

**Industrial Internship Report Embedded and IOT
"IRON DOME"
Prepared by :
Yashvi Barai**

Executive Summary

This report provides details of the Industrial Internship provided by upskill Campus and The IoT Academy in collaboration with Industrial Partner UniConverge Technologies Pvt Ltd (UCT).

This internship was focused on a project/problem statement provided by UCT. We had to finish the project including the report in 6 weeks' time.

My project was based on IOT which is an emerging technology. Basically it helps your house to be more safe and secure even when you are not there.

This internship gave me a very good opportunity to get exposure to Industrial problems and design/implement solution for that. It was an overall great experience to have this internship.

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1 PREFACE :

1.1 Summary of the Six-Week Work

During my internship, I developed a "Smart Security System" designed to enhance home security using IoT technology. The project involved integrating various sensors, cameras, and communication modules to create a real-time monitoring and alert system.

1.2 Importance of Internships in Career Development

Internships are crucial for bridging the gap between academic learning and professional application. They provide hands-on experience, improve job prospects, and help in personal growth by enhancing communication and problem-solving skills.

1.3 Brief About the Project/Problem Statement

The "Smart Security System" aimed to develop an IoT-based solution that offers real-time monitoring and alerts for home security. The system includes sensors, cameras, and communication protocols to detect and notify homeowners of any unusual activities.

1.4 Opportunity Provided by USC/UCT

The internship opportunity provided by USC/UCT was instrumental in gaining practical experience and exposure to real-world industrial problems. Their support and resources were vital in the successful completion of this project.

1.5 Program Planning

The program was meticulously planned to balance learning and application. The first week focused on orientation and understanding IoT basics, followed by weeks dedicated to conceptualizing, designing, building, testing, and finalizing the project.

2 INTRODUCTION :

2.1 About UniConverge Technologies Pvt Ltd

Established in 2013, UniConverge Technologies (UCT) specializes in digital transformation and industrial solutions, focusing on sustainability and ROI. They leverage cutting-edge technologies like IoT, cybersecurity, cloud computing, machine learning, and communication technologies.

2.2 About upskill Campus

Upskill Campus, along with The IoT Academy, facilitates comprehensive internship programs in collaboration with industrial partners like UCT. They aim to upskill learners through practical experience and industry interactions.

2.3 Objectives of the Internship

The objectives were to gain practical industry experience, solve real-world problems, improve job prospects, enhance field understanding, and foster personal growth.

2.4 References

- [1] D. Pavithra; Ranjith Balakrishnan, "IOT based monitoring and control system for home automation", IEEE Explore, Communication Technologies (GCCT), 2015 Global Conference on.
- [2] For Brief Literature Survey : <https://www.mdpi.com/2571-5577/1/4/42>
- [3] For Sensors Working and implementation : <https://www.make-it.ca/nodemcu-details-specifications/>
- [4] <https://www.geeksforgeeks.org/sensors-in-internet-of-thingsiot/>
- [5] "Design of an Anti-Theft Floor System Based on IoT Technology" by Xiaodong Liu, Liankai Zhao, and Xiaoguang Wang.
- [6] <https://www.youtube.com/watch?v=cN1loWOq0K8>

3 PROBLEM STATEMENT :

Security is a Major concern in 21st century , The current security systems are either not efficient or pretty expensive. So tackle down the problem here it has been designed a security system which is efficacious as well as economical in price, and it would come with same capability as like expensive security systems. to tackle the problem of distrust and security concern, the system has been developed .

By introducing an IOT based security system by the name of “IRON DOME”, the name is inspired from the IRON DOME Defense system of Israel. In this system we have used PIR sensor, which will notify you when it detects any activity in its range.

When there is no one at home, user can activate the system, if someone tries to break into your house, he/she will immediately come in the radar of sensor and sensor will activate buzzer/alarm. Also, user will get a call as alert through GSM module, once the threat is eliminated you can turn off the alarm through the application dedicated to system, you can add or remove the contact numbers. The app will also give you alert alarm when intruder intrudes house, app will be connected to the system via Google Firebase technology.

