Smart Home

Team members (section 7 Group 1)

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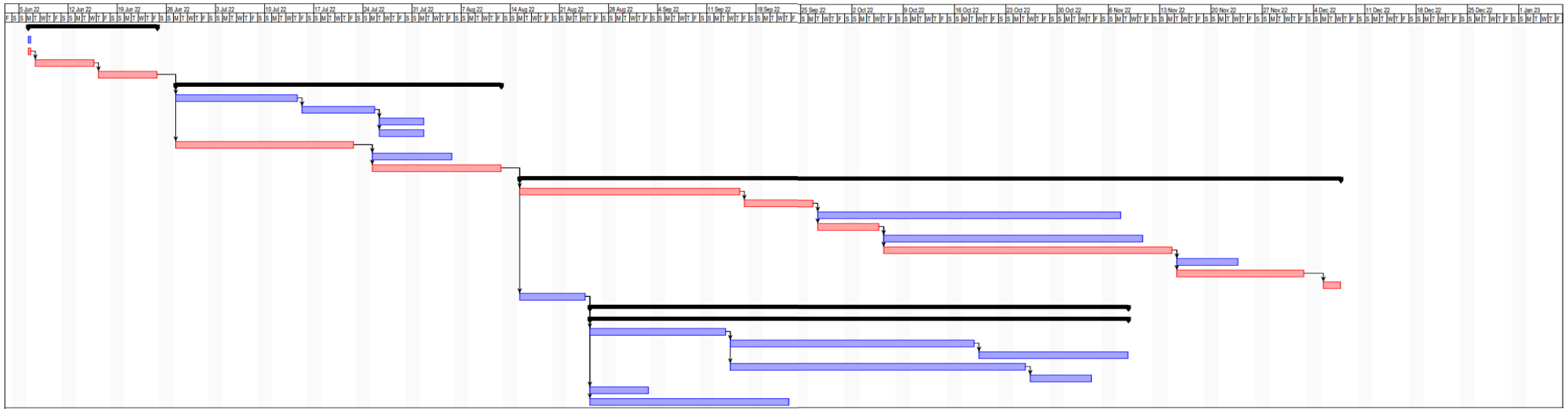
PLANING

PROJECT CHARTER:



SYSTEM REQUEST:

Project Sponsor: Nehal Abd El-Hamid

Business Need:

The main reason this system works is to make it easier for our client to control Home Kit accessories, and also to provide a high degree of security.

Home Kit is Apple's smart home platform which is designed to let you control and links various internet-connected home devices together and adds new capabilities to devices like lights, locks, cameras, thermostats, plugs, and more .

With Apple devices, with this system, the house will be more manageable.

Business Requirements:

With the Home app you can easily and securely control your Home Kit accessories while you are away from your home from all your Apple devices.

With the Home app you can easily control devices in any part of your house with a tap.

The Home app provides a high degree of security when important activity is detected.

Business Value:

The benefits that the system will create for the organization is 20%.

In sales and : market share (15% : 5%).

Special Issues or Constraints:

1- Internet must be connected in order for the system to connect to and respond to the home devices

2-Make sure that the user login to home smart system using mobile application

3- Make sure that the devices that will be added in the system is smart so that it will be connected directly to the system and if it’s not we may be try to handle it by another way

FEASABILTIY ANALYSIS:

Technical Feasibility "can we build it?"

1) ***Familiarity with application:***
   It is the first time that the company implements the idea, so we are going to use assets to take thoughts from it.
2) ***Familiarity with technology :***
   The company has a great knowledge about this technology, and we plan to increase the knowledge of our employees and give them training in a new technology that the company is used to it.
3) ***Project size :***
   It is expected that it will take between 5 and 6 years according to our predictions regarding the number of employees that will be involved in the project -about ten thousands employee- and the many features we will present.
4) ***Compatibility :***
   The compatibility in this project is flexible to be integrated as we are going to make use of other technologies and devices from related companies like (Eve, Adobe, Philips, Ecobee, August, Arlo).

Economic Feasibility "Cost-Benefit analysis"

		2012	2013	2014	2015	2016	2017	Total
Benefit								
Monthly Fees Participaion			1900000	9500000	19000000	28500000	38000000	
Increase Sales			2150000	10750000	21500000	32250000	43000000	
Decrease No. Labor			250000	1250000	2500000	3750000	5000000	
Increase Revense			1400000	7000000	14000000	21000000	28000000	
Total Benefit		0	5700000	28500000	57000000	85500000	114000000	290700000
Present Value Total Benefit			4956521.739	21550094.52	37478425.25	48884902.5	56678147.82	169548091.8
Development Costs								
Philips Tlue		854.24	0	0	0	0	0	854.24
Ecobee Smart thermostats		2704	0	0	0	0	0	2704
Eve		799.04	0	0	0	0	0	799.04
Nanoleaf Essentials		312.96	0	0	0	0	0	312.96
Panels		312.96	0	0	0	0	0	312.96
Wemo Smart Plug		399.84	0	0	0	0	0	399.84
Fibaro Motion Sensor		872	0	0	0	0	0	872
MyQ Garage Door Controller		479.84	0	0	0	0	0	479.84
Abode Smart Security		5214.56	0	0	0	0	0	5214.56
Video Distribution System		8800	0	0	0	0	0	8800
Multi Room Auto System		4800	0	0	0	0	0	4800
Total Development Costs		25549.44						25549.44
Operational Costs								
HomePod (Hub)			5600	28000	56000	84000	112000	285600
August Wifi Smart Lock			4011.2	20056	40112	60168	80224	204571.2
Arlo Ultra			7847.68	39238.4	78476.8	117715.2	156953.6	400231.68
Logitech Circle View			3184	15920	31840	47760	63680	162384
Lutron Caseta Dimmer			1039.84	5199.2	10398.4	15597.6	20796.8	53031.84
Frist Alter Onlink Smoke			1919.84	9599.2	19198.4	28797.6	38396.8	97911.84
Shutter & Blind Control			1320	6600	13200	19800	26400	67320
Home Energy Monitor			9600	48000	96000	144000	192000	489600
Total Operational Costs			34522.56	172612.8	345225.6	517838.4	690451.2	1760650.56
Total Costs		25549.44	34522.56	172612.8	345225.6	517838.4	690451.2	1786200
Total Benefit – Total Costs		-25549.44	5665477.44	28327387.2	56654774.4	84982161.6	113309548.8	288913800
Cummulative Net Cash Flow		-25549.44	5639928	33967315.2	90622089.6	175604251.2	288913800	577827600
Present Value Total Costs		25549.44	30019.61739	130520.0756	226991.4359	296075.7859	343276.2735	1052432.628
Net Present Value (NPV)								168495659.2
Return on Investment (ROI)	161.75	% (288,913,800/178,6200)						
Break-Even Point (BEB)	2.00	Years						

Organizational Feasibility "If we build it, will they come?"

	Role	To Enhance Organizational Feasibility
Champion	-Initiates the project - Promotes the project - Allocates his or her time to the project - Provides resources - Capacity to meet and exceed expectations of management -Keeping track on team members - keeping all project stakeholders aware and engaged	-Ensure ongoing alignment with business objective -serve as a voice for the project and ensure appropriate organizational priority is given to it throughout -assemble and provide on-going support for the project organization -Ensure control mechanisms and reviews are in place
Organizational Management	-Know about the project -Budget enough money for the project -Encourage users to accept and use the system	- Using social media as an essential factor in spreading the extent of its use and saving time, effort and safety in homes - Publishing some videos that explain the use of devices in the system and its positive impact on the user - Using news media to spread his feedback to people who used the system for encouragement as well
System Users	-Make decisions that influence the project -Performs hands on activities for the project -Ultimately determined whether the project is successful by using or not using the system	-Users will give us the help we need to improve the system -Responsible for giving their opinion on the security system, testing it, study it, and then adding their changes to it -Responsible for giving an opinion on each device's system and how it attaches to the application. -Responsible for giving an opinion on the audio system that can be added to the software and how it can be enhanced and implemented on me.

Analysis

INTERVIEWES:

Person Interviewed: Sarah Adam

Doctor in the field of pharmacy

Interviewer: Sama Osama

Purpose of Interview:

- Trying to know the opinions of users in order to improve this system
- Improve the system to make our clients expectations
- Spread and attract users to try it

Summary of Interview:

- Well the interviewer and the client discuss the most important points about the system and how to improve it
- We discuss briefly about the security system and What the client expect from this system
- The customer's comments on the system and what they want to add to the system.

Open Items:

The company is not just going to report this, but is also waiting for me to meet the rest of the team to learn about the users requirements and to love and discuss the problem they may have in the system

Detailed Notes:

1) What were your expectations from this system when you heard about it and did it fulfill your expectations?

Well, when I first heard about this system, I thought that it was a very good and modern idea, if it was implemented as I read about it, and I built very high expectations on it. One of the most important predictions is that I expect a high degree of protection from the system, and a very easy control of my home, whether I'm in or away from it. As for if my expectations are met, I think it's too early to say, but even now what I've read is a very satisfactory system.

2) What is your approximate budget for this system if you buy it?

I think as far as I have an open budget, but if I have to determine, I think it could start at 700,000.

3) Do you think your home is equipped to implement this system?

I think it's pretty well equipped, but of course it's missing some other equipment, like some of the appliances that have to be brought in to connect it to the system.

4) What is the least useful feature for you of this system?

Well, I think we should take care of the privacy point where, from what I've read, there will be cameras in the house, and I can check the camera footage from my phone, I think it's really good to take care of the privacy point where, for example, I have my daughter, and I have to respect her space, not just because my daughter has anyone in my family who has privacy.

The second thing I want to comment on is that the whole house is going to be connected to one system, so if one device's system is damaged, or broken, does that mean that the whole system will fail and affect the operation of the rest of the system, which is something that we cannot accept or deal with

The last thing I would argue for is that a high fire system would be installed, but my husband's a smoker so would it work every time that smoke smelled.

5) What security standards do you expect to find in the system?

Well, I prefer to change the password for the app once every three months for a better degree of protection. I hope that a smart lock will be installed in the doors for me to control the door opening and locking myself from the app. Also, if I'm outside and my kids come back from school and want to get in, I can open it for them through the app. I also hope that if something goes wrong with one of the devices or a strange move around the house, like break-in, the app will send me a detailed notification or message for each type of device or hazard.

6) Is there anything in particular you wish to find in the app?

In fact, there's something I hope to find in this app I hope it sends me a detailed report of what's going on at home, so for example, I set a timer for a device in a kitchen and ended up sending me a message that it's done, and maybe the temperature of the rooms in the house, and if there's a new app update, it sends me a message.

7) How would you like to have the app open with the Internet?

For me, the use of the Internet in an application should be normal, but once your phone is connected to the Internet, it should receive any notifications, whether it's fire, theft, etc. It should not require the Internet to be strong enough to receive such notifications.

8) How about using English as the main language in the application?

I think that's a good idea, but there's a problem that there are some users who aren't going to be able to handle it in English, so I think we should have more than just the language in the app to choose from.

9) If the app is large would you like to use it?

Naturally, any user would prefer to have the application space not as large as necessary, such as using ads that make the application space large. This consumes the Internet, so you have to limit advertising to make the Internet suitable and the application space not so large.

10) Will slowing down or increasing speed affect you as a user?

Well, I hope it allows more than users to log in at the same time and use it without affecting the speed of any one of us

Person Interviewed: Adam Yahia

Student in computer science

Interviewer: Nehal Abd El-Hamid

Purpose of Interview:

- Promote our system to clients
- Improve the system to make it to our clients expectations
- Know any problems we might find in the system and try to avoid it
- Understand the needs of our clients and make it happen

Summary of Interview:

I discussed with the client what he needs and what he expects in the system, and asked him what might be the main problem in this system which he answered to is the lag that might happen, and asked him of the limitation of the price of this system.

Open Items:

- The security and privacy in the system
- The kind of performance he expects

Detailed Notes:

1) Is there something you do not understand in this system?

Well, I do not understand the way it works, like how when I am in the car and want to open the garage door or how do I open the radio.

2) If this system was implemented in Egypt will it work?

This system is very good and amazing but not all people would be able to use technology as there are deference in cultures so not all will be able to use it that will be a problem for them so I think around 25% will buy it.

3) What are the main problems do you think will appear?

The error or lag that might happen to the system which might happen because of not being able to differentiate between the many voices.

4) Would you like a regular maintenance?

Of course there should be regular maintenance at least one every 3 months and there should be update installed automatically.

5) What are the features you expect in the system?

Make the system know more than one language and accent so it can understand children and adults, provide medical care, make the system if it did not hear a command for more than 7 hours it will automatically call the relatives of the owner or call the ambulance, make sure that the old aged people not get lonely and every now and then talk to them.

6) What is your limit of budget?

Does not exceed over half million

Person Interviewed: Abod Saleh

Civil Engineer at Hassan Allam roads and bridges

Interviewer: Nehal Abd El-Hamid

Purpose of Interview:

- Promote our system to clients
- Improve the system to make it to our clients expectations
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Summary of Interview:

I discussed with the client what he needs and what he expects in the system, and asked him what might be the main problem in this system which he answered to is the lag that might happen, and asked him of the limitation of the price of this system.

Open Items:

- The security and privacy in the system
- The kind of performance he expects

Detailed Notes:

1) Is there something you do not understand in this system?

What is its most performance that can it give to the users.

2) If this system was implemented in Egypt will it work?

First not all people will buy it because of its high price but as time goes buy it will be popular and many will buy it because it will not cost as high as before

3) What are the main problems do you think will appear?

The error or lag that might happen to the system, if the system does not make an auto shutdown there will be a lot of energy consumed.

4) Would you like a regular maintenance?

Of course there should be regular maintenance at least one every two weeks because of the weather and multi usage.

5) What are the features you expect in the system?

There should be special words that will trigger the system.

6) What is your limit of budget?

Between 100: 125 thousand.

7) What is the first question that came over your mind when I told you about the system?

Who will design it like which specialty will be responsible for this system.

Person Interviewed: Aya Allah Ahmed
Student in Arts
Interviewer: Gehad Omar
Purpose of Interview:

- To know what is the customer's idea of our system and what they are waiting for

Summary of Interview:

We should improve system by adding features and make access more organized so only parent can control the main function and children can use only limited function

Open Items:

Do you think the System should be able to deal with unable people?

Detailed Notes:

1) What are the features that you want to see it in the system?

I want the system to inform me whenever there is a problem in any device, so if I was out home and the system tell me that the lamp is burnt and then order a new lamp online

It will be nice if Siri could help me to know how to deal with the devices by show all features in the system then let me ask about any details

If the problem was complicated the system contact with the supporter team in apple and they send me a notice with a question about when i will be available so they come and fix the problem

2) Would you like a regular maintenance?

Yes, because this system is too expensive so a regular maintenance will be important

3) Do you think your home is equipped to implement this system?

I think it's pretty well equipped, but of course it's missing some other equipment, like some of the appliances that have to be brought in to connect it to the system.

4) What is the problem that you expect to occur in this system?

Problems with security, if a hacker try to access the home devices.

5) Would the system be suitable in Egypt or not?

It will be suitable if the internet is high speed without any interrupts.

6) Do you think there will a problem in this system when dealing with children?

Yes, they could access credit card or play with lamps by turning it on and off many times, so the system must be dealing with only parents.

7) Is the cost of electricity may be a problem?

No, but I prefer if you can replace normal electricity with solar power so as not to have a problem in case of power outages.

Person interviewed: Alfarok Omar

Software engineer

Interviewer: Gehad Omar, Shahd Mohamed

Purpose of interview:

Understand the connection between the devices

Summary:

we can install the system in a house that contain all smart devices and we can also install the system in house that contain not smart devices but we will need to make some changes first before install the system , and to understand the concept of IOT

Open Items:

- Can we make the system able to understand the disabled people?
- How can we make benefits of AI?

Detailed Notes:

1) How will the system recognize that this TV is Samsung?

By sending request to application which sends it to server to accept request and turn it off or on

2) Do we need all devices to be from apple?

No, there is no apple TV or Lamps, Etc... so you will deal with devices from other companies but it must be connected to the same network

3) Can we use iCloud to store data for each home instead of database?

iCloud is only connects Apple devices to each other , so you can control light by using your Laptop instead of the phone if it is far away , as long as the phone and laptop are connected to the same network , database will be stored in iCloud

4) Will the system need processor for organization?

it depends on the modernity factor, if the system is smart then we will use the application only , but if not then we will need Arduino which is an electronic development board consisting of an open source electronic circuits with a computer programmed microcontroller , designed to facilitate the use of interactive electronics in multidisciplinary projects , the processor will connect all devices together

5) What are the elements for making an application to be suitable for this system?

back end , front end , which server to buy , Arduino (it could be one or more , for example all fan are controlled by one Arduino, all lights are controlled by one Arduino, then the main Arduino control all of this).
Your apple device which you write code on it must be at the latest version

6) What do we need to do after finishing the application?

You must upload it in apple store but before this you have to participate in apple store and pay 99$

7) If all devices were smart we don't need processor?

No, you will still need it cause maybe you want to control devices from your phone and you are out

8) How can we make system understand the idea of lighting level?

