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المـدرسـة العليـا للمـواصـلات بتونـس
ÉCOLE SUPÉRIEURE DES COMMUNICATIONS DE TUNIS

Scope Statement

Development of a mobile application supervises

an intelligent alarm system

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1. Context

In recent years and with great rapidity, intelligent systems continue to develop and believe. Which caused a kind of competition and improvement in terms of quantity and quality.

Currently, the trend in technologies is to use wireless techniques such as the Internet of Things which has been integrated into several fields such as: the military, industry, agriculture, etc.

Internet of Things is a very broad and rich term. It makes us imagine a whole world that is connected and can be communicated through the exchange of information between its objects.

2. Problematic

In the field of security, protecting a home from theft or intrusion attempts is essential. But existing alarm systems are not precise. Because they often trigger false alarms following a gust of wind or following an animal passing.

3. Ambitions

Based on the previous elements, we can formulate the main objective of our work, which is the combination of the latest developments in the market of mobile technology, persons detection, face recognition.

The goal is to create a continuous and efficient video surveillance system. Our approach is based on the use of smartphones, with devices such as (camera, alarm, Raspberry Pi board..) as additional peripherals.

Figure 1: System modeling

Thus, the main architecture of our work consists of a part in which we establish a reliable connection between the mobile device and the camera to collect continuous data. In another part, we analyze the data using different kinds of data analysis techniques and trigger an alert in case of danger.

The video surveillance system will be connected to a mobile application, from which the administrator is able to add easily images of people (family members, friends, etc.). They will be saved in the database.

Note that our intelligent video surveillance system is based on the persons detection, image and video analysis. It detects any foreign individual (his face does not exist in the database already populated by the administrator).

As a result, the owner of the house can consult the alerts generated, the video surveillance in real time, through the mentioned mobile application, etc.

4. Description

- ➢ Our solution is intended for homeowners who want to protect their homes.
- ➢ It can be always operational with a possibility of activation and deactivation.

- ➢ As already mentioned, the video surveillance system will be connected to a mobile application. This app will cover the following points :

Security :

Internet security is becoming an ever-increasing issue. Our application is storing personal and sensitive information so security is an absolute must.

Add person's picture to database :

The administrator is able to easily upload the images of the people he wants the surveillance camera to recognize them, through an interface within our application.

Localize the administrator :

Locate the user from the position of his smartphone. When he is near to the garage, the garage door opens automatically.

Push notifications :

To alert the administrator once an alarm is triggered, push notifications are more attractive than emails and less likely to end up in a spam folder.

➢ Functional limits of our concept :

Dependence on other equipment (sector: electricity, WiFi).

➢ Conception :

The following image summarizes the architecture of our application.
Starting with the **Front-End** part, It communicates with the **middleware server** through HTTP
requests. So that JSON is the format of the data exchanged between this two parts.
Also we will use Websockets for the notification push feature.

On the other hand, the **middleware** server communicates with the **Raspberry Pi board** throw
MQTT protocol

Regarding data, they are stored in a NoSQL database : MongoDB.

Figure 2: Global architecture of the mobile application
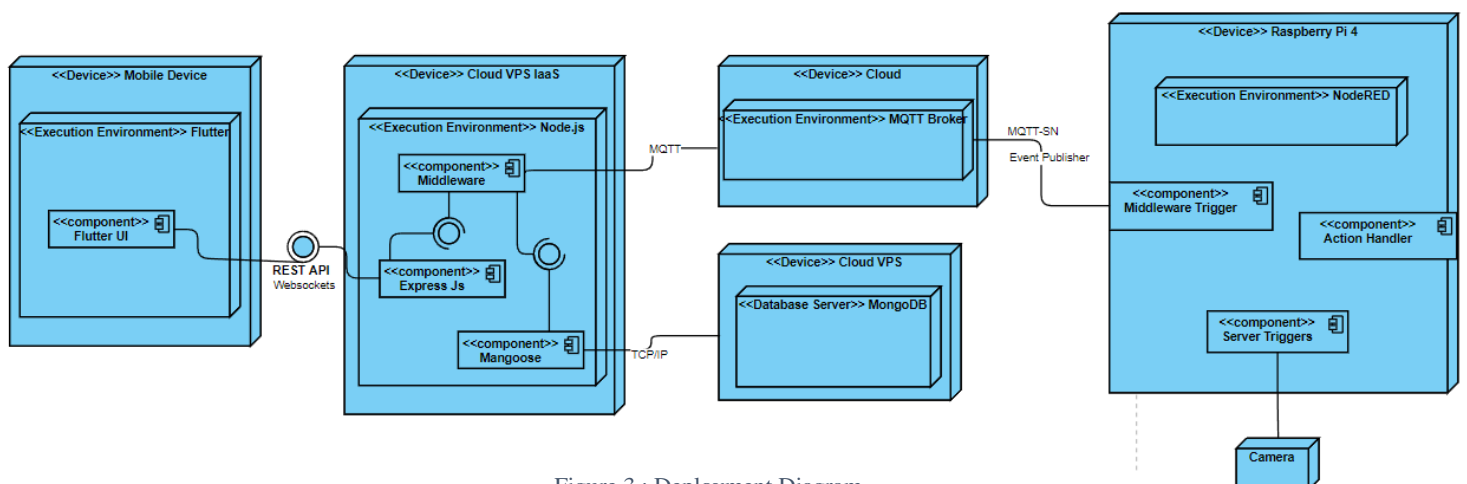
➢ Deployment Diagram