Programming is done in the Arduino IDE software and we precisely connected every hardware and software part. I am going to use android Studio for our application development and firebase for connectivity.

So, this is our IOT based home security System, an innovative as well as cheap way that will help in maintaining the security of house. This system also allows you to go anywhere for picnic and tour with your family and friends without worrying about house security.

4 EXISTING AND PROPOSED SOLUTION :

Recent acts of theft have highlighted the need for efficient video surveillance and on-the-spot notification of ongoing thefts. Legacy systems cannot provide real-time theft notification to the house owner nor detect partially or fully obscured faces. An IoT-based smart home monitoring system can be designed and developed based on an integrated framework of sensors, cameras, and customized hardware to analyze unauthorized access. The software modules are further subdivided into several further levels, including data logging, data retrieval, and storage. The main objective of the software is to detect and report unsupervised human activity using large data handling techniques as close to real-time as possible.

4.1 Necessity of a New IoT-Based Theft System

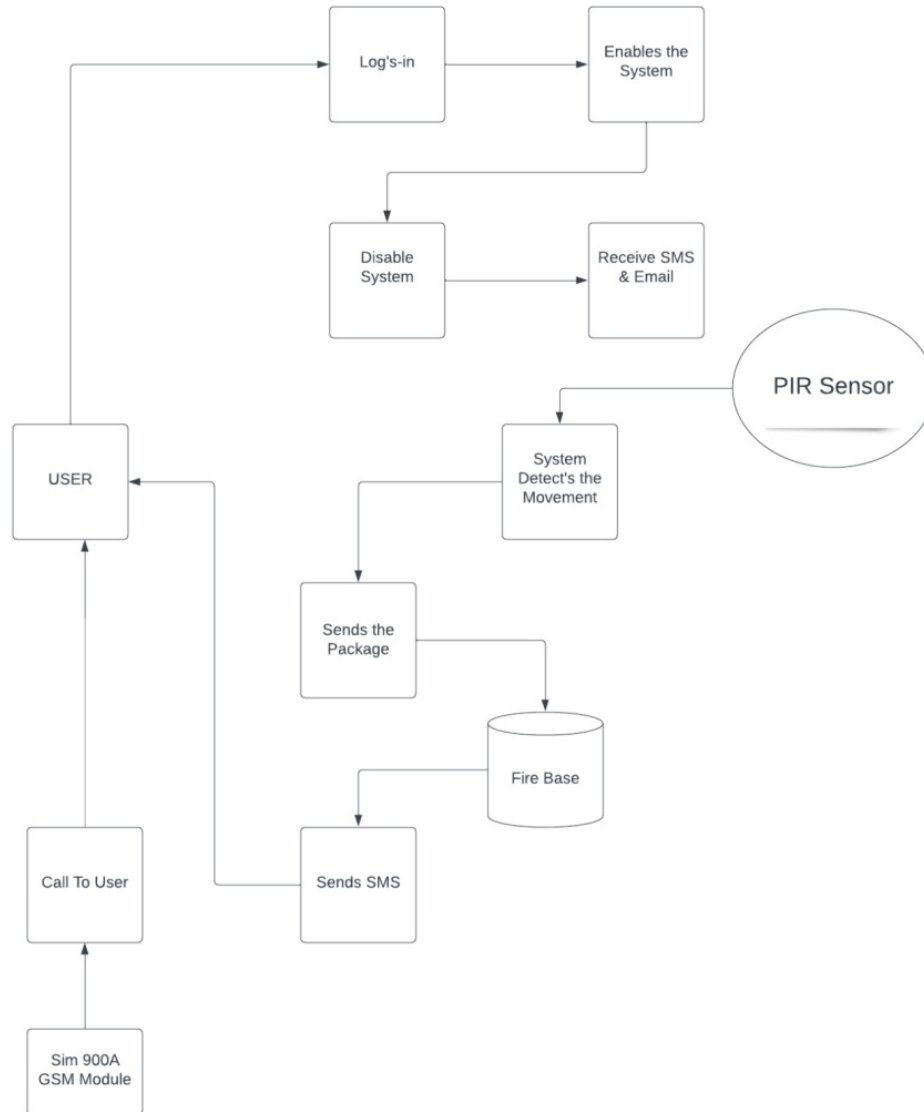
The smart home monitoring and control framework is applied on two levels: equipment and programming. It consists of four areas: body sensor setup (BSS), ambient sensor setup (ASS), crisis sensor setup (CSS), and other sensors setup (OSS). BSS provides observations of inhabitants in different physiological states, ASS contains a temperature sensing unit, motion sensing unit, and pressure sensing unit, CSS is equipped with manual push buttons, and OSS offers the utilization checking and control of electrical home devices.