If you send 1 volt it will understand that the lighting is high and if you send .5 volt it means moderate lighting and if lower than .5 it means that lighting is low

9) What are the steps of this process?

1- User press button → send true or false to server → Arduino → if true send 5 volt to lamp to open and if false send 0 volt to lamp to close
And we need buck-boost-converter to regulate voltage difference between devices

10) Do we need database for each house?

No, it is server that connects all houses together like Facebook for example each customer has his own account which contain pages he like, groups he join but this doesn't mean that each customer has his own data base in the house

11) If we provide each house with its own database will that make security better?

No, that will make it more complicated to adjust security and privacy, it is easy to manage one database than generate code to make database with every new house

12) If we want to know more information about this topic what should we read about?

You must read about IOT it will help you a lot in understanding the system

Person Interviewed: DR. Ibrahim Al-Awadi
Computer & Control Engineer
Interviewer: Gehad Omar & Shahd Mohamed

Purpose of interview:

Understand user needs to meet his expectation

Summary:

The system is capable to deal with people with unable people

Open Items:

Since you are a doctor, do you think that the academic community will be more inclined to buy this system more or there is no link?

Detailed Notes:

1) What are the features that you want to see it in the system?

- The system understands the rays emanating from the brain (Human Brain Computer Interface).
- The system can help people with inabilities.
- The system can act on its own using the auto sensor, if one of the devices is working without the need for it, turn it off, for example, if there is no movement in the room, it turns off the lights.

2) Would you like a regular maintenance?

The system is the one that determines if it needs maintenance or not, and which devices need maintenance and what not.

3) What is the problem that you expect to occur in this system?

I expect that privacy will be the biggest problem.

4) Would the system be suitable in Egypt or not?

Yes, if this system is implemented in Egypt, it will succeed.

5) Are you ready to pay a large amount for it?

If it's worth it, why not?

Person Interviewed: Ahmed Hazem
Computer & Control Engineer
Interviewer: Shahd Mohamed Mostafa
Purpose of Interview:

- Promote our system to clients
- Improve the system to make it to our clients expectations
- Know any problems we might find in the system and try to avoid it
- Understand the needs of our clients and make it happen

Summary:

- This system contains different sensors, each with its own shape and function according to its environment.
- The connection of devices to each other is the basis for this system.
- Protection is essential to the success of a system like this.

Open items:

- What are the best methods of protection and how are they implemented?
- Is the complex network, which may increase the risks of the system?
- Is any problem in the devices communication that may affect the performance of the connection or the performance of this device or other devices? How can such a problem be avoided?

Detailed Notes:

1) What is the difference between Sensors?

Each sensor has its own way of working, and this method depends on the way the electrical circuits are configured, the code, and the environment in which it is placed. It also determines the method of operation of the sensor.

2) Is in electrical circuits of the command receivers, their composition depends on the presence of a sensor only?

In electrical circuits, the sensor is usually not the only component in the circuits, leaving with it other components that help the device connect with other devices such as: Wi-Fi Module, or Bluetooth Module, etc.

3) What types of sensors are used in the system?

- **LDR or a Light Dependent Resistor:**
  It is a device, whose resistance varies according to intensity of light it is subjected to. When the light falling on an LDR is more, its resistance becomes very less and when the light is less, well, the resistance of the LDR becomes very high.
- **Temperature Sensor:**
  ICs (like LM35, DS18B20), Thermistors, Thermocouples, RTD (Resistive Temperature Devices), etc.
  Temperature Sensors can be analog or digital. In an Analog Temperature Sensor, the changes in the Temperature correspond to change in its physical property like resistance or voltage. LM35 is a classic Analog Temperature Sensor.
  Coming to the Digital Temperature Sensor, the output is a discrete digital value (usually, some numerical data after converting analog value to digital value). DS18B20 is a simple Digital Temperature Sensor.
- **Proximity Sensors:**
  A Proximity Sensor is a non-contact type sensor that detects the presence of an object. Proximity Sensors can be implemented using different techniques like Optical (like Infrared or Laser), Sound (Ultrasonic), Magnetic (Hall Effect), Capacitive, etc.
  Some of the applications of Proximity Sensors are Mobile Phones, Cars Parking Sensors.
- **Reflective Type IR Sensor:**
  In this, the transmitter and the detector are positioned adjacent to each other facing the object. When an object comes in front of the sensor, the infrared light from the IR Transmitter is reflected from the object and is detected by the IR Receiver and thus the sensor detects the object.
- **Smoke and Gas Sensors:**
  One of the very useful sensors in safety related applications are Smoke and Gas Sensors. Almost all offices and industries are equipped with several smoke detectors, which detect any smoke (due to fire) and sound an alarm.
- **Humidity Sensor:**
  If you see Weather Monitoring Systems, they often provide temperature as well as humidity data. So, measuring humidity is an important task in many applications and Humidity Sensors help us in achieving this.
  Often all humidity sensors measure relative humidity (a ratio of water content in air to maximum potential of air to hold water). Since relative humidity is dependent on temperature of air, almost all Humidity Sensors can also measure Temperature.
  Humidity Sensors are classified into Capacitive Type, Resistive Type and Thermal Conductive Type. DHT11 and DHT22 are two of the frequently used Humidity Sensors in DIY Community (the former is a resistive type while the latter is capacitive type).

4) What guarantees in this system that there is no penetration of the internal network of the house and that the information of the internal system of the house is preserved?

- The network inside the house that connects the devices together is limited to the house and its devices and the server connected to these devices only, meaning that every house has its own network and every house has its own server, so the network is hierarchical as the devices are a network with each other and this network is connected to a server.
- Every house is on its own even every network is on its own too, maybe the applications are connected to outside services but the whole network inside the house belongs to the owner, the devices are connected to it and these will go up to the server and come back again.

5) What is the processor for that system and what is the difference between it and the Hub?

- The processor name is Arduino, it is something that does not exist much in reality and we don't use it much in projects but we use it in simple projects as education where performance is not a necessary thing, it has infrastructure, modules installed on it and sensors, we can use it in many things.
- Hub as a router which is a layer under the Internet layer, it is a device in labs that connects other devices together
- Hub as IOT device which is a smart home, it is on cloud, it controls the functions (like send messages between the device and the application running it) and it provides security as not any one can access the device.

6) How will the protection system look like?

- The first thing that protection starts with is that the circuit for each device is protected, so that no one can change its function, how does it happen.
- Then the biggest stage begins, which is to protect the connection between the devices with each other and their connection to the router, whether this connection is via Bluetooth or Wi-Fi, and if it is via Wi-Fi, then for protection The protocols are organized and the use of some types of encryption that will be dealt with, which helps to protect them, prevent penetration and control the home network.
- Then the communication between the router and the hub or the cloud is secured to prevent any penetration or manipulation of the system's properties.
- Then the cloud is secured in order to maintain what It contains data, whether this data is about people in the house or about home appliances.

7) What types of protection can be applied to this system?

- Network scare action
- action filter
- encryption Shutdown the WPS(the WPS is a protocol that connects routers to each other and access points)

8) How is the process of executing the orders in this system?

- In every home, the devices are connected to an internal network of the home, and then they are connected to the router, and the router is connected to the server in the house, and this server is connected to the application, so the server is the recipient of orders and sends them, as it sends information about each device. A simplified example of a network with one device: a sensor connected to the router, the router to the cloud, and the cloud to the application.

9) Is there a specific component in the devices, the router, the server, and the application?

- Wi-Fi module
- Bluetooth module.

Person interviewed: Ahmed mamdouh

Teaching Assistant in Electricity division in faculty of Engineering

Interviewer: Rania Mohamed

Purpose of interview:

- Determine the user's view of the system in general and his opinion of the changes to the system
- Deduce the extent of success and failure of the application in the future by users

Summary:

A simple report on the level to which technology has evolved and how it has become saving time and effort for users, their opinions on its use and their view of the improvements that make the user's life simple so that it can be provided in the system and an estimate of the success or failure of this system (Home kit application) in the future.

Open Items:

- He did not speak clearly about the security aspect of using the system or how to manipulate or exploit hacking in such an electronic system.
- I was not convinced from his point of view of the devices that cannot be dispensed with in this system for all people to be able to provide it as the most important thing in the system, like watch! I think that people need devices that are much more important than them, but they are points of view.

Detail Notes:

1) What are the advantages that motivate you to use a system like the Home kit?

- He is able to quickly access all the household appliances while sitting on his bed
- Want to know whether the devices are working or not without going to them.
- It will be outside the house and I want to know whether the devices are working or not, in order to control their operation and disconnect them to control energy savings
- It is possible to download a movie from the iPhone and you want to watch them from any other smart device in the house.
- Enjoy the convenience and ease of control throughout the house easily**.**

2) What are the disadvantages of this system from your point of view as a user to the system?

- It is possible that the device does not distinguish the sound easily and I have to say the commands more than once.
- It is possible for the user to be forced to memorize certain sentences to give commands to the devices, because if I changed the device, it would not respond to these lights. These are boring things for the user.
- It is possible that the specified distance to control the devices is not efficient.
- Excessive use of the application and dealing with smart devices for a large period of time and talking to them may cause autism for the user and have a negative impact on him.

3) What are the developments or modifications from your point of view while using the system?

- Finding a way to use each device separately without having to use a hub or a specific server with an integrated system to control the home and make the whole house smart devices with an independent system.
- I control the distance in which the devices respond to the commands given.

4) What do you think about using the voice recorder and storing all the data for everyone in the house?

A great idea and provides a lot of privacy if someone wants to control their devices with just their voice.

5) What do you think about the application of this system in villages and rural areas?

Certainly not, as: technology needs people to enter at different stages in order to understand it and be able to deal with different devices easily and then move on to advanced stages of using technology such as using the Home kit.

6) What is an indispensable device in this system from your point of view?

The Apple watch. It enables me to be more efficient both in my personal and professional lives. The ability to stay apprised of incoming messages and respond to them without having to dig out another device lets me work faster. Plus, receiving calendar reminders through the watch is great for time management, ensuring I stay on target even on the busiest days."

Risk Assessment

Risk Event	Probability of Occurrence			Magnitude of Impact			Risk Response Contingency Plan
	Low	Medium	High	Low	Medium	High	
Absent team members		Medium			Medium		Have absent team member complete work missed
Too many workers	Low					High	Set necessary number of people needed and do not go above that number
Delays involved with project	Low				Medium		Monitor project
Consumers do not buy product as expected	Low					High	Improve sales management and advertising of the product
User impersonation Identity and credential theft			High			High	Control cameras to monitor and spy on users
Control cameras to monitor and spy on users		Medium				High	Give access to the camera to the admin only
Wi-Fi connection hijacking			High			High	Set up secure Wi-Fi network
sensor data manipulation	Low				Medium		Data encryption and authentication
privacy violation			High			High	Secure physical locations
malicious code injection		Medium				High	Monitoring system's performance
credentials disclosure	Low				Medium		Security awareness and training
network traffic interception	Low				Medium		IDS-IPS, encrypted and monitored network traffic

WORK PLAN:

Task ID	Task Name	Assigned to	Estimated			Actual			Dependency	Status
			Duration (Days)	Start Date	Finish Date	Start Date	Finish Date	Duration Variance		
1	***Planing***		15	6/6/2022	6/24/2022					
1.1	Project Charter	Nehal	1	6/6/2022	6/6/2022					OPEN
1.2	System Request	Rania, Sama	1	6/6/2022	6/6/2022					OPEN
1.3	Feasbility Analysis	Shahd, Gehad, Nehal	7	6/7/2022	6/15/2022				1.2	OPEN
1.4	Collecting Data	All Team	7	6/16/2022	6/24/2022				1.3	OPEN
2	***Analysis***		35	6/27/2022	8/12/2022					
2.1	Interviews	All Team	14	6/27/2022	7/14/2022				1.4	OPEN
2.2	Creating Work Plan	Shahd, Gehad, Nehal	7	7/15/2022	7/25/2022				2.1	OPEN
2.3	Functional Requirements	All Team	5	7/26/2022	8/1/2022				2.2	OPEN
2.4	NonFunctional Requirements		5	7/26/2022	8/1/2022				2.2	OPEN
2.5	Use Case		20	6/27/2022	7/22/2022				1.4	OPEN
2.6	Process Model		10	7/25/2022	7/22/2022				2.5	OPEN
2.7	Data Model		15	7/25/2022	8/12/2022				2.5	OPEN
3	***Design***		83	8/15/2022	12/7/2022					
3.1	create Interface	SHAHD	24	8/15/2022	9/15/2022				2.7	OPEN
3.2	Sensing Requirements		7	9/16/2022	9/26/2022				3.1	OPEN
3.3	Security level		30	9/27/2022	11/7/2022				3.2	OPEN
3.4	Generate buzzer noise		7	9/27/2022	10/5/2022				3.2	OPEN
3.5	Network architecture		26	10/6/2022	11/10/2022				3.4	OPEN
3.6	Engineer wiring plan		28	10/6/2022	11/14/2022				3.4	OPEN
3.7	Central Control Unit		7	11/15/2022	11/23/2022				3.6	OPEN
3.8	Room Control Unit		14	11/15/2022	12/2/2022				3.6	OPEN
3.9	View status review		3	12/5/2022	12/7/2022				3.8	OPEN
3.10	Manage database		8	8/15/2022	8/24/2022				2.7	OPEN
4	***Implementation***		54	8/25/2022	11/8/2022					
4.1	Testing	GEHAD	54	8/25/2022	11/8/2022					
4.1.1	Devices		14	8/25/2022	9/13/2022				3.10	OPEN
4.1.2	Local communication		25	9/14/2022	10/18/2022				4.1.1	OPEN
4.1.3	View Status Review Interface		15	10/19/2022	11/8/2022				4.1.2	OPEN
4.1.4	Online communication		30	9/14/2022	10/25/2022				4.1.1	OPEN
4.1.5	Documentation		7	10/26/2022	11/3/2022				4.1.4	OPEN
4.1.6	Data use		7	8/25/2022	9/2/2022				3.10	OPEN
4.1.7	Interoperability		21	8/25/2022	9/22/2022				3.10	OPEN

FUNCTIONAL REQUIREMENTS:

Process-oriented:

- Control: The app supports the idea of controlling your home device easily with in any part of your house or away from it.
- Internet: The application is designed that it doesn't need a very powerful Internet, but it needs a normal amount to receive important notifications when you're out of the house, like fire and break-in and so on.
- The system will be able to differentiate between the voices.
- The system will be able to handle the lag or error in a little time
- The system provides a help option
- Authenticate User ID and Password:
  The homeowner can enter in the home or activate and deactivate the system when they login successfully throughout the control panel. If the user enters the wrong id and passes five times the system locked and activated after 30 minutes.
- Arm and Disarm the system:
  ADT pulse module totally depends on the user login whenever the user login successfully this module activated, then this module can show the option to user to arm and disarm the system if the user enter arm the system this module can create the session for the user otherwise they can disarm the system.
- Alarming Upon detection of intrusion:
  An audible alarm generates whenever the sensor detects the motion, water level increase, fire and smoke detect.
- Contact with Home Owner, Fire and Police department:
  Without delay, whenever the alarm generates the system notify the user, police and fire departments via message and call. In that case Homeowner can also deactivate the burglar alarm. All alarm details are automatically saved on the cloud database services.

- Monitoring and Cloud Services:
  All events occurred by sensors and actuators are stored in cloud service via the corporate smart home server. IP cameras recording is also monitored by monitoring company as well. All reports are generated whenever the user demands.
- Reports Generation:
  The system works in this sequence that whenever a homeowner wants to view the reports of sensors and actuators events the system allows the user to download the reports through the control panel. These reports are generated after every 7 hours. So the user has the facility to view and download the reports when they want.

- Disarming the Alarm:
  In case when the user is at home or away from home, the system can activate the burglar alarm by some reasons, then the user has the facility to disarm the alarm.
- Configure a network that connects all the components of the system to each other (and this network is in a hierarchical system)
- The devices contain a Wi-Fi module, Bluetooth module, or both
- Connecting sensors to devices, whether the devices are smart or not
- Definition of the house by the person's account on the application that the system knows their voice or each of them has their own password and so on
- Controls devices and gives commands by the application
- when an error occurred Send messages or warnings to application
- Hup control your smart home accessories while you're away from your home
- The cloud sends reports to the phone about the performance, condition, and energy consumption of a device
- Configure the router to connect devices and the cloud
- Arduino connects all devices together by wires and then connect all of that with the router
- Hup connects the devices to the router
- The Hup collects commands from the devices and send it to the server
- Sensors For each device that contains a sensor, it is ready to receive and send commands
- Some of sensors are able to make their own decisions, especially who has the camera in their composition
- Devices Implement orders, and if a problem occurs, a report is sent
- 1) Using the main parent device like HUB (high level Functional requirement):
- 1.1)You need a home hub to control your Home Kit accessories while you're away from your home, grant access to the people you trust, and automate your accessories to do what you want, when you.
- 2) Internet connection is required (Very high level Functional requirement):
- 2.1) without an internet connection, wireless devices do not work and you cannot build a system at all
- 3) Saving (high level Functional requirement)
- 3.1) electricity saving :It provides the user with following up on all home appliances remotely from one place, reducing energy wastage, because he will be more aware of which devices are important to operate in relation to them or not.
- 3.2) effort: The user provides quick access to all devices from one place
- 3.3_Time Management: If the user is busy doing certain things that he cannot leave, he can take advantage of these devices, setting a timer to finish doing other tasks without going to each device, closing and opening it, etc.

