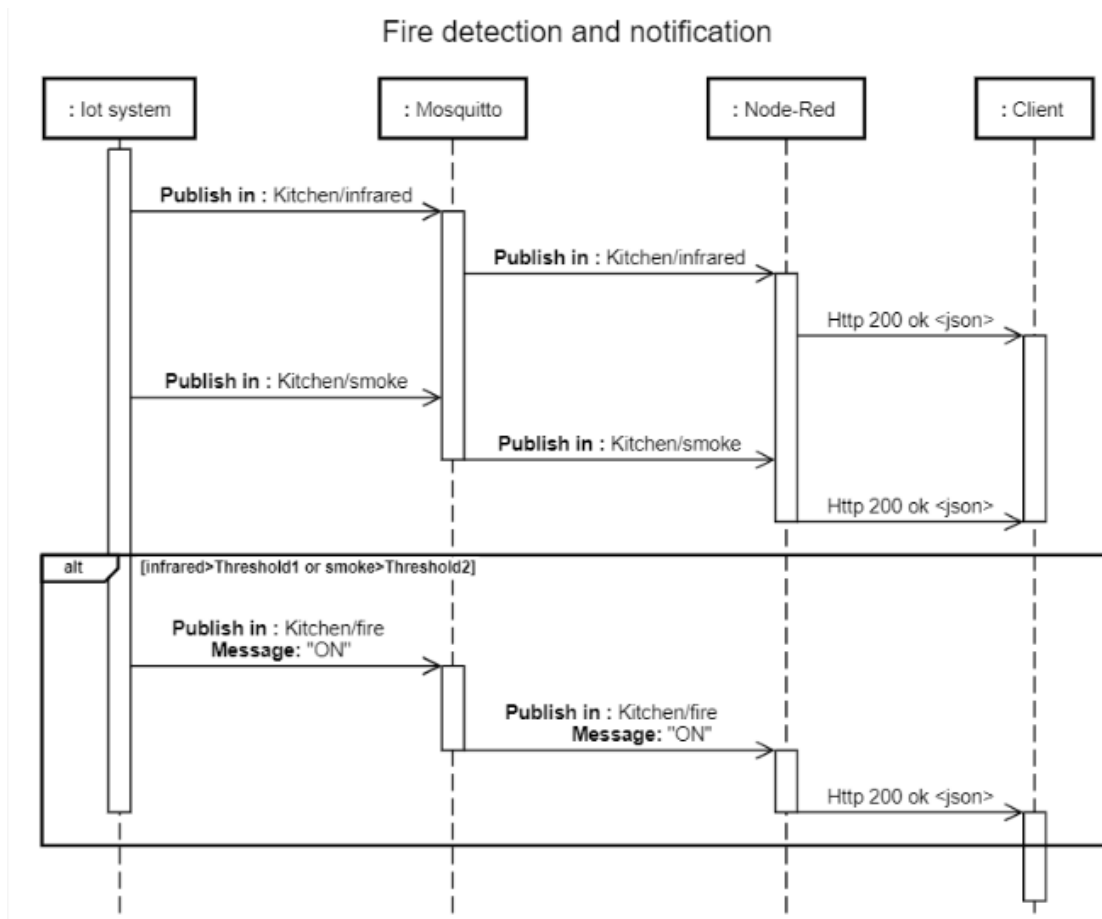


Figure 2: Sequence diagram

### 2.3 Class diagram:

The class diagram summarizes the different parts of the entire project. Starting with the iot system, which is composed of the sensors(detect the smoke) and the actuators( send notification, start alarm and command the irrigation system). The other part of the project is the mobile application side. The users of the application are in contact with the application through user interface. The mobile application gives the user the following access:

- Create an account.
- Subscribe to the application services.
- Check on the status of the sensors in real-time.
- Command the actuators.