4.2 Proposed Solution:

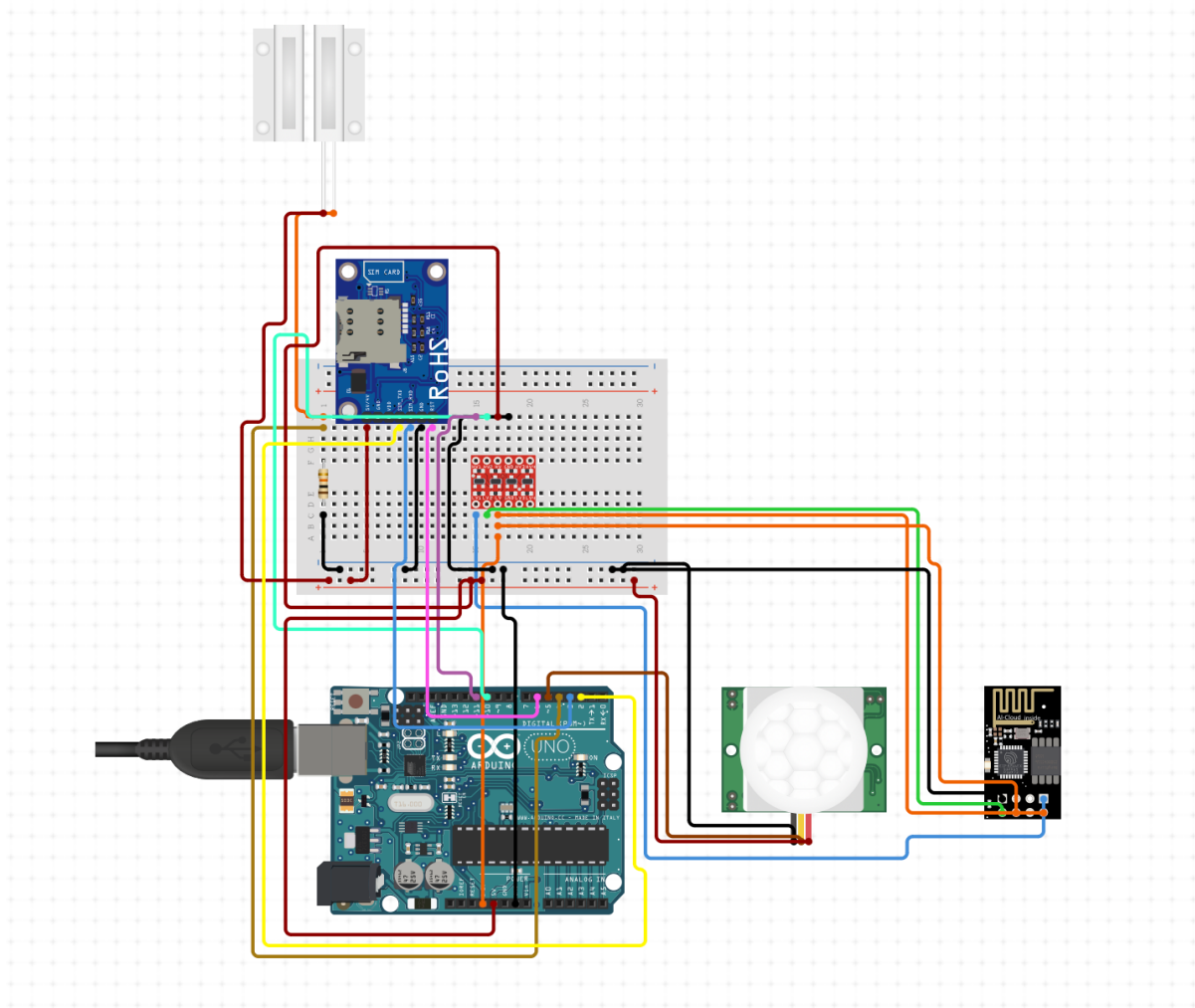
The proposed Smart Security System employs a Node MCU microcontroller, PIR sensor, SIM900A GSM module, breadboard, reed switch, jumper wires, and an Android phone. It detects unauthorized entries and door openings, sending notifications to the user. The user can then take appropriate action. The system uses the Node MCU to interface components, a PIR sensor to monitor activity, a buzzer for alarms, and the ESP8266 Wi-Fi module for internet communication