- 4) Use the same system:
- 4.1) first, the owner of the system must be a login agent for all the devices that he does not control (high level Functional requirement), and he does not limit the number of other users by registering their data in the system, such as, for example, that the system knows their voice or each of them has their own password

Information -oriented:

- Report :The app sends detailed messages about what's happening in the home, saves it, and also sends a notification i
- Definition of the house by the person's account on the application (information)
- Storage of data for each device in server (information)
- Storage of equipment cases, their energy consumption, working hours, or opening and closing times (information)
- Store maintenance dates and what will be spent on the system since it is applied at home (information)
- That the protocols of the routers be prepared to receive data or commands and send them, whether from the cloud or from devices(information)

NONFUNCTIONAL REQUIREMENTS:

1-Operational Requirements:

1.1 Management requirements:

- The document for requirement specification submitted on 12th July.
- The document for analysis model submitted on 18th June
- The document for design model submitted on 21th June
- The document for the deployment and construction submit on 25th June
- The summary of the report all meetings should be submitted

Implementation requirements:

- The system should be developed by using SWIFT and Objective C
- The system should be developed by using the Xcode Tools.
- The modelling of system should apply for using lucid chart.

Standard requirements:

- The development process should be coherent with waterfall model.

1.2 Once an application is opened from a device, it requests a password entry, and the app supports that it opens from any device and does not connect to any one particular device.

1.3 The system can be run on all Apple devices, and a basic device that connects them to each other, and it can be run with all Android devices, in the case of a major device or server, in order for these devices to be compatible with Apple devices and Net7. Work with all devices as if they join the same design as Apple devices

1.4

- The system will provide an emergency plan
- The system has a set of different languages and accents
- The system provides a medical care

1.5

- Language: The application provides more than just the language in the app for the user to choose from.
- Space: The application is designed to not take up a lot of storage, does not support advertisements that increase its space, and also increases Internet consumption

2-performance Requirements:

2.1 Usability Requirements:

The average time for homeowners to seek all feature of the user interface via Personal computer must be less than the one hour.

Static requirements:

- The Smart Home security software requires only 30 MB of memory on the run time.
- The control software for smart home is limited to 200MB of hard disk space of the main processor for installation.
- The hard disk for recorded video file requires only 20 GB. Dynamic Performance:
- In User Mode when the sensors of heat. Motion, water, CO2 and others are active and detects intruder, the system report to the user in just 1000 milliseconds.
- When the user watch camera monitoring procedures the delay between image and displaying image is less than the 500 milliseconds. The video codec is MPEG-5 requiring 0.7 GB for 7 hours recording with 7 frames.

Reliability requirements:

- There must be no anyone malfunctions of signing on the web service. For example, if the username OR password are not correct, the server has never allowed the user to avail the service.
- Second, there is no malfunction in validating a PIN number of passwords, i.e. if the input code is not correct the control panel can't allow the user to use all features of the control panel.
- All possible fluctuations and errors must be handled and reported to the online service centers since their guarantee no system down; the systems automatically send recovery setting in some situation to the user.

Availability:

- The system operates 24 hours in a day. So there is no issue street that caused the program/software bugs interview 6

Plate from Constraints:

- The control panel system must use some operating system like iOS 13. The system use Java JRE 2.6 must be installed before the whole system is deployed.

Modifiability:

- If a customer wants to add more functionalities e.g. camera and sensors, through the programming effort it is done in just 10 MS

2.2 This app needs a large, powerful database to receive a large number of users at the same time without affecting speed of any one of them.
2.3 We are sorry to inform you that the performance of the system depends only on the speed of the Internet, as well as on the distance between the main device and the devices that the user wants to control.
2.4 The system provides a regular maintenance and the user will determine the period.

3-Security:

3.1 The app supports security by preventing intrusion to prevent user distraction to intimidate the user, and violate privacy by sending fake notification of danger. The app will send a detailed notification or message for each type of danger
3.2 The security feature is high, as only the owner of the system can control the devices by recognizing some of its features such as voice or fingerprint, etc., but an error can occur in a case like, for example, if someone records his voice and uses it after that to open his own device without his permission or Due to the great development that is abundant in the field of hacking, home cameras can be hacked and this can harm the user, so the user must check the quality of the security from time to time

4-Cultural &Political:

■ the system must be able to differentiate between languages and between adults and children so that the authority is for the parents and there are limited functions for use by the children

USE CASES:

Use Case Name: Log In WI-FI MODEL	**ID:**UC-1	**Priority:** High

Actor: User Or Customer

Description: The User Need To Log In The Home System WI-FI MODEL So That He Or She Can Connect To The System and Benefits And Controls All The Powers Of The System .

Trigger: The User Want To Connect The System So He Or She Could Control The Devices Of The Home

Type: ☑ **External** ☐ **Temporal**

Pre Conditions:

1. Large Database To Store The Data
2. A Network

Normal Course:

1. First The User Opens Their own Wi-Fi Icon in the Application.
2. After They Press It, If the User Is Logging in for the First Time, They Are Asked To Enter A New User Name And Assign A New Password, But If They Already Registered, He Or She'll Choose His/Her Username And Enter The Password.
3. If The Entered Data Is Correct, This Message Will Appear (Log In Successfully Performed).
4. The User Will Then Have A Selection Of How Many People Are Allowed To Use This Wi-Fi.
5. After Determining The Number, These People Are Selected And Logged In.
6. If A New User Is Logged Into Wi-Fi, A Message Will Appear With That User's Name, The Date, And Time When He Or She Logged In.
   The User Can Click On Button Details In The Wi-Fi Icon It Will Show His/her Daily Details Of Wi-Fi Like The Current Speed And Consumption Of Each Connected Device.
7. After Completion, A Message Appears (People Have Been Added Successfully).
8. The User Is Then Automatically Returned To The Application Home Page And Connected To The Home System.

Information For Steps:

←	User Name
←	User Password
→	The Success Message
←	Select The Number Of Users
→	The Message Of New User
→	The Daily Message

Post Conditions:

1. The User Name And Password Will Be Stored In The Database Of The System
2. The User Will Be Able To Connect The System And Control The Devices
3. The Sensors Will Automatically Connecting To Devices, Whether The Devices Are Smart Or Not

Exceptions:

1. The Password You Entered Isn't Strong Enough.
2. Not Accepting A Password, Because Of Not Using Uppercase And Lowercase Letters, Numbers, And Special Symbols
3. Username Already Exists In Database (Already Used)
4. Use Numbers Or Special Symbols In 'Username 'Field.
5. Use Too Long Or Too Short User Name

Summary Inputs	Source	Outputs	Destination
User Name	User	The Success Message	User
User Password	User	The Message Of New User	Database
Select The Number Of Users	User	The Daily Message	Database

Use Case Name: Authenticate User Id and Password	**ID:** UC-2	**Priority:** very high, Must be implemented

Actor: user of smart home

Description: when the user Decide to login to home smart system using mobile application or web to take permission to control all the devices**.**

Trigger: login to Home smart system
Type: ☐ **External** ☑ **Temporal**

Pre Conditions: Safe home system is configured and its operating well

Normal Course :	**Information For Steps:**
1. The Home Owner interaction with control panel ←	using touch screen to enter data
2. The home Owner types User ID and password ←	Password must contain special characters , small and capital letter
3. System Validates user id and password →	Show a message indicating that the login was successful

Alternative Courses:
If the user ID and password are not appropriate, the system shows error message and does not allow the user to enter

Post Conditions:
If the user id and password are appropriate, safe home system allows the user to enter

Exceptions:
When someone tries more than 10 times to enter the password

Summary Inputs	**Source**	**Outputs**	**Destination**
User ID and password	through log in interface of a mobile application or website	home system allows the user to enter	The system record the access status into the database

Use Case Name: Add New Device or Accessory.	**ID:** UC-3	**Priority:** High

Actor: System owner (user).

Description: This use case describe how user can add new device to his smart home

Trigger: The user needs to add a specific device to the system.
Type: ☑ **External** ☐ **Temporal**

Pre Conditions:

1. The user has the Home kit application and has created an account on it before that.
2. The user has a basic device (hub) so that he can connect the new device to which he will add.
3. The user has a strong internet that continues throughout the day.

Normal Course:	**Information For Steps:**
1-Connect your device with your hub	← Your account on application
2-Open the Home app and tap Add Accessory ⊕ or Add + .	← Your homepage on app
3-Tap Add Accessory	← The accessory QR code
4-Use the camera on your iPhone, iPad, or iPod touch to scan the eight-digit Home Kit code, or	→ User accepted
QR code on the accessory or accessory documentation. If you have an iPhone 7 or later and see	→ Name of your accessory.
on your accessory, hold your iPhone near the accessory to add it.	→ Press ok
5-When your accessory appears, tap it. If asked to Add Accessory to Network, tap Allow.	
6-Name your accessory and assign it to a room to help you identify it in the Home app and control it with Siri.	
7-Tap Next, then tap Done.	

Alternative Courses:	
1- You chose the accessory brand. (branch at step 1)	← Brand accessory?
2- Another brands or suggested other accessories	→ Other suggestions
3- If your accessory from apple brand Connect to the hub directly	← Hub connection page.
4-If the device is from a brand other than Apple, connect it to the bridge server first, then to the hub.	← Bridge server connection page.

Post Conditions:

1. After absorbing the hub of the new device and its ability to control it, the user places it within the appropriate area through:
2. 1- On the Rooms tab, tap or click Home, then select Room Settings.
3. 2-Tap or click on the "area". Select a suggested region, or choose Create New and name your new region.
4. 3- Click or tap on done.

Exceptions:
1- The device itself is not of the Apple brand, and this will prevent it from being connected directly to the hub without using a bridge server.
2-A sudden malfunction in the Internet will prevent the connection between the system and the new accessory device from responding.
3-A message appears confirming that the device is placed in the appropriate room, adding any other device, or making an adjustment to the rest of the system rooms.
4-A message appears to restart the system.

Summary Inputs	**Source**	**Outputs**	**Destination**
1- Gmail to sign in app 2- Account on system 3- QR code of accessory 4- Accessory Brand	System owner System owner Accessory company Accessory company	User choice and accepted Other suggestions	1-Company database. 2-Accessories list of the system. 3-main devise connection.

Use Case Name: control system	**ID:**UC-4	**Priority:** High
Actor: Engineers & developers		
Description: The overall picture of the system.		
Trigger: Determine the functions that the system will contain. **Type:** ☑ **External** ☐ **Temporal**		
Pre Conditions: **1.** Register devices to the system. **2.** Connect all devices together.		
Normal Course: 1. Connects all the components of the system. 1.1. A network that connects all the components of the system to each other. 1.1.1.Configure the router to connect Hup and the cloud (server) 1.1.1.Connect all devices with the Hup. 1.1.2.Connecting sensors to devices, whether the devices are smart or not. 1.1.3.Connecting all devices together by wires or wireless and then connect all of that with the Hup. 2. Sensors For each device that contains a sensor. 2.1. Voice command sensor. 2.2. Recognize commands by pointing. 2.3. Sensors make their own decisions, especially who has the camera in their composition. 2.3.1.Automatic action in the event of any dangers such as fire or burglary. 2.3.2.Automatic lighting control by infrared sensor. 2.3.3.Automatic control of opening and closing doors for people who know their faces or their car numbers. 3. Devices Implement orders, and if a problem occurs, a report is sent.		**Information For Steps:** The id of each device Voice command Sign command Permission to control
Alternative Courses: **1.** If the connection is lost, a warning message will be sent to the phone. **2.** Device connection to server.		

3. Connect the phone to the server connected to the home. **4.** When any technical problem occurs, a message is sent to the company to study the problem. **5.** Send a report on the stored data to the phone to see if the user will modify it or not.	

Post Conditions:

1. Ease of complete control of the home through the user.

2. Ease of solving problems and maintenance operations.

Exceptions:

- The system breakdown.

Summary Inputs	**Source**	**Outputs**	**Destination**
voice command	User	Response	Device
sign command	User	Response	Device
permission to control	user	Automatic control	Device

Use Case Name: server	**ID:**UC-5	**Priority:** High

Actor: Engineers & developers

Description: Determine what functions the server performs and what data it stores

Trigger:

Type: ☑ **External** ☐ **Temporal**

Pre Conditions:

The server is registered on the company's server

Normal Course:	**Information For Steps:**
1. Storage information about each system and users.	
1.1. Data for each device.	
1.2. Storage of equipment cases, their energy consumption, working hours, or opening and closing times.	
1.3. Store maintenance dates and what will be spent on the system since it is applied at home.	
1.4. Storage of user device data.	
1.5. Store the data of the friends that the server allows to communicate with them.	← Data about user
1.6. Store the permissions granted by the user to his friends to prevent any hacking.	
2. Control orders from devices & response.	
2.1. Receives orders from Hup and carries them out.	← Order
2.2. Send a response to Hup.	← Order
2.3. Receives orders from application and carries them out even from outside the house.	
3. The sever sends reports to the phone about the performance, condition, and energy consumption of a device.	→ Report
4. After the server is installed, allow the user to register their own devices.	← Data about device
5. Use appropriate protocols for its job.	
5.1. It contains the information and functions necessary to understand the signals coming from the devices.	
5.2. Main and subsidiary functions for each device.	

Alternative Courses:

1. If problem occurs
   1.1. If this problem occurred due to the system not understanding the matter or any malfunction in the system, the server will send an alert message to the user and a report to company to fix this problem.
   1.2. If it is a problem that does not affect the system as a whole, it will send a message to the user or to any device that contains a speaker that display the problem and solves it by voice.

Post Conditions:

1. Organizing the receiving and sending process.
2. The system is more efficient, safer, and data-saving.

Exception :

Server failed

Summary Inputs	Source	Outputs	Destination
Data about use	User	Acceptance	Application
Order	Hup	Response	Device
Order	Application	Response	Device
Data about device	User	Acceptance	Application
	Hup	Report	Application

Use Case Name: Providing Emergency Plan	**ID:** UC-6	**Priority:** Medium

Actor: User

Description: If The User Has Health Condition Then The System Will Aid Him Until Real Help Comes And Call An Ambulance

Trigger: A User Of The System Is In Bad Health Condition

Type: ☑ **External** ☐ **Temporal**

Pre Conditions:

1. The User Must Enter His Health Condition And Provide All The Information Needed
2. The User Must Always Keep The Emergency Mood On

Normal Course:	**Information For Steps:**
1.0 Aim The User And Call A Relative	
1. The User Creates An Account For Himself	Username/Password
2. The User Enters The Health Condition He Has And All The Extra Information Needed	Health Condition Search Criteria
3. The User Enters A Search Request By Providing His Location	Hospital Matching Location
4. The System Shows Him The Nearest Hospitals That Can Help Him In His Condition	Hospital Name
5. The User Selects The Hospital He Wants	
6. The User Provides The Number Of The Relative That Can Help Him	Relative Number
7. The User Provides The Message The System Will Show To That Relative	Message
8. The User Can Change The Hospital That Will Help Him	New Hospital Name
9. The User Can Change The Relative	New Relative Number
10. The User Can Create Multiple Accounts For The Family	

Post Conditions:

1. The System Will Have At Least One Health Condition For Each Account
2. The System Will Have A Number Of The Nearest Hospital
3. The System Will Have A Number Of A Relative And A Message To Show
4. The System Will Be Able To Aim The User Until Real Help Comes

Exceptions:

E1: The Health Condition Is Unique And There Is Not Much Information (Occurs At Step 2)

1. System Contacts Special Doctors To Diagnosis His Condition And Provide More Information
2. System Stores The New Health Condition

E1: Search Request Returns No Results (Occurs At Step 3)

1. System Displays Message That No Results Were Found For That Search
2. System Asks The User If He Wants To Search Other Areas Near Him

Summary Inputs	**Source**	**Outputs**	**Destination**
Username/Password	The User	New Hospital Name	Hospital Database
Health Condition	The User	New Relative Number	Relative Database
Search Criteria	The User		
Hospital Matching Location	Locations Database		
Hospital Name	The User		
Relative Number	The User		
Message	The User		

Use Case Name: Monitor Camera	**ID:** UC-7	**Priority:** high , Must be implemented
Actor: user		
Description: when user want to view the record of camera in real time		
Trigger: View the record of camera in real time **Type:** ☑**External** ☑ **Temporal**		
Pre Conditions: user must have singed in the system first and have the control in application		
Normal Course : 1) Home owner clicks surveillance menu 2) Home owner, click display submenu 3) Homeowner right click on the camera 4) Homeowners click record side menu		**Information For Steps:** Display interface of menu Show message show that the process succeed
Alternative Courses: Some cameras are not activated There is no enough space to record the video		show message to the warn the user
Post Conditions: Show message show that the process succeed		
Exceptions: Select wrong choice		

Summary Inputs	**Source**	**Outputs**	**Destination**
Selected menu and sub-menu	user	Interface to view the record of camera	to be uploaded in server And user

Use Case Name: Fire sensor	**ID:** US-8	**Priority:** High

Actor: User

Description: Fire sensors can detect and respond to the presence of a flame or fire. They use visual and audio signalization (to warn people about a possible fire, smoke, or carbon monoxide occurrence in the area of coverage), When the fire occurs it sends warning signal like a loud siren/bell or a flashing light or it can be both and also send a voice message to the user or makes a call to the authorities or to the occupants.

