



Green University of Bangladesh
Department of Computer Science and Engineering (CSE)
Faculty of Sciences and Engineering
Semester: (Spring, Year: 2021), B.Sc. in CSE (Eve)

Course Title: Computer Networking Lab
Course Code: CSE-312 Section: 191-ED

Lab Project Name: Smart Home System.

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Lab Project Status

Marks:

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Comments:

Date:

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Chapter 1

Introduction

1.1 Introduction

The technology has been growing from day to day in human life. The necessity for the development of technology is to lead human life comfortably. Living home that includes smart objects with specific functions is called smart home. It improve safety, comfort and efficiency which can be used to automate home activities. We uses various smart devices and sensors like Temperature, Humidity, Camera, Light, Sound etc to monitor the home environment. Here Camera, light, door, air cooler, heater, LCD display are connected with different detectors and sensors. We also try to implement monitoring system from our mobile or PC. We use latest version of cisco packet tracer to simulation, modelling and configuration of IOE systems with conventional networking system to implement smart home.

1.2 Design Goals/Objective

- We try to use many smart devices to implement our home that helps to lead human life comfortably.
- These smart devices will gives us a lot of security.
- Even we are outside the home, these system will able to maintain the activity of home element.
- These system will automatically take necessary measures according to the needs of the environment.
- In this project our main goals is to transform the analog system into a digital system.

Chapter 2

Design/Development/Implementation of the Project

2.1 Entry Section

Here we have worked on the entry process of the system. It contains several subsections.

Such as-

- Motion Sensor.
- Webcam.
- Light.
- Door.
- LCD Monitor.



2.1.1 Motion Sensor: A motion sensor is an electronic device that is designed to detect and measure movement. We use it to detect there was anyone in front of the house or not.



2.1.2 Webcam: A webcam is a video camera that feeds or streams an image or video in real time. We use it to take video record who came to house. When motion sensor is active webcam record real image of people.



2.1.3 Light: A light bulb provide us light at right time to visualize everything. When motion sensor was active light is active otherwise it is on off state.



2.1.4 Door: A door is a movable barrier that allows ingress into and egress from an enclosure. We use it to enter the house. When motion sensor was active the door will open otherwise it is on off state.



2.1.5 LCD Display: A LCD (Liquid Crystal Display) display uses to produce a visible image. We use it to shows system running state and some messages.

2.2 Room Section

Here we worked on some smart element to maintain room environment. It also contains several subsections. Such as-

- Air Cooler.
- Temperature Sensor.
- Motion Sensor.
- LCD Display.
- Heating Element.



2.2.1 Air Cooler: An air cooler helps us to cool air. If room temperature rises above normal temperature air cooler will on otherwise it is off.



2.2.2 Temperature Sensor: A temperature sensor helps us to measure temperature. We use it to determine room temperature.



2.2.3 Motion Sensor: A motion sensor is an electronic device that is designed to detect and measure movement. We use it to determine anyone was inside the room or not.



2.2.4 LCD Display: A LCD (Liquid Crystal Display) display uses to produce a visible image. We use it to display some messages.



2.2.5 Heating Element: A heater makes warm air in room. If room temperature reduces below normal temperature heating element will on otherwise it is on off state.

2.3 Gateway Section

In this section we worked on monitoring the system. It also contains several subsections. Such as-

- Temperature Monitor.
- Home Gateway.
- Tablet or PC.



2.3.1 Temperature Monitor: A temperature monitor helps us to monitoring the temperature in room.



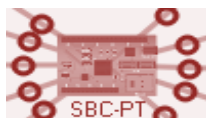
2.3.2 Home Gateway: It is a router. We use it to create local area network inside the room.



2.3.3 Tablet or PC: It is our smart devices. Uses this devices we can also monitoring the system if will outside the room.

2.4 Main Section

To connect all sections we use a main section. In this section we use SBC (Single Boarded Computer) to connect all sections. In programming part we implement some python code to maintain every part work perfectly.