5 PROPOSED DESIGN AND MODEL :

5.1 SYSTEM FLOW



5.2 MODULE SPECIFICATION (SCREENSHOT OF WORKING MODULE VIRTUAL CIRCUIT)



Virtual Model

5.3 Design Setup

The proposed system uses a Node MCU, PIR Sensor, Sim900 A GSM Module, Bread board, Reed Switch, Jumper wires (Male, Female), Android Phone, and a mobile device. The system will inform the owner about any unauthorized entry or whenever the door is opened by sending a notification to the user. After the user gets the notification, he can take the necessary actions. The

security system will use a microcontroller known as Node MCU to interface between the components, a PIR sensor to monitor the status, a buzzer for sounding the alarm, and a Wi-Fi module, ESP8266 to connect and communicate using the Internet.



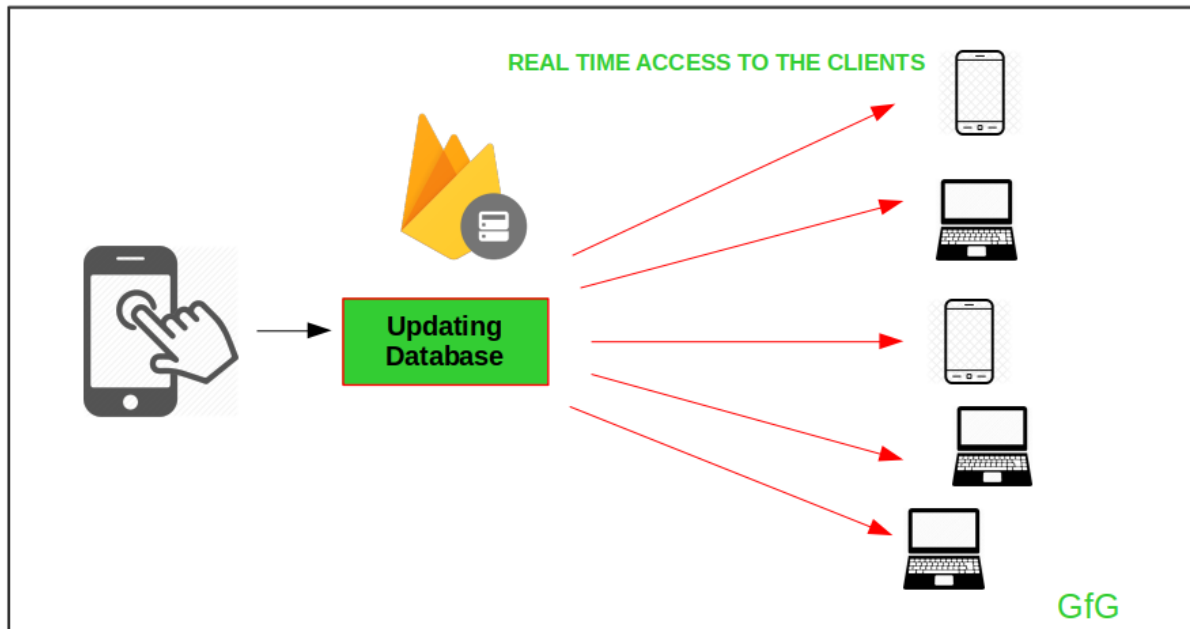
Example of IOT Model

5.4 Storage Module

In the case of Firebase Real-time Database, clients will be connected to the database and will maintain an open bidirectional connection via web sockets. Then if any client pushes data to the database it will be triggered and (in this case) inform all connected clients that it has been changed by sending them the newly saved data.