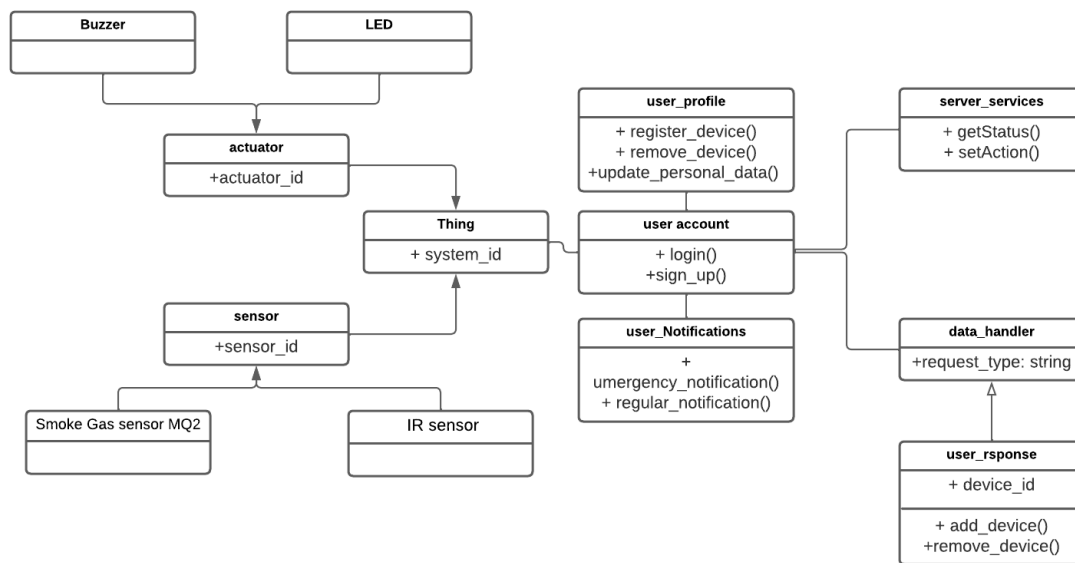


Figure 3: Class diagram

2.4 Deployment diagram:

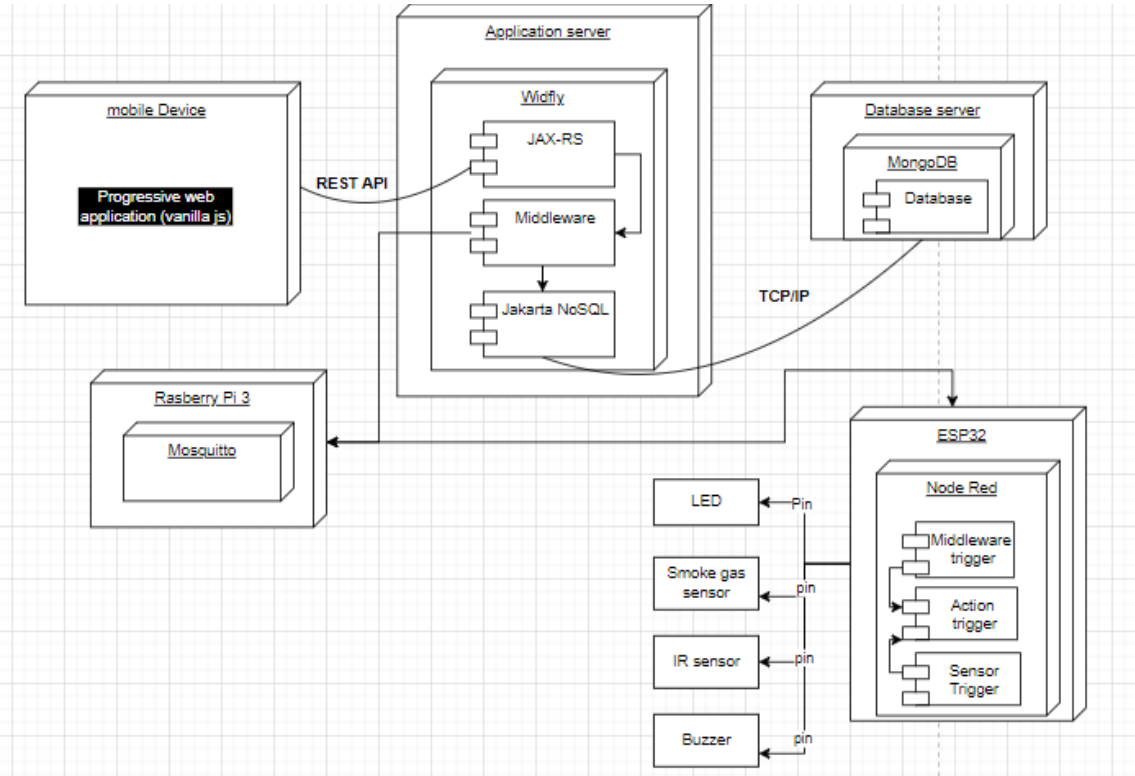


Figure 4: Class diagram