Trigger: When a fire has broken out, the fire sensor responds

Type: ☑ **External** ☐ **Temporal**

Pre Conditions:

1. The user has to add a fire alarm to the app to connect it to the system.
2. Detector : a device suitable for connection to a circuit that has a sensor that responds to a physical stimulus such as heat or smoke or flame

Normal Course:	**Information For Steps:**
1. First the fire alarm systems use automatic functions like the sensors to detect the occurrence of an event that may result in a fire. They receive a signal from a fire sensor (smoke, heat or carbon monoxide detector) and automatically transmit it to the fire alarm panel	← presence of a flame or fire ← receive signal
2. The fire alarm panel activates the flashers or the sounders, turns on sprinklers (or they can be activated along with the detector), or makes a call to the authorities or to the occupants	
3. The app sends a fire warning message to the user, identifies the exact location of the fire inside the home, and sends instructions about the best escape route if there is people are found during fire	→ Warning message
4. The app also sends a recorded voice message to the fire extinguisher stating that there was a fire, and lists the full address of the house.	→ recorded voice message

Alternative Courses:	
1. We can equip the sensor with heat detector, which determines the type of fire by measuring temperature and identifying smoke	← A certain temperature
1.1. the sensor sends a quick message to the heat-detector to determine the type of fire and takes automatic action immediately	← quick message
1.2. if the fire is caused by electrical contact then all water sources in the house will be cut off, and the system will use fire extinguisher	→ fire Type message ← electrical contactmessage
1.3. if the fire is caused by burning of solid materials then the system will use water	← burn soild message → Blue flash
2. The sensor can also be fitted with a light device (flash) so that if the fire is	→ redflash

caused by burning solid material it emits blue light and if it is caused by an electrical arcing it emits red light 3. The sensor can also be equipped with an audio device where the user can record a set of specific instructions or messages with their voice about how to deal what to do, so that this audio message turns on automatically when the sensor detects a fire so that people can be alerted if they are at home during the fire	← The audio message recorded on the audio device. → Sound caused by audio device

Post Conditions:

1. The fire alarm is connected to the home system
2. Increased fire safety becausethe system will be fully configured if a fire breaks out in the house, and all necessary security measures will be taken.

Exceptions:

1. because of the sensors high sensitivity, they may (false alarms (unwanted fire signals like : Fumes from cooking or burnt food, smoking, Poorly trained users)
2. If the sensor is damaged or malfunctioning, it will not function well in an emergency

Summary Inputs	Source	Outputs	Destination
presence of a flameor fire	firsensor	Warning message	Fire alarm pannel
receive signal	firsensor	fire Type message	Sensor
quick message	heat detector	Blue flash	if fire caused by Electrical contact use fire extinguisher
A certain temperature	heat detector	red flash	if fire caused by burning of solid materials use water or fire extinguisher
electrical contact message			User
burn soild message	Heatdetector	recorded voicemessage	Database
The audio message recorded on the audio device	Heatdetector User	Sound caused by audio devic	

Use Case Name: application interface	**ID:** UC-9	**Priority:** High

Actor: User

Description: Operations that can be controlled at home

Trigger:

Type: ☐ **External** ☑ **Temporal**

Pre Conditions:

I. Register every device in the house or modify existing devices

II. Log in to the home account Device registration

Normal Course:	**Information For Steps:**
1. Register every device in the house or modify existing devices	ID for each device
2. Controls devices	
2.1. Give orders your smart home and devices accessories while you're away from your home	Order
2.1.1.Music control, command response sounds, and alarm sound	
2.1.2.lighting control	
2.1.3.Opening and closing devices	
2.2. Control of the power used	Permission
2.3. Determine if the device can make a decision if it does	
2.4. home security control	
2.4.1.Identify the faces known to the system, fingerprints, and the people who have the right to control	Data about user
2.4.2.Operating the protection system, whether to protect the house from the outside or from the inside, or closing one or both of them	
2.4.3. Control the system of opening, closing and unlocking doors	
3. gives commands	
3.1. Receive reports from devices	Device report
3.2. Receive reports on hardware problems and their causes	Problem report
3.3. Receive warnings when any danger occurs	
3.4. Receive reports on hardware problems and their causes	

4. Knowing the amount of energy consumption, expenses and expenses for repairing any faults 5. Setting maintenance schedules	 Data about devices  Data about user
Alternative Courses: 1. Show a recording error message and display points for resolving it 2. Show the message that the command is not executed because the phone or device has lost communication with the home server 3. Show a message to send a report to the company in the event of a problem and the inability to solve it 4. No change in the percentage of energy consumed if the device reaches the maximum stage of energy reduction 5. When a sudden change occurs in the room, before the device takes the decision, it presents it to the owner if he is outside. It appears through the application if at home. This alert may appear in the form of a sound or as an image, depending on the device used during this period. 6. Continuous renewal of the protection system 7. In the event of any danger, the alarm works in more than one way to avoid damage by a large percentage 8. When an error occurs in the protection system, the system automatically sends the company a report and the owner has a report and offers quick solutions to solve this problem with the application of the default mode of the system to prevent any danger in these moments	

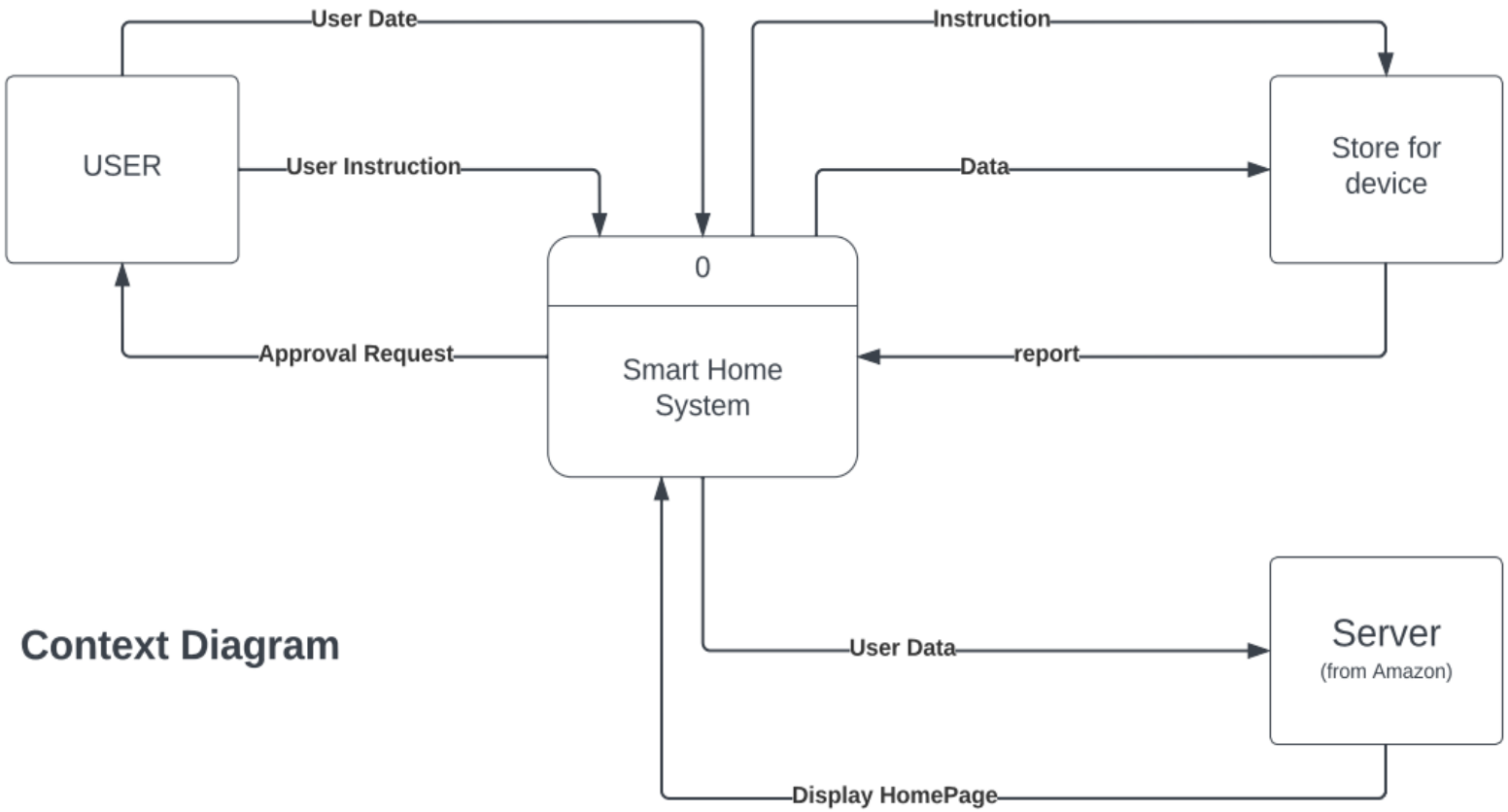
Post Conditions:

1. Full control of appliances from outside or inside the house
- **1.1.** control its work
- **1.2.** control its consumption

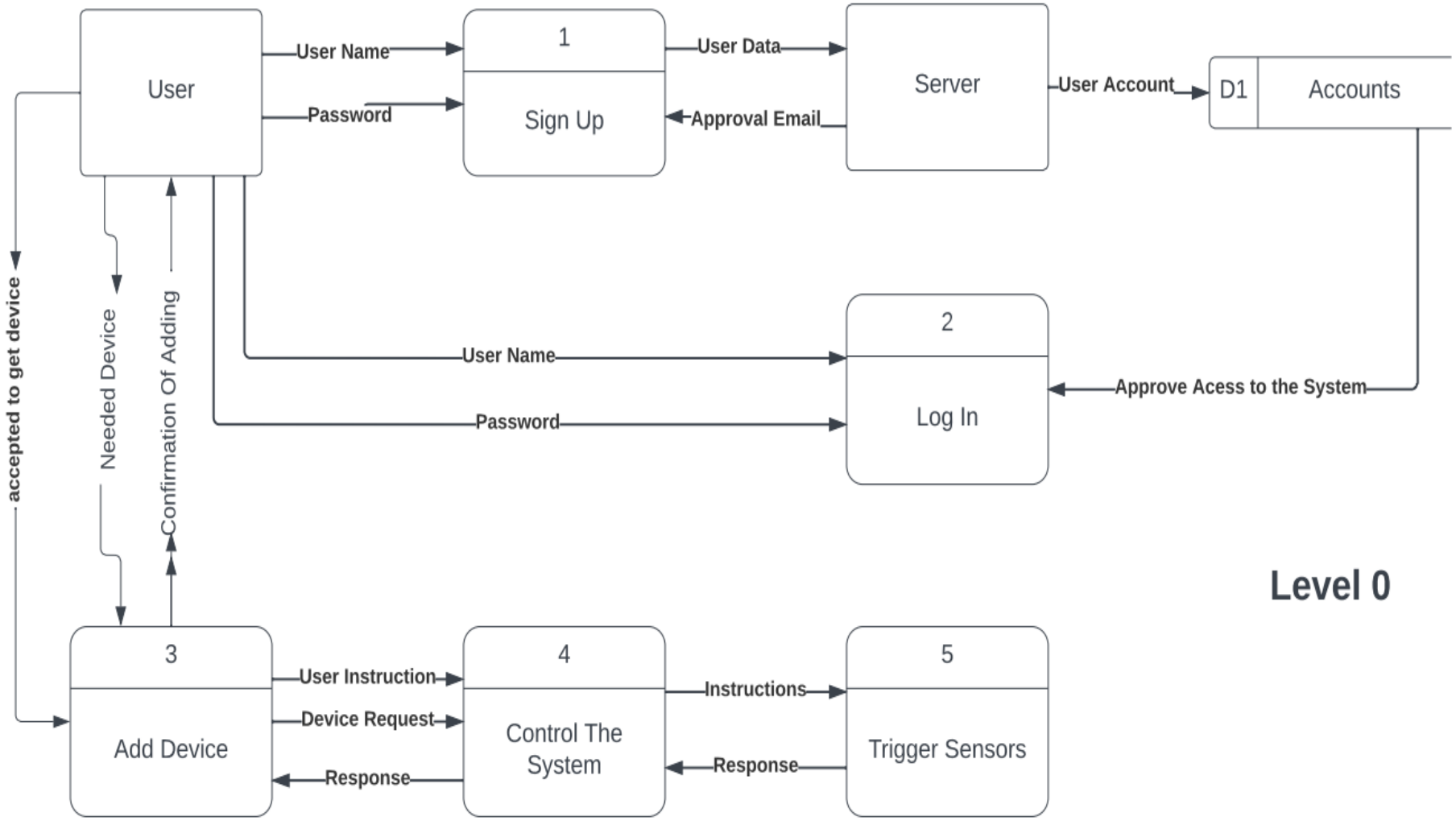
2. Full knowledge about the devices
- **2.1.** Full view of the device status
- **2.2.** Know the damages and try to improve them

Exceptions: Fail network of the home			
Summary Inputs	**Source**	**Outputs**	**Destination**
ID for each device	User	Acceptance	Application
Order	User	Response	Application, Server
order	User	Permission	Application, Server
Data about user	Application	Saved	Server
Device report	Device	Report	Application
Problem report	Device	Report	Application
Data about devices	Server	Data	Application
Data about user	User	Data	Application, Server

PROCESS MODEL:

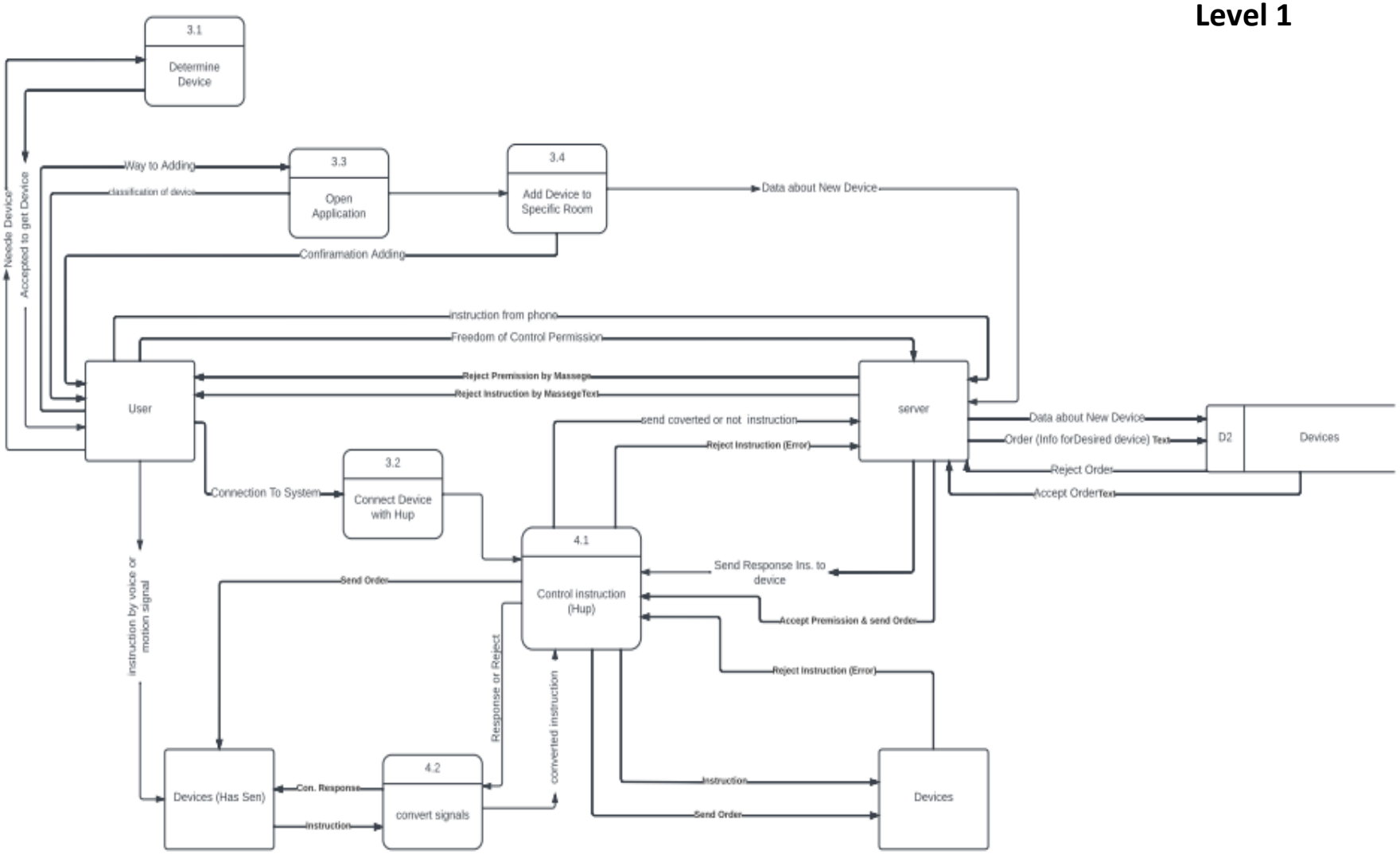


Context Diagram

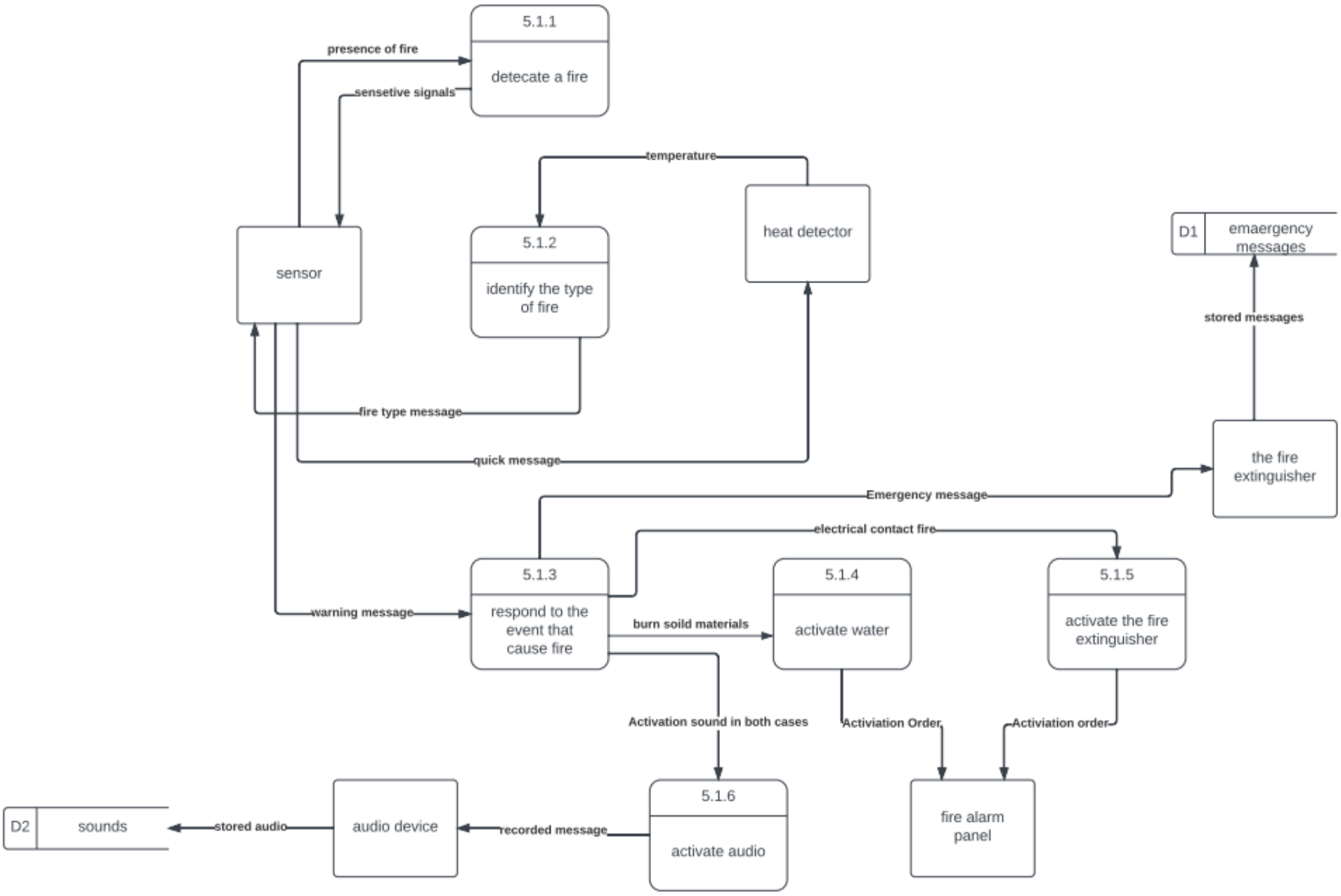

User
User Name
Password
1
Sign Up
User Data
Approval Email
Server
User Account
D1
Accounts
accepted to get device
Needed Device
Confirmation Of Adding
User Name
Password
2
Log In
Approve Acess to the System
3
Add Device
User Instruction
Device Request
Response
4
Control The System
Instructions
Response
5
Trigger Sensors

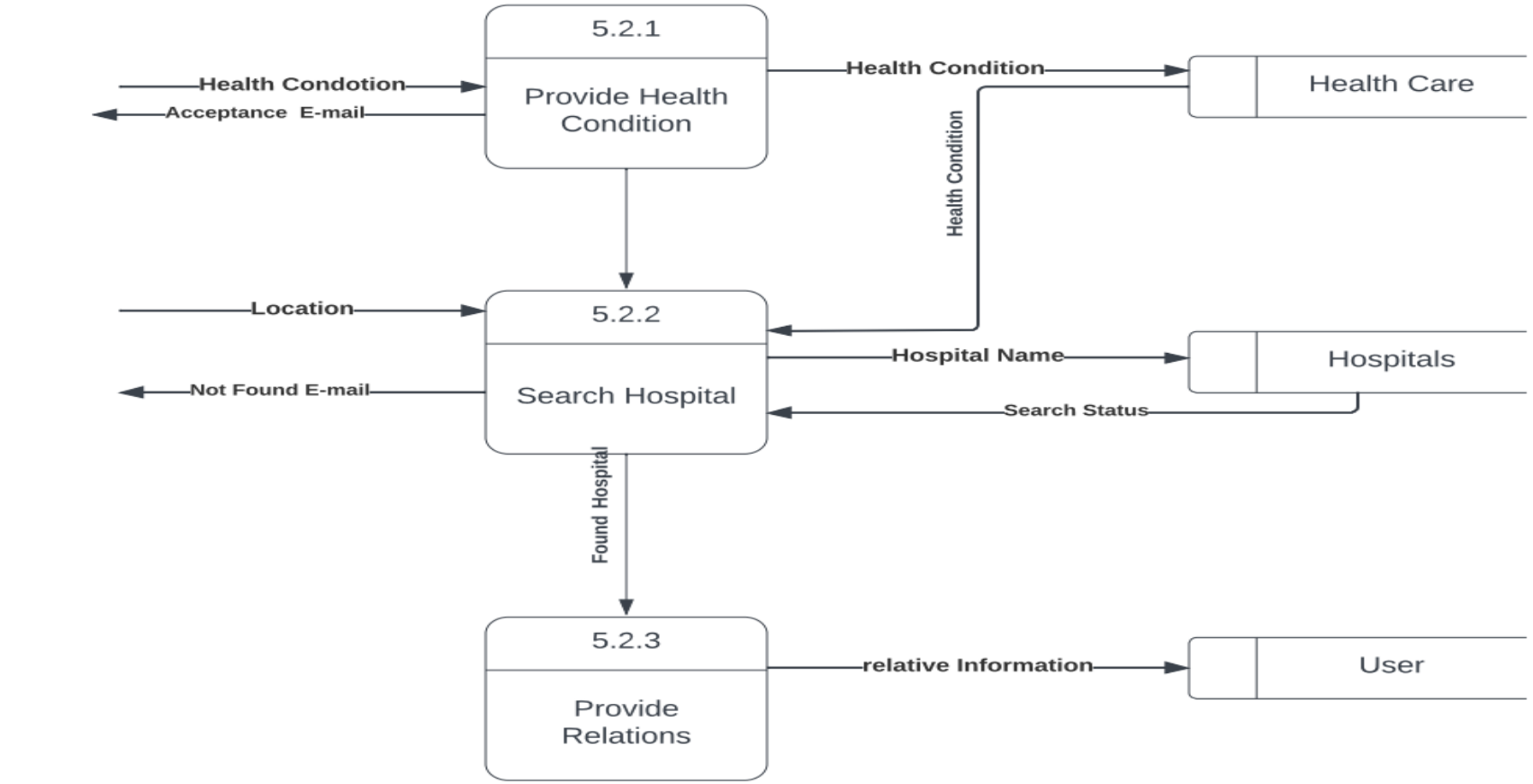
Level 0

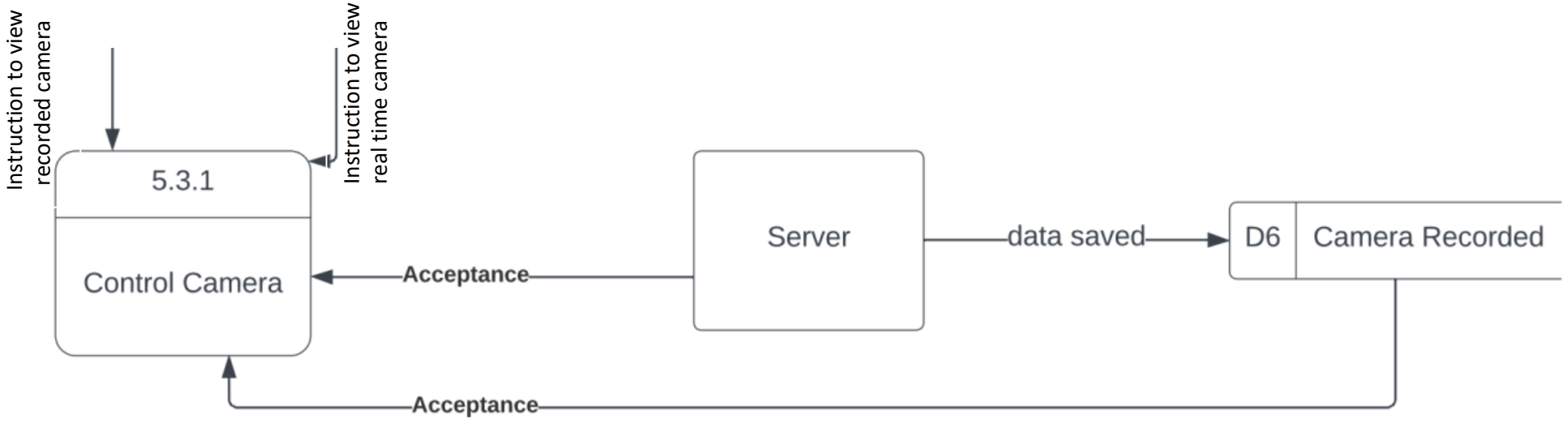
Level 1

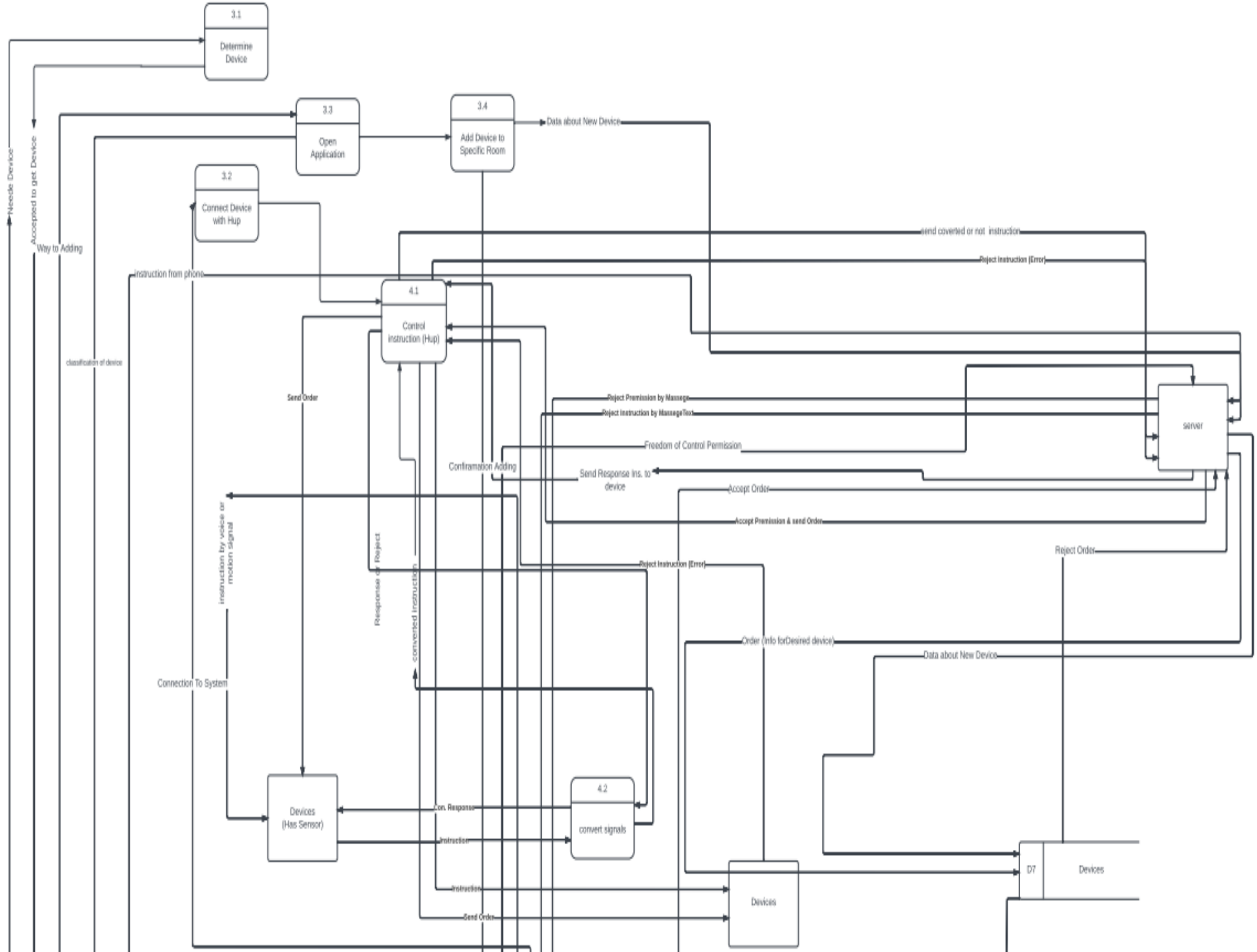

3.1
Determine Device
Needs Device
Accepted to get Device
Way to Adding
classification of device
3.3
Open Application
3.4
Add Device to Specific Room
Data about New Device
Confiramation Adding
instruction from phone
Freedom of Control Permission
User
Reject Premission by Massege
Reject Instruction by MassegeText
server
send coverted or not instruction
Reject Instruction (Error)
Data about New Device
Order (Info forDesired device) Text
D2
Devices
Reject Order
Accept OrderText
Connection To System
3.2
Connect Device with Hup
4.1
Control instruction (Hup)
Send Response Ins. to device
Send Order
Accept Premission & send Order
Reject Instruction (Error)
instruction by voice or motion signal
Response or Reject
converted instruction
Devices (Has Sen)
Con. Response
Instruction
4.2
convert signals
Instruction
Send Order
Devices