This way of working may remind you of the MQTT broker and how it reacts when it receives a message from a publisher and sends it to all subscribers. The difference this time is the addition of the data persistent part, which is the database. So as you can see here, you don't need to route messages yourself using other protocols — Firebase Real-time Database will take care of that plus performing its normal database function. Amazing isn't it?

Returning to the IoT system mentioned earlier, you can now connect the device to the Firebase Real-time Database and make it push data periodically to the database. On the other part of the system you have a web application which will be connected to the same service as the device and will receive new data whenever there is a change in the database.



Storage Model

5.5 H/W AND S/W REQUIREMENT

Hardware Requirement

- Node MCU.
- PIR Sensors
- Sim 900A GSM Module
- Bread Board
- Reed Switch
- Jumper Wires (Male , Female)
- Android phone
- Data Cable

Software Requirement

- Windows 7 or above
- Android Studio

- Arduino Software
- Firebase

5.6 PROGRAM/MODULE SPECIFICATION

⇒ Enable System

After login in system user have to enable the system so that the owner can get notified whenever intruder attacks.

⇒ Disable System

Disabling the system is same as enabling it, it will disable the whole system and it will not detect any activity.

⇒ Receive SMS

Whenever any activity happens and owner is not present they will be notified by SMS by SIM900A module over GPRS send/receive SMS and make/receive voice calls. So the user will get message by the module.