Chapter 3

Performance Evaluation

3.1 Simulation Environment/ Simulation Procedure

3.1.1 Entry Section:

Here we have worked on the entry process of the system. In this part our main element is Motion Sensor, Webcam, Light, Door and LCD Monitor. We take this element one by one and connect with main section. To connect SBC port we use IoT custom cable. To create connection we use digital ports. In below we see the connection –

<i>Device</i>	<i>Device Port</i>	<i>SBC Port</i>
<i>Motion Sensor</i>	D₀	D₀
<i>Webcam</i>	D₀	D₁
<i>Light</i>	D₀	D₂
<i>Door</i>	D₀	D₃
<i>LCD Monitor</i>	D₀	D₄

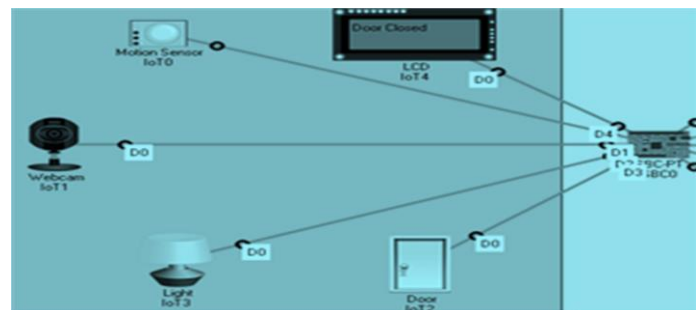


Fig: Entry Section

3.1.2 Room Section:

Here we worked on some smart element to maintain room environment. In this part our main element is Air Cooler, Temperature Sensor, Motion Sensor, LCD Monitor, and Heater. We take this element one by one and connect with main section. To connect SBC port we use IoT custom cable. To create connection we use digital ports. In below we see the connection –

<i>Device</i>	<i>Device Port</i>	<i>SBC Port</i>
<i>Air Cooler</i>	D₀	D₅
<i>Temperature Sensor</i>	D₀	D₆
<i>Motion Sensor</i>	D₀	D₉
<i>Temperature Monitor</i>	D₀	D₇
<i>Heater</i>	D₀	D₈

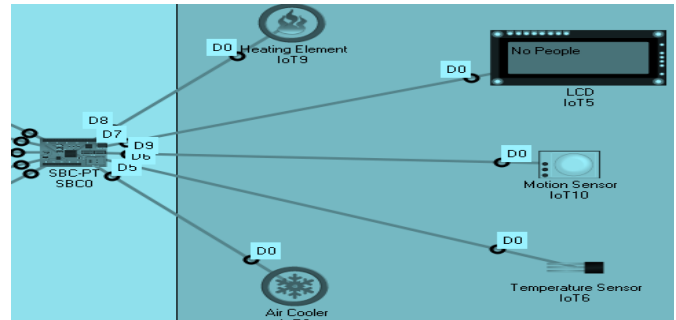


Fig: Room Section

3.1.3 Gateway Section:

In this section we worked on monitoring the system. In this part our main element is Temperature Monitor, Home Gateway and Tablet or PC. We take this element one by one and connect with each other.

1st I configure Home Gateway because it is our router and we use it to create local area network.

In configuration wireless part we give its SSID and set a password for it.

Then we configure Temperature Monitor. In configure wireless part we give same SSID and Password to access our Gateway.

Then we configure Tablet or PC. In configure wireless part we give same SSID and Password to access our Gateway.

It generate a Gateway address and connected Temperature Monitor and Tablet or PC into a LAN network.

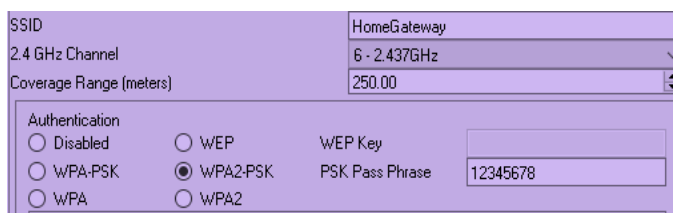


Fig: Configure Home