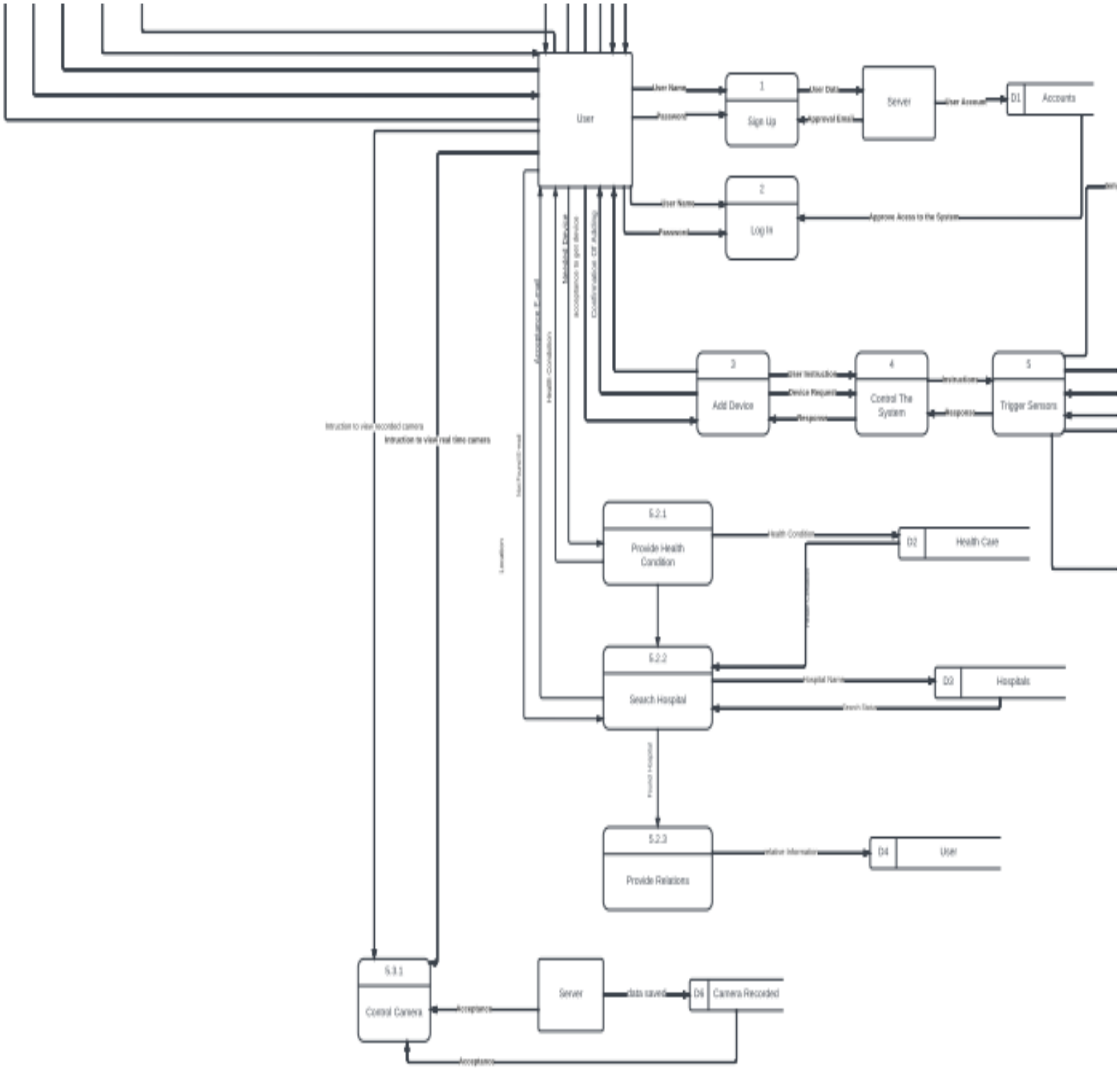
Level 2

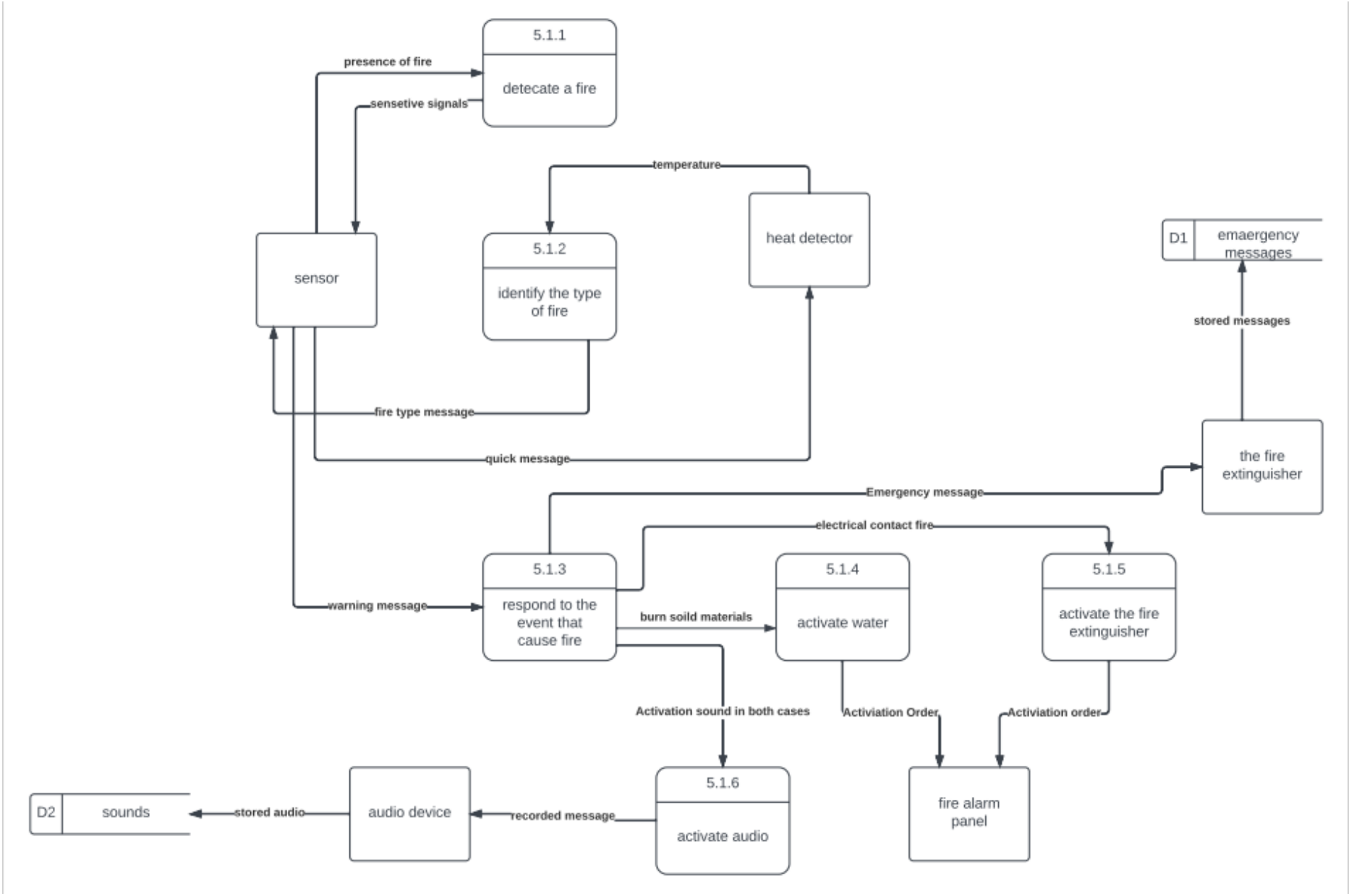

5.1.1
detecate a fire
presence of fire
sensetive signals
temperature
sensor
5.1.2
identify the type of fire
heat detector
D1
emaergency messages
stored messages
fire type message
quick message
the fire extinguisher
Emergency message
electrical contact fire
5.1.3
respond to the event that cause fire
warning message
burn soild materials
5.1.4
activate water
5.1.5
activate the fire extinguisher
Activation sound in both cases
Activiation Order
Activiation order
D2
sounds
stored audio
audio device
recorded message
5.1.6
activate audio
fire alarm panel


5.2.1
Provide Health Condition
Health Condotion
Acceptance E-mail
Health Condition
Health Care
Health Condition
5.2.2
Search Hospital
Location
Not Found E-mail
Hospital Name
Hospitals
Search Status
Found Hospital
5.2.3
Provide Relations
relative Information
User

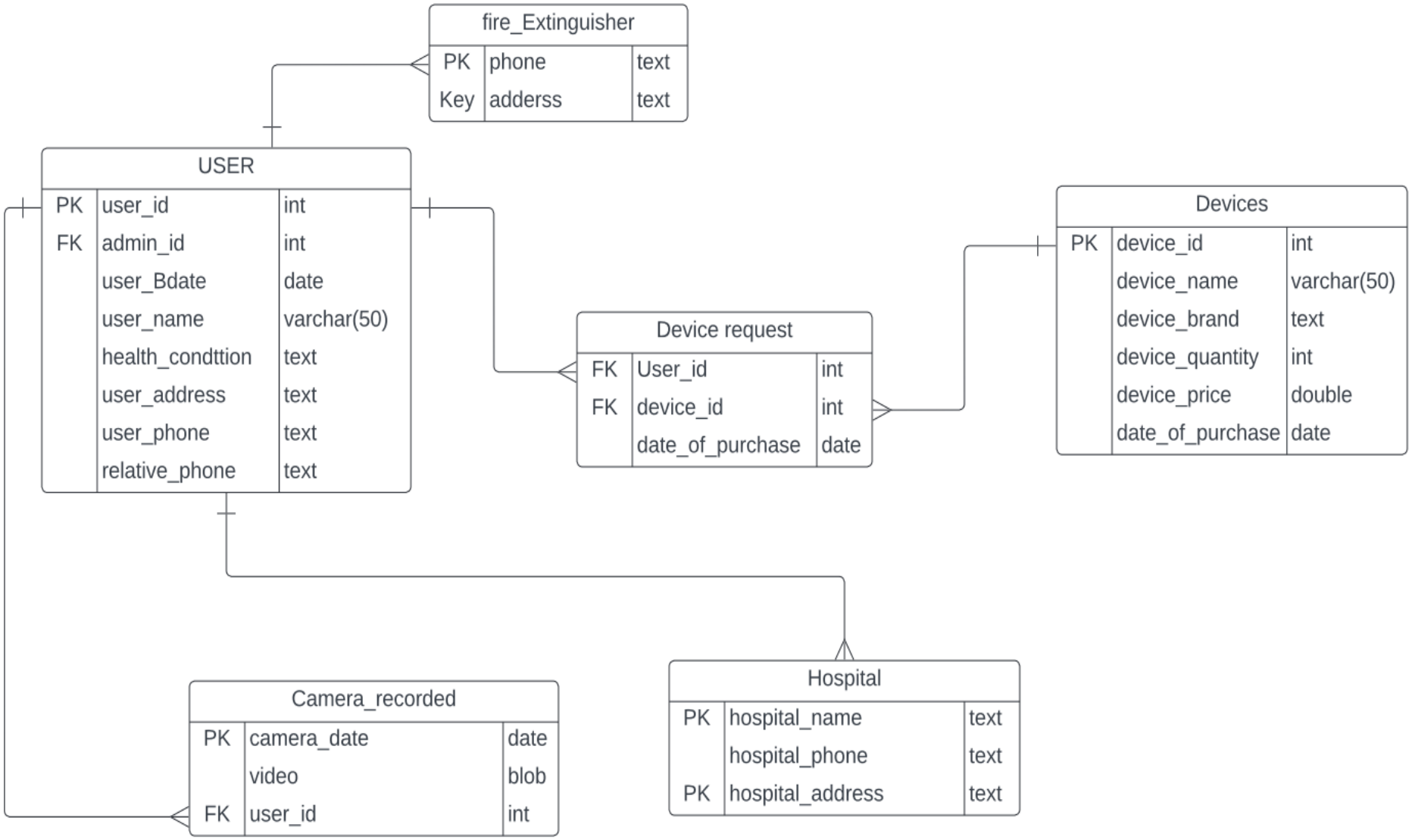

Instruction to view recorded camera
Instruction to view real time camera
5.3.1
Control Camera
Acceptance
Server
data saved
D6
Camera Recorded
Acceptance


3.1
Determine Device
3.3
Open Application
3.4
Add Device to Specific Room
3.2
Connect Device with Hup
Data about New Device
Needle Device
Accepted to get Device
Way to Adding
classification of device
send coverted or not instruction
Reject Instruction (Error)
instruction from phone
4.1
Control instruction (Hup)
Send Order
Reject Permission by Manege
Reject Instruction by ManegeTech
server
Freedom of Control Permission
Confirmation Adding
Send Response Ins. to device
Accept Order
Accept Permission & send Order
instruction by voice or motion signal
Response of Reject
convered instruction
Reject Instruction (Error)
Reject Order
Order (Info forDesired device)
Data about New Device
Connection To System
Devices (Has Sensor)
4.2
convert signals
Con. Response
Instruction
Instruction
Send Order
Devices
D7
Devices


User
User Name
Password
1
Sign Up
User Data
Approval Email
Server
User Account
D1
Accounts
2
Log In
User Name
Password
Approve Access to the System
3
Add Device
4
Control The System
5
Trigger Sensors
User Instruction
Device Request
Response
Instruction
Response
Acceptance E-mail
Health Condition
Medical Device
acceptance to get device
Confirmation Of Adding
Intruction to view recorded camera
Intruction to view real time camera
5.2.1
Provide Health Condition
Health Condition
D2
Health Care
5.2.2
Search Hospital
Hospital Name
D2
Hospitals
Search Data
Trigger Sensors
Location
Nearest Hospital
5.2.3
Provide Relations
Relative Information
D4
User
5.3.1
Control Camera
Acceptance
Server
data saved
D4
Camera Recorded
Acceptance

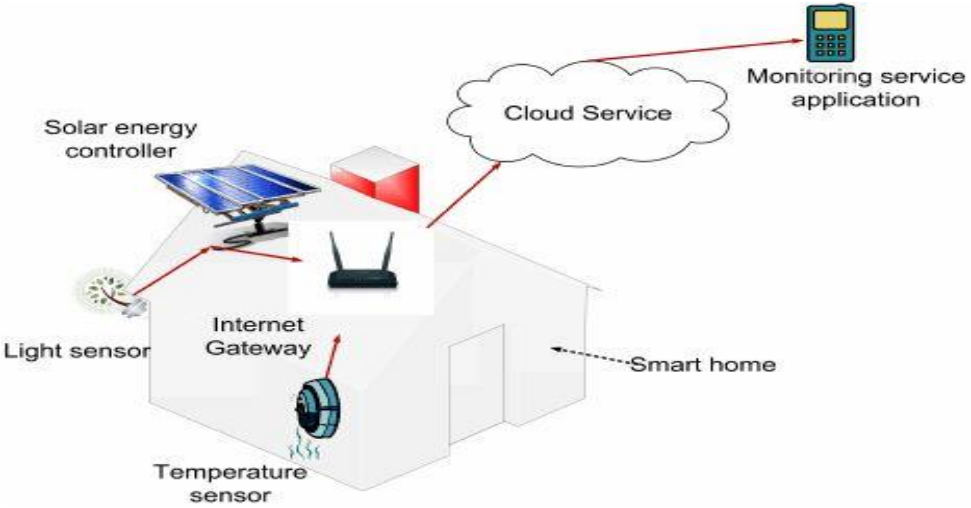

5.1.1
detecate a fire
presence of fire
sensetive signals
temperature
sensor
5.1.2
identify the type of fire
heat detector
D1
emaergency messages
stored messages
fire type message
quick message
the fire extinguisher
Emergency message
electrical contact fire
5.1.3
respond to the event that cause fire
5.1.4
activate water
5.1.5
activate the fire extinguisher
warning message
burn soild materials
Activation sound in both cases
Activiation Order
Activiation order
5.1.6
activate audio
fire alarm panel
D2
sounds
stored audio
audio device
recorded message

DATA MODEL:


fire_Extinguisher
PK phone text
Key adderss text
USER
PK user_id int
FK admin_id int
user_Bdate date
user_name varchar(50)
health_condttion text
user_address text
user_phone text
relative_phone text
Device request
FK User_id int
FK device_id int
date_of_purchase date
Devices
PK device_id int
device_name varchar(50)
device_brand text
device_quantity int
device_price double
date_of_purchase date
Camera_recorded
PK camera_date date
video blob
FK user_id int
Hospital
PK hospital_name text
hospital_phone text
PK hospital_address text

Design

HOME AUTOMATION SYSTEM DESIGN



Home automation is a method of controlling home appliances automatically for the convenience of users. This technology makes life easier for the user, and saves energy by utilizing devices according to strict requirements. Controls can be as basic as dimming lights with a remote or as complex as setting up a network of items in the home that can be programmed using a main controller or even via cell phone from anywhere in the world.

A home automation system can involve switching off electrical appliances like air-conditioners or refrigerators when a desired temperature has been reached, then switching on again when the temperature has crossed a certain value. A home automation system can also be used to secure a house from burglars by sending alerts to the nearest police station and the homeowner in case a trespasser is sensed.

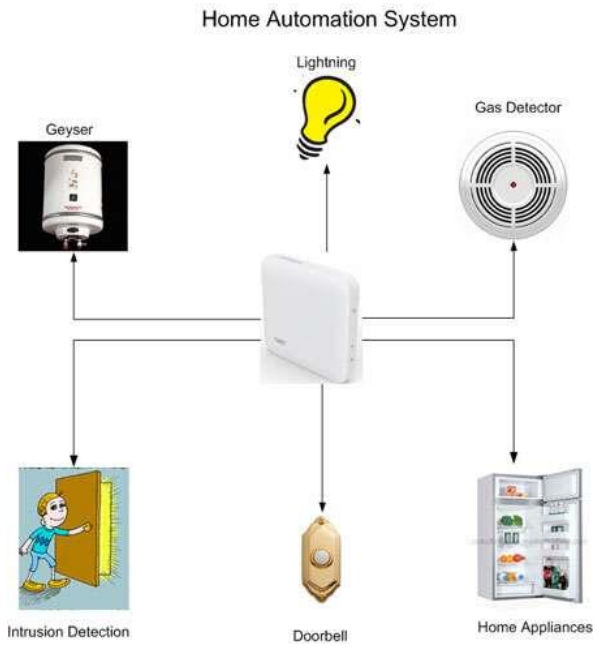


Figure 1: A basic home automation system

Apart from algorithmic automation, devices can be controlled by the user to suit personal requirements using direct buttons, cell phones, the internet, or infrared remotes. A network of appliances and sensors can interact with each other and make decisions for operation.

This article provides a framework for designing a cost-effective and functional home automation system, first discussing the general design considerations that should be evaluated before starting, followed by a review of the trade-offs amongst various architectural approaches, and then how to implement that design using system-on-chip technology.