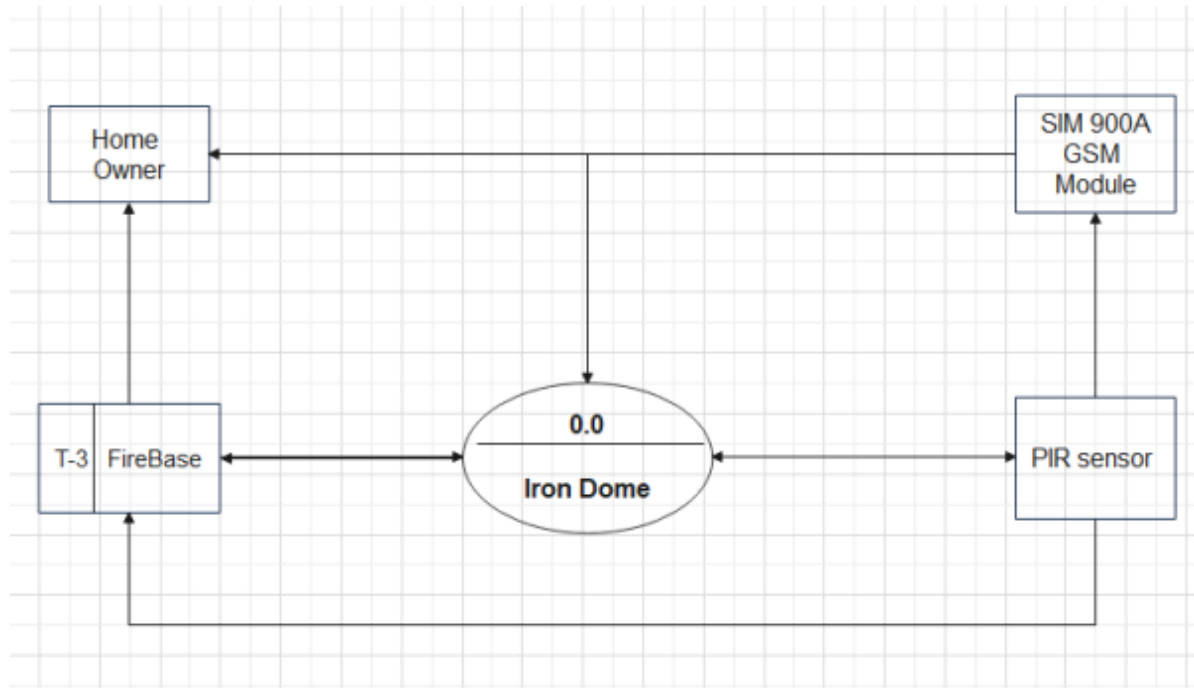
⇒ Detect Motion

Here the motion is detected by PIR sensors mostly used in PIR-based motion detectors. Also, it used in security alarms and automatic lighting applications. It will detect the motion and as it will detect with the help of SIM 900 A module, it will notify user.

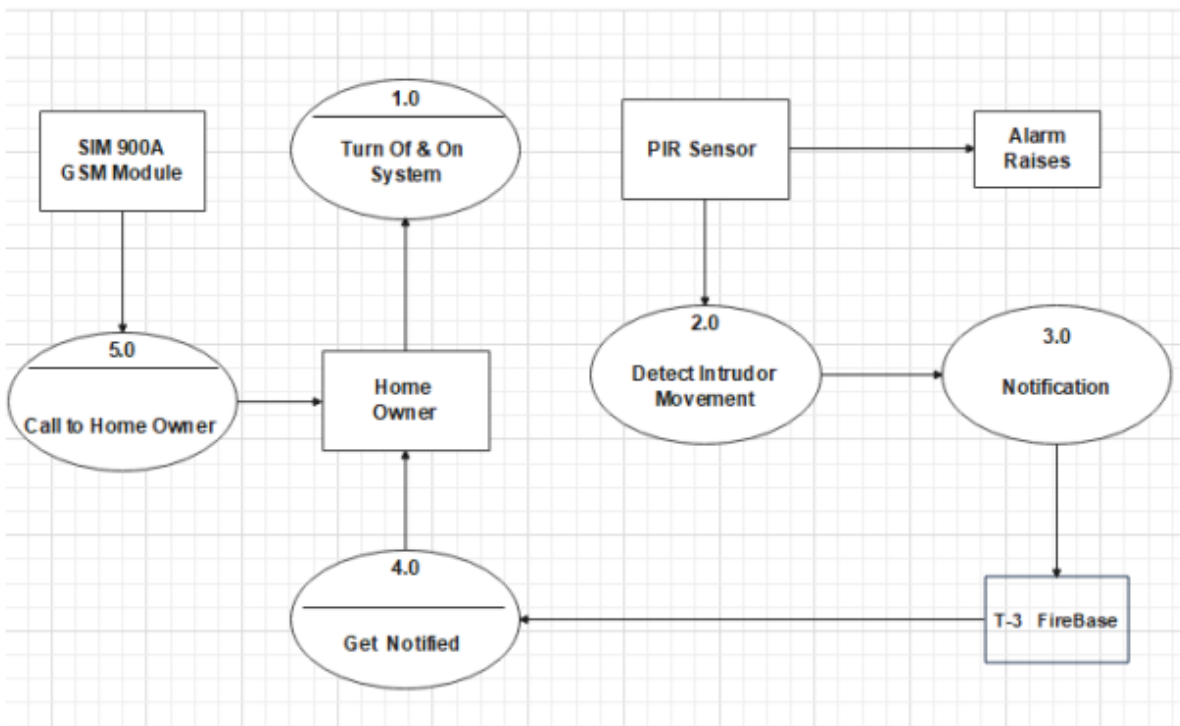
⇒ Call the User

As the activity detects it will send message as well as it will give call to user so that they can take any action.