Figure 3 : Deployment Diagram

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5. Technologies

Front-End :

For the Front-End part we will use the framwork Flutter :

Figure 4 : Flutter Logo

Flutter is an open-source UI software development kit created by Google. It is used to develop cross platform applications from a single codebase.

We have chosen Flutter because we already have an idea about it. Last year we made a mobile application using the Flutter framework. So we wanted to deepen our knowledge about it.

Middleware Server :

✦ **Node.js**

Figure 5: NodeJs logo

Node.js is an open-source, cross-platform, back-end JavaScript runtime environment. It is used in particular as a web server platform.

Thanks to how easy it is to create an API in Node and how quick to start development, we have chosen Node.js

NoSQL Database :

Figure 6: mongoDB logo

MongoDB is a source-available, cross-platform , document-oriented database program. Classified as a NoSQL database program, MongoDB uses JSON-like documents with optional schemas.

We have chosen mongoDB because it is the easiest NoSQL database
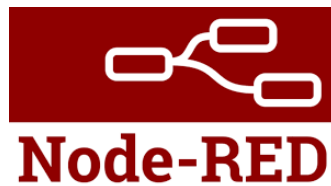
IoT Backend :

✦ **Node-RED :**

Figure 7: Node-RED logo

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.

It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single-click.

✦ **Mosquitto:**

Figure 8: Eclipse Mosquitto logo

In MQTT protocol there are two major entities: a broker and clients. Eclipse Mosquitto is an open source message broker that implements the MQTT protocol. It is suitable for all situations from full power machines to embedded and low power machines.

We have chosen the Mosquitto MQTT broker since it supports SSL protocol, It supports webSocket. Its also managed, self hosted with a static IP and the installation process is not difficult.

6. Business Model

Our marketing strategy aims at increasing the awareness of our product , increase sales and expand our target. It consists in :

Product :

Quality level	Features
Standard	Add person's picture to database Push notifications
Premium	Locate the user from the position of his smartphone. When he is near to the garage, the garage door opens automatically.

Price :

The price of our services differs from one subscription to another. For the standard offer there is a basic price and for the premuim offer the client must add additional costs to benefit from other features.

Promotion :

- Offline advertising measures: television, radio, newspapers, magazines, posters, etc. (CLASSIC)

- Online advertising measures: Display Advertising, Videos, emailings, newsletters, social media marketing (on YouTube, Facebook or other video platforms integrated on websites), advertising on social networks, SEO, etc.

- Personal Communication : Customer to customer exchanges (promote word of mouth recommendation)

Placement :

- The Internet has a geographically dispersed market.

- Using advertising on social networks (Facebook, YouTube, Instagram...).

- The availability of the product throughout the Tunisian territory.

- Use of e-commerce (secure payment, shopping software).

- Field trips and prospecting campaigns (in workshops, seminars, conferences) will be carried out in order to disseminate the information to youth, adults, and companies.

- The use of paid advertising in traditional media (radio and television stations) to reach television channels) to reach the entire Tunisian territory.

7. Livrables :

- Conceptual Workbook
- Source code
- Technical Documentation
- User Manual
- Marketing materials
- Press Kit.