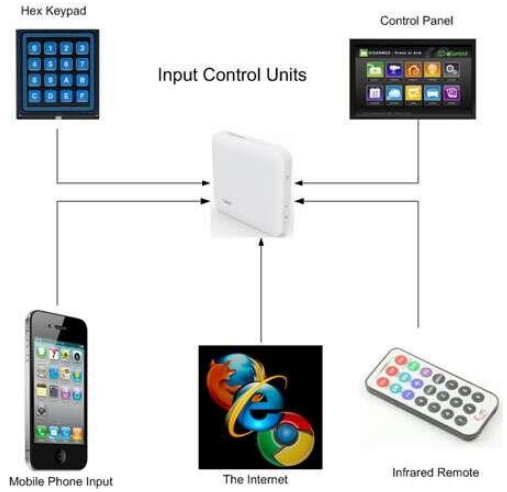


Figure 2: Control unit examples

Design considerations

there are several design challenges and considerations involved while developing a home automation system, many of which are determined by user needs. Once those have been determined, the designer can choose the appropriate processor, sensors, and communication protocol for the system, keeping the following parameters in mind:

Type of Interface: The most basic and crucial requirement in a home automation system, the interface is the basic communication protocol and hardware combination used for sending and receiving messages between devices and the user. Designers have many options for executing communication between devices, the user, and the overall system, depending upon the system, range, size of house, ease of use, etc. If a user wants to control the home appliances through the Internet, the designer needs to add an Ethernet/Wi-Fi interface to connect the system to the home network. If the user wants to control the system using Bluetooth from a cell phone, the designer needs to add a Bluetooth interface to communicate with the device.

The choice of communications interface also depends upon the topology used between the central control unit (CCU) and room control units (RCU). These units will be discussed in more detail later in this article.

Sensing Requirements: The designer needs to determine the sensing requirements of the user and decide upon the required sensor to perform the task. He or she also needs to assess the sensor specifications required for different needs and usability in different environments. The range of sensors that should be considered include:

- Thermistors can be used to control air conditioners, refrigerators, geysers, heating system, or in case of fire.
- Humidity sensors sense the moisture level in the environment.
- Gas sensors can be used to detect gas leaks.
- Light sensors can be used to detect the luminous intensity in the house.

The information provided by these sensors (after signal conditioning) is used by the processor to make several important decisions regarding the appliances and when to switch them ON or OFF.

Security level*:* Another major requirement while designing the home automation system is to make the entire system secure so that it can't be easily altered to give control of the house to unauthorized users. It should be able to prevent most types of intrusion. Even if the system is broken into, it should be able to send signals to the user and the nearest police station. It also necessary to hide as many components as possible from direct access via the main control panel, preventing it from being turned into a black box. It should also be able to send and comprehend encoded data while communicating with other devices. This will prevent intruders from tapping into the system and using the same interface to hack devices.

Topology: Topology defines the way home automation control units interact with each other. A star type topology is the most commonly used as it makes use of a central control unit (CCU) interacting with all the available remote control units (RCUs) and taking over decision making responsibilities. The role of the RCUs is to send data fetched from the sensors back to the CCU. After it has assessed the input from the sensors and made any necessary decisions, the CCU sends the command back to the RCU to take a specific action.

Another topology to be considered is a mesh topology, which has no CCU and makes use of a constellation of control units of roughly equal intelligence and capability connected with each other. Each unit sends information on the network which is shared by all the units. Each Unit is independent and makes its own decisions based on the shared information.

The choice of system topology governs the selection of communication interfaces such as ZigBee, RF, Bluetooth, etc.

Depth of automation: System design is affected by the requirements ranging from simple control of lights in the house to controlling all appliances and the security system. Each requirement affects the overall design, and developers need to determine

the most optimized way to perform all the tasks with the lowest cost and complexity. Despite the internal system complexity, the system should be easy to use and not pose barriers to its operation by a household user.

Cost: This is the most important aspect of system design as system complexity and depth of automation determine the cost. A highly complex – and thus costly – system can deter customers from purchasing and installing it in their house.

The cost of the system is directly linked with the number of components, interface used, and complexity of design of firmware and hardware. While there should be no compromise on the quality of hardware and software, the number of components in the system can be decreased to reduce the overall cost and system size as well. Rather than the traditional component-based approach, lower cost can be achieved using System-on-Chips (SoC) that integrate multiple peripherals and a processor into the same IC.

The architecture of a home automation system

While there are several topologies to choose from, for the sake of simplicity we focus in this article on a star topology-based home automation system and its two types of control units, the CCU and multiple RCUs (**Figure 3**).

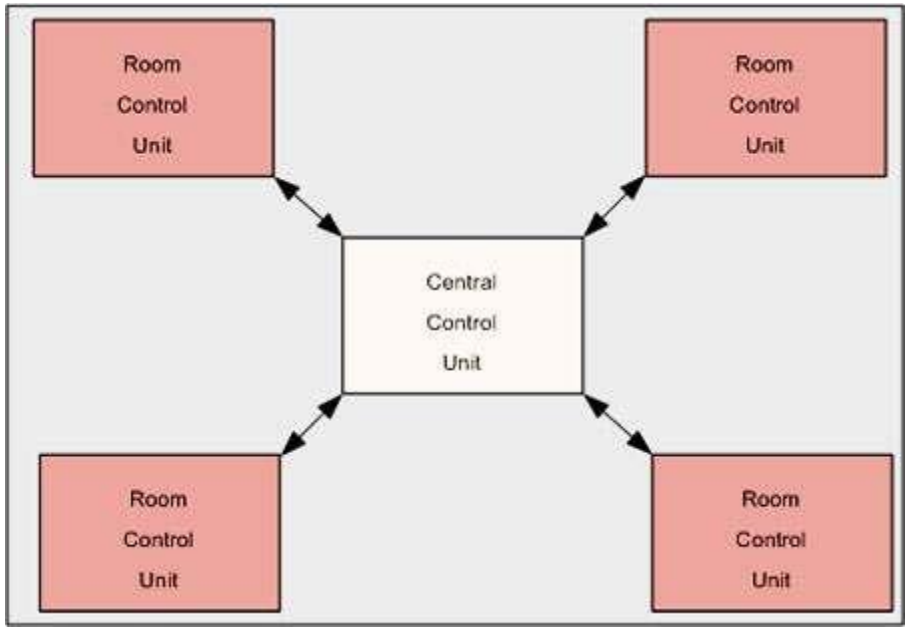


Figure 3: Star topology system architecture

Central Control Unit: The Central Control Unit is the hub and brain of a home automation system. Common features of a central control unit are:

- Measuring the current environmental conditions using the various sensors and control the lights and fans of rooms accordingly
- Receiving instructions from a remote user over GSM or Ethernet and controling an appliance in a specific room as per the received instructions
- Controlling appliances based on time, such as automatically switching off a television at a specific time
- Monitoring the current state of power and switch off appliances to protect them when a power fault is detected
- Informing remote users when an intrusion is detected or when some fault is detected in the system

Room Control Unit: A Room Control Unit controls the appliances in a particular room. It has a set of sensors to sense the surrounding environment. Based on the current conditions, it can decide upon a course of action. Common features of a room control unit are:

- Monitor the current environmental conditions using the various sensors and communicate this data to the CCU
- Receive instructions from the CCU and control appliances in the room as per the received instructions
- Control appliances based on inputs from a hand-held remote
- Control appliances based on inputs from user buttons

Let’s look at the architectures of both of these units separately:

Central Control Unit

this is the main unit responsible for monitoring the complete home automation system. It interfaces with other system blocks to perform required tasks. The most common interfaces on a CCU are shown in **Figure 4**. Some of these interfaces are optional and are used as per the system and user requirements.

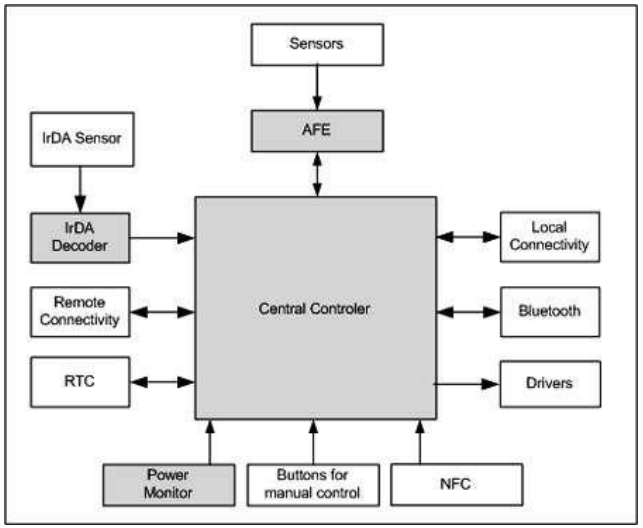


Figure 4: Central control unit block level architecture

Different blocks found in a typical central control unit are:

Sensors: Sensors are the eyes of a home automation system. They "see" the environment and convert what they find into an electrical quantity that can be measured by a microcontroller or system processor. Basic home automation sensors include temperature sensors, humidity sensors, light sensors, and gas sensors. Data in the form of signals from these sensors can be used to control the various appliances directly without any human intervention. For example, lights can be automatically switched on upon sunset, an air conditioner can be switched off automatically when no movement is detected in the house for a half hour, or an alarm can be raised when the system detects a LPG leakage event.

Analog Front End (AFE): Each sensor converts the change in a physical parameter such as temperature or light intensity to a similar change in electrical parameters such as resistance or capacitance. These physical quantities must be converted to a voltage equivalent so that the microcontroller can identify the variation in environment. For this purpose, an analog front end (AFE) is interfaced with analog sensors. The AFE preconditions output signals coming from the sensors by filtering out noise and providing required gain to the signals. AFEs are also required to calibrate the system for sensor readings, thus providing a base value for the system to identify any changes in the environment.

Remote Connectivity: Depending on need and various design considerations, users may need to be able to control the system and appliances remotely. The two most common ways of doing this are using GSM-based mobile telephony and the Internet. GSM, Ethernet, or both interfaces can be used to communicate with the system from a remote location. The system can also send or "push" useful information to users such as periodic updates, faults, intrusions, etc. These connectivity options generally require a serial communication protocol like SPI or I2C to communicate with the host processor.

Local Connectivity: The Central Control Unit and Room Control Units need to communicate with each other periodically as well as when events occur. There are multiple options available to establish communication between the CCU and RCUs that can be decided upon based on system cost and topology, including Bluetooth, RF transceivers, and XBEEs, among others. Each of these interfaces has its own pros and cons, hence system designers need to consider all of a system's requirements before selecting a particular interface.

Manual Control: In a typical home automation system, there are situations when the user needs to manually control one or more appliances. Keypads and/or infrared remotes are most commonly used to provide system control to users. Manual user control should be authorized by the system to prevent control of the system by an intruder and the shutting down of intrusion alerts.

Real Time Clock (RTC): Home automation systems must be able to control appliances based on time. An accurate time source is required to control appliances using time-based settings. An external RTC can be used to maintain time for the system and the central controller can access it to receive current time related information.

NFC Interface: Near Field Communication (NFC) is used for close proximity communication. This technology is quickly gaining traction in embedded applications for communications and information sharing. It can be used to at the main door to lock or unlock the door using the homeowner's NFC-enabled smartphone.

Power Monitor: In any house there are many electrical appliances that are sensitive to voltage fluctuations and need a reliable supply voltage within a specific range to work as expected. A power monitor block can be added to the Central Control Unit to check the instantaneous power supply voltage. This block brings down the voltage level of power supply to a level where the system can monitor it using an ADC. Using input from this block, the controller can detect low voltage, high voltage, and voltage fluctuation situations. In extreme cases, this block can instruct RCUs to switch off sensitive appliances to prevent damage. An example of a simple power monitor circuit is given in **Figure 5** and can be easily implemented into automation systems.

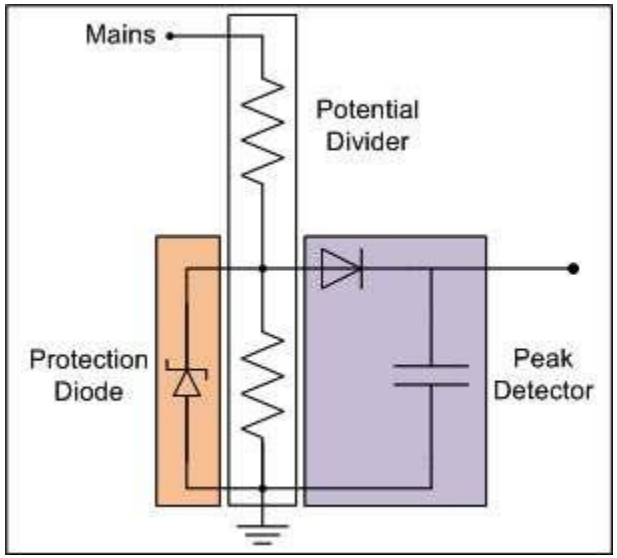


Figure 5: Power monitor circuit

In the power monitor circuit, the potential divider circuit brings down the mains voltage to a lower voltage which can be safely measured by a microcontroller ADC. The peak detector circuit creates an envelope on the scaled down voltage that gets measured. The protection diode protects the microcontroller by limiting the maximum voltage to its Zener Voltage (Vz).

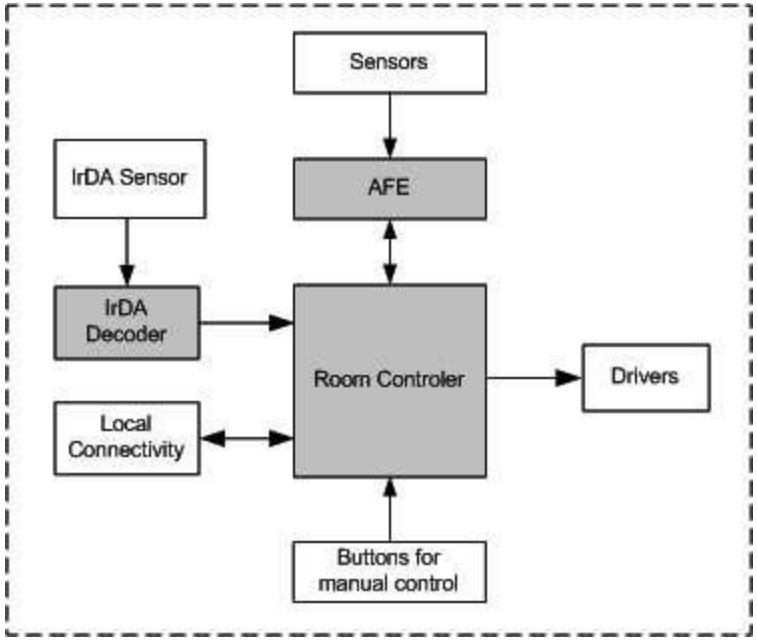


Figure 6: Block level architecture of Room Control Unit

Room Control Unit (RCU)

The room control unit (**Figure 6**) is responsible for controlling the appliances installed in a particular room. This unit receives control commands from the central control unit and also from user buttons that can directly control appliances. The room control unit can also have various types of sensors built in to locally monitor the appliances in the respective room. If the RCU has an IrDA interface, the user can control appliances using an infrared remote. Optionally, if Bluetooth is used for local communication, then the user can control the system using a smart phone.

An RCU is an auxiliary unit responsible for monitoring local environmental conditions and controlling local appliances connected to the unit. RCUs are essential for a large house with multiple rooms. These units communicate the local environmental conditions to the central control unit, and also control the local appliances based on commands from the CCU. This unit interfaces with other blocks in the system to perform the required tasks. A block level diagram and description of a RCU is given in **Figure 6**.

3. Design

3.1. A basic home automation system

3.1.1. Design considerations

3.1.1.1. create Interface

3.1.1.2. Sensing Requirements

3.1.1.2.1. Thermistors can be used to control air conditioners, refrigerators, geysers, heating system, or in case of fire.

3.1.1.2.2. Humidity sensors sense the moisture level in the environment.

3.1.1.2.3. Gas sensors can be used to detect gas leaks.

3.1.1.2.4. Light sensors can be used to detect the luminous intensity in the house.

3.1.2. Security level

3.1.2.1. Generate buzzer noise

3.1.3. Topology

3.1.3.1. Network architecture

3.1.3.2. Engineer wiring plan

3.1.3.3. Application focus

3.2. The architecture of a home automation system

3.2.1. Central Control Unit

3.2.1.1. Sensors

3.2.1.2. Analog Front End (AFE)

3.2.1.3. Remote Connectivity

3.2.1.4. Local Connectivity

3.2.1.5. Manual Control

3.2.1.6. Real Time Clock (RTC)

3.2.1.7. NFC Interface

3.2.1.8. Power Monitor

3.2.2. Room Control Unit

3.2.2.1. Monitor the current environmental conditions using the various sensors and communicate this data to the CCU

3.2.2.2. Receive instructions from the CCU and control appliances in the room as per the received instructions

3.2.2.3. Control appliances based on inputs from a hand-held remote

3.2.2.4. Control appliances based on inputs from user buttons

3.3. View status review

3.3.1. Validation status

3.3.2. Send notification

3.3.3. Manage notification

3.4. Manage database

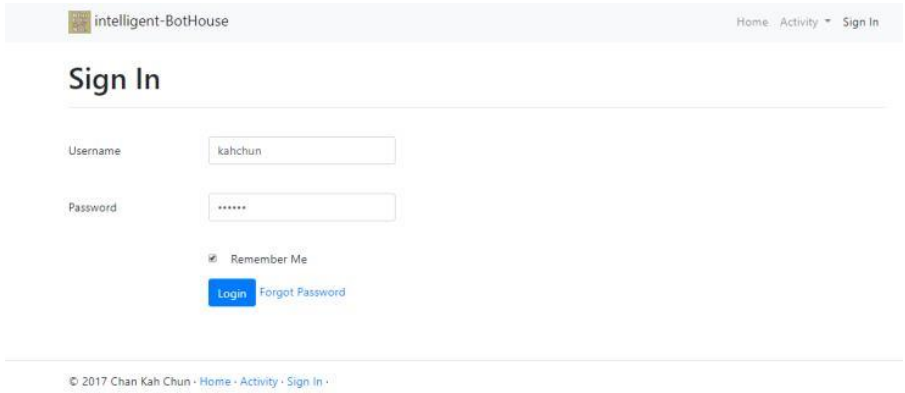
Implementation

4. Implementation

The prototype design of the system is implemented based on the documents or formal specification created during the Analysis and Design phase.