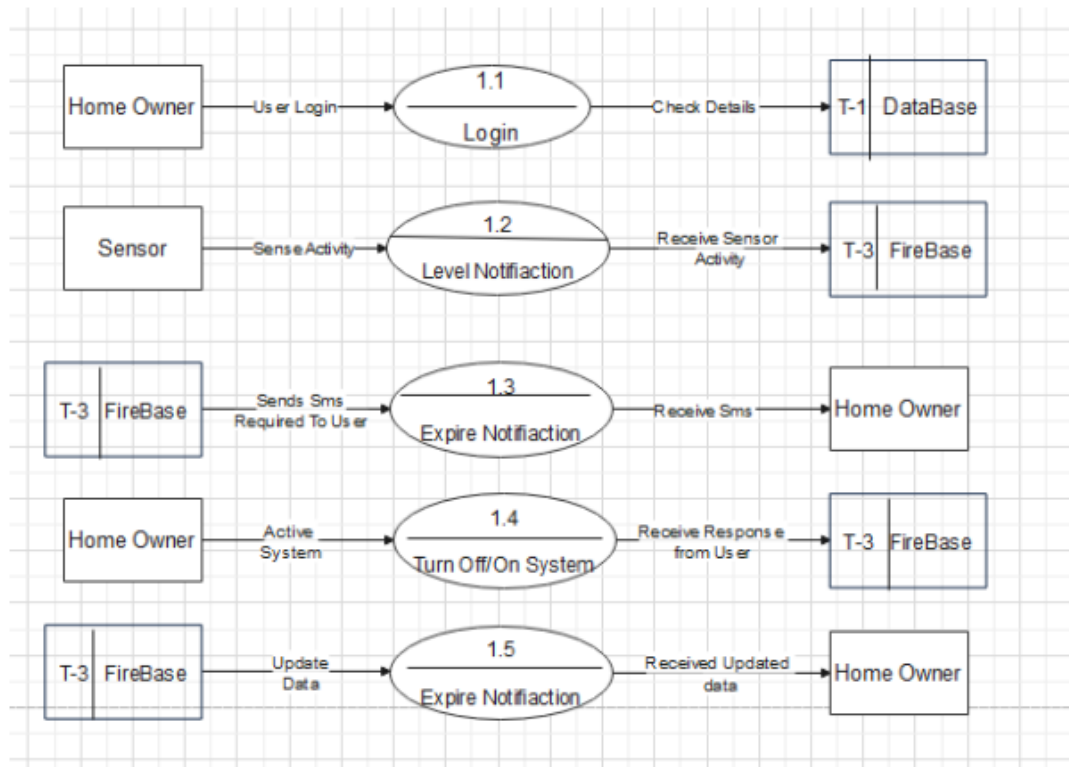
5.7 Data Flow Diagram



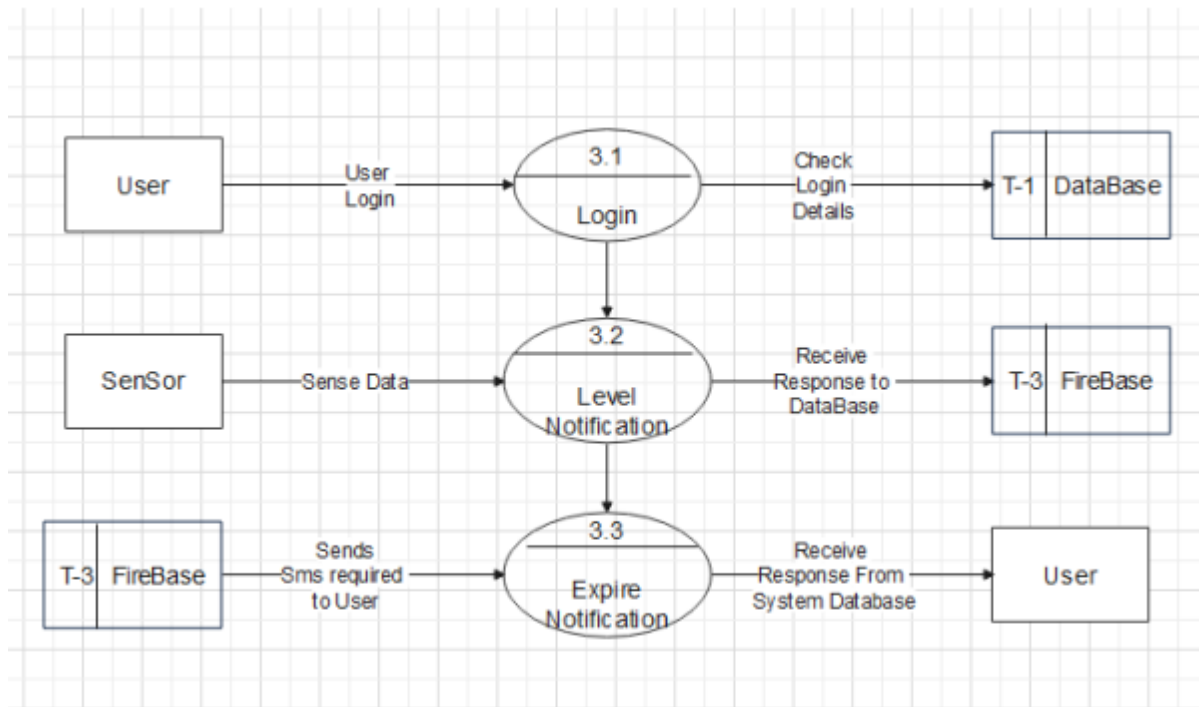
DFD Level 0



DFD Level 1



DFD Level 2 of 1.0



DFD Level 2 of 3.0

6 PERFORMANCE TEST :

The project is basically based on anti theft floor system which helps the owner to guard their property or their valuable items when they are not available at the moment. To ease their tension, now while developing this project there were two types of sensors were used, at first reed switch were used which was basically giving accuracy upto 70% which is not much benefiting to the project neither to the users. As it is made up of glass tube there was a huge risk of glass being broken in middle of working project with that same, we needed more accuracy towards the project.

By replacing the reed switch, here PIR sensor were used which has more accuracy then reed switch. Basically, It can detect micro-motions, which can be a hand moving across a keyboard or even a user's breathing pattern. It does this by examining the Doppler shift of the waves in the room. And it's accurate to about 8 m, or more than 20 ft. So instead of Reed switch here PIR sensor has been used for more accuracy.

Now the below table will guide as a accuracy table:-

Reed Switch	PIR Sensor
As in space of 5 meters it showed accurate motion detection.	Same as in space of 5 meters it showed accurate motion detection.
Now for 8 meters the glass body cracked.	In sensor for 8 meters, it worked perfectly.

6.1 Outcome



```
Output Serial Monitor x
Output
message (Enter to send message to 'NodeMCU 1.0 (ESP-12E Module)' on '/dev/cu.SLAB_USBtoUART') New Line 9600 baud

GSM module is working.
Calling 9773413852
B 0 b 0 0 0 I 000000 Response: AT
OK

GSM module is working.
Calling +919773413852
$0 00s0/0 000000 Response: AT