4.1 *Access the System Interface*

In web-based application design, the main interface design of the intelligent-smart Home to redirect to the sign in page is shown in Figure 14. By clicking on the sign in button, the web page will be redirected to the sign in page in order to gain access to the smart home control system



4.2 *Manage Devices or Sensors Interface*

In this sub-section, all the system control interfaces are displayed. The first interface to be portrayed in Figure 16 is the house appliance control interface. Figure 17 reviews the security control interface. Figure 18 shows the fire detection control interface. Figure 19 displays the humidity and temperature monitor control interface.

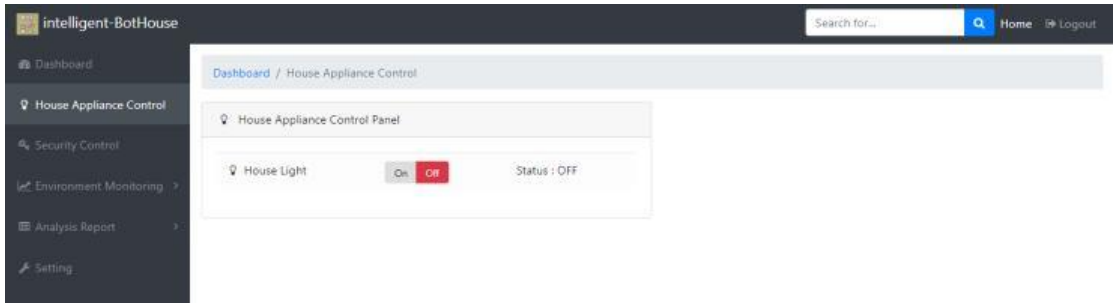


Figure 16: House appliance control interface

Figure 17: Security control interface

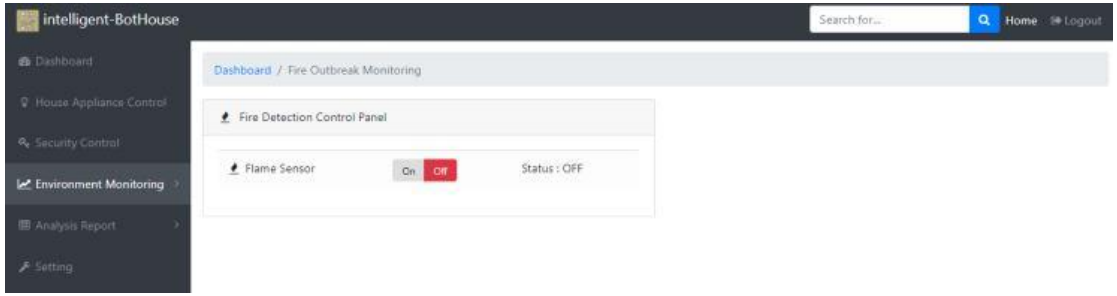


Figure 18: Fire detection control interface

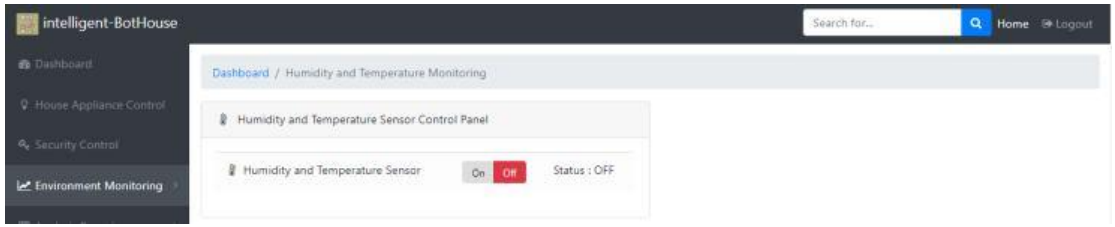


Figure 19: Humidity and temperature monitor control interface

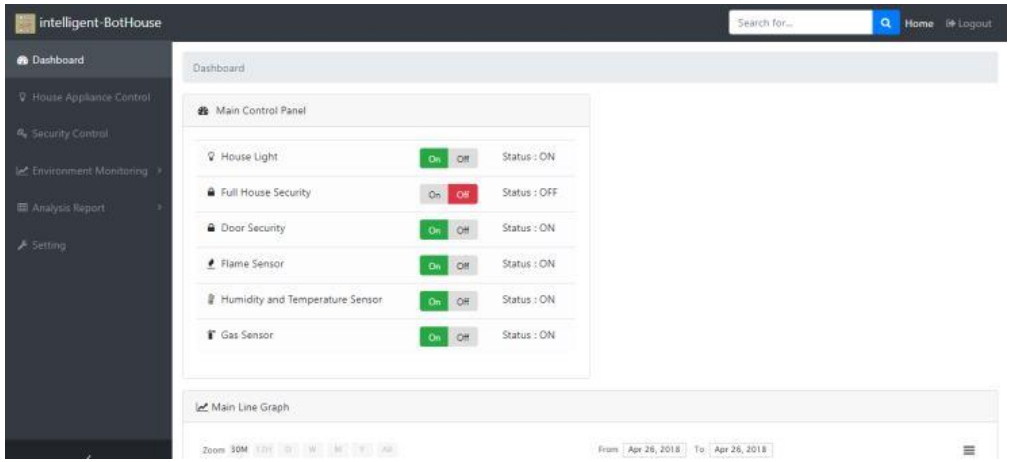


Figure 21: Main control panel or status review interface

4.3 *View Status Review Interface*

The dashboard web interface displays the main control panel or the status review interface. Figure 21 indicates its interface

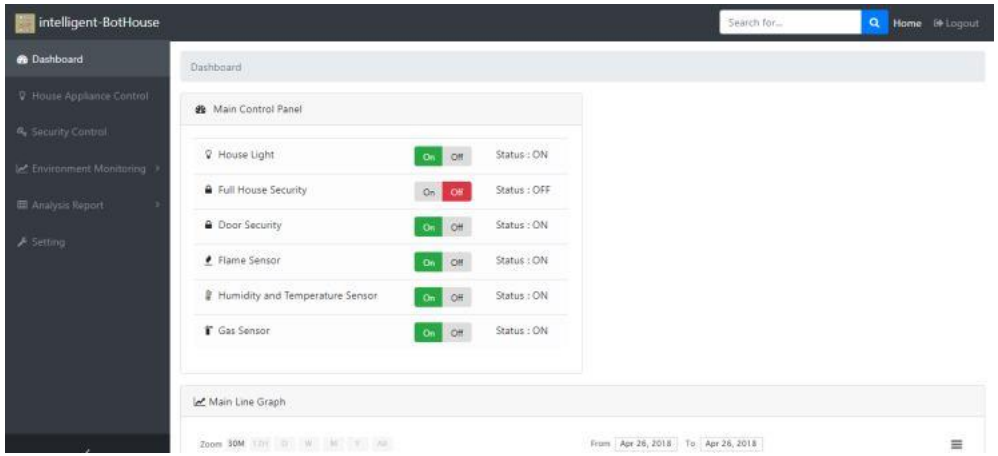


Figure 21: Main control panel or status review interface

4.4 *Analyze Devices or Sensors Readings Interface*

In this particular module, the data that the sensors gather are sent to the thing speak cloud server and the data is represented in the graph within the tab of public or private view. These graphs are used in the web interface to read the information and reorganized the information into more comprehensive line graph and combination of multiple graphs. This is shown in Figure 22.

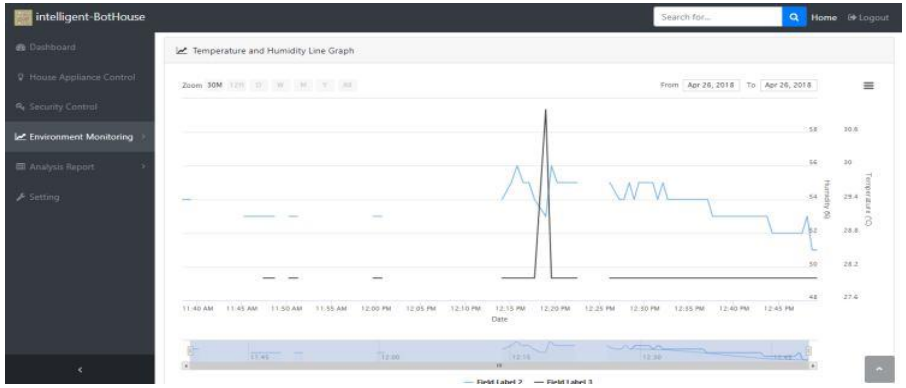
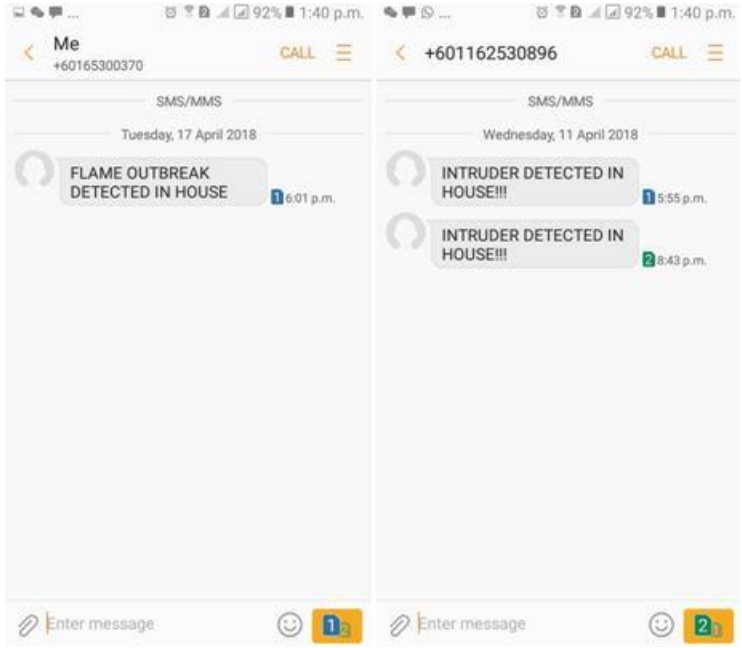


Figure 22: Humidity and temperature line graph interface

4.5 *Send Notification Interface*

After alarm is triggered due to safety and security measures, the message-based notification will be delivered to the users. Figure 24 depicts the illustration of the message received by user.



4.6 *Manage Notification Report Interface*

Notification sent from the GSM to the user creates a record and save into the database. These information are then displayed in the web page through read mechanism from database table. User can conduct delete operation on selected record in the table as shown in Figure 25

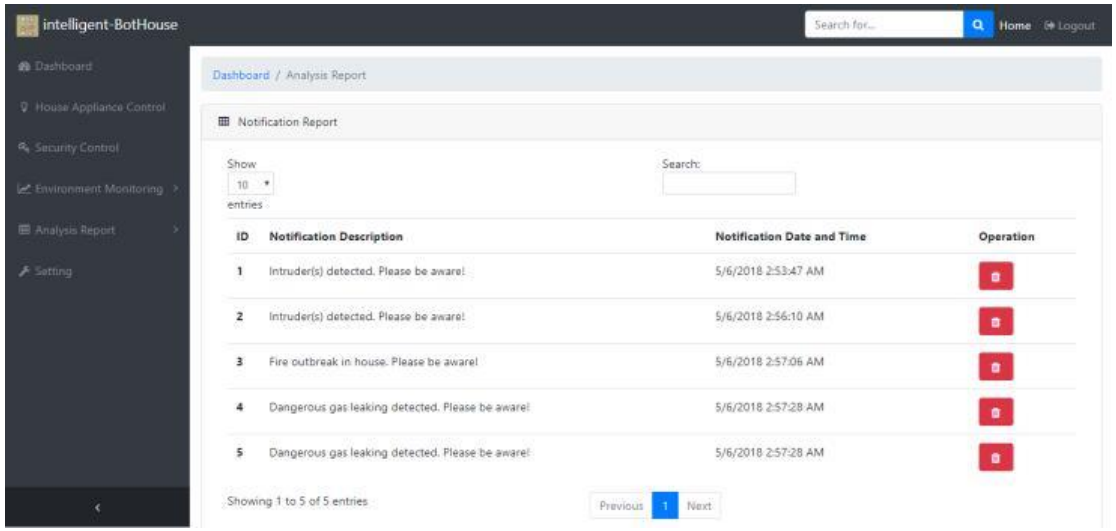


Figure 25: Notification report interface

4.7 *Manage Validation Status Report Interface*

Each login procedure will records its status, date and time into the database. These information will be presented in the access validation report table for user to check and ensure no hacker is trying to attack the web interface. Also, User can conduct delete operation on selected record in the table as shown in Figure 26.

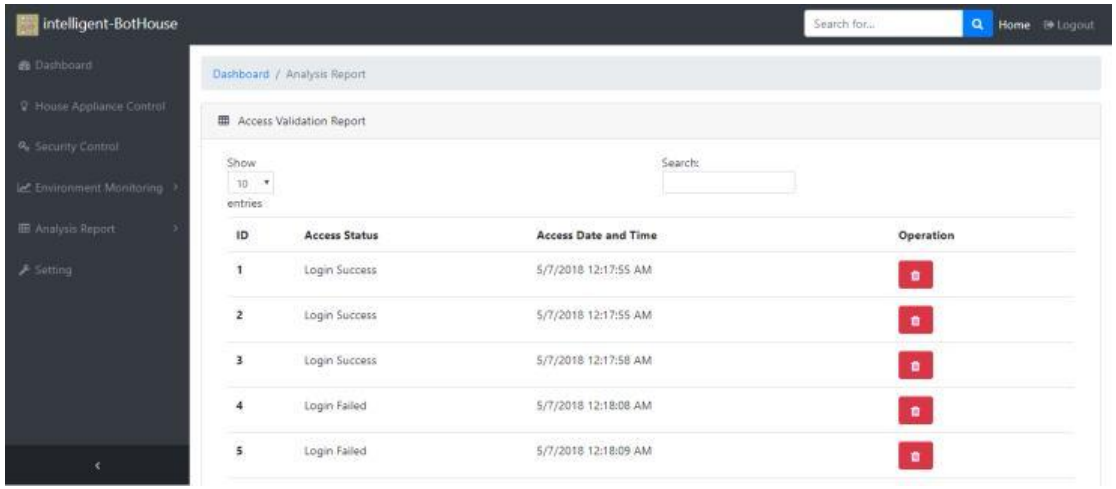


Figure 26: Access validation report interface

4.8 TESTING

1) Smart home product and function testing

this test procedure is a voluntary test. A smart- home device is submitted to the usual product tests. We test products such as motion sensors and smoke alarms for their mechanical and electrical safety and for their functionality.

As notified body, we are entitled to support you with the necessary product tests for your CE marking.

2) Protected privacy for the smart home

our specially developed test program focuses on data protection and information security. The "Protected Privacy" test program involves a number of tests, some of which are mandated by the data protection regulation. Our experts check whether smart home products effectively protect user privacy. We test the following products:

- **4.8.1 Devices:** Is the device delivered with privacy-friendly default settings, is it suitable for updates and can it be reset to its factory settings?
- **4.8.2 Local communication:** Are data transferred to the gateway in encrypted form? Does pairing have to be confirmed manually?
- **4.8.3 Online communication:** Are individual and strong passwords promoted? Is the IP protocol encrypted?
- **4.8.4 Apps:** Does the app have privacy-friendly default settings, and is it protected by an identifier?
- **4.8.5 Documentation:** Does the documentation meet user expectations as well as legal requirements? Does it contain hints for the user on improving privacy?
- **4.8.6 Data use:** What is in the terms and conditions? Are children protected?
  As well as the tests contained in the Protected Privacy test program, other tests for smart home and IoT products are possible.
- **4.8.7 Product testing:** Mechanical and electrical safety, function tests not relating to privacy
- **4.8.9 Interoperability:** Are there standards that enable the device to work with other components? Does your device speak ZigBee, for example, and can other bus participants understand

Thank You