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GSM module is working.
Calling +919773413852
I0AR?0I000 000000 Response: AT
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Ln 7, Col 30 NodeMCU 1.0 (ESP-12E Module) on /dev/cu.SLAB_USBtoUART 3
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Result

7 MY LEARNINGS :

The internship provided significant learning opportunities, enhancing my technical skills in IoT and my understanding of real-world problem-solving. It also improved my project management and teamwork abilities, contributing positively to my career growth.

The project work that will be carried out in this project is it will develop a device which will be helpful in sensing the intruder and will report it to the owner of the property. Eventually, it will also be useful at house, offices, jewelry shops and many more places where privacy is concerned. The sensors will send message as well as call to the property owner. This system is also suitable for small personal area surveillance. i.e., personal office cabin, bank locker room, parking entrance. Whenever the motion is detected through .The main advantage of the project is easy to implement, low cost with high quality.

8 FUTURE WORK SCOPE :

For future preference, we can add image processing which will capture the image of an intruder and it will directly send it to owner and security as well. Effectively we can also add video capturing which can be more helpful in identifying the intruder. The device must be connected to all owner so that everyone can be notified about intruder.

Future enhancements could include integrating advanced machine learning algorithms for better intrusion detection, expanding the system's capabilities to cover larger areas, and improving user interfaces for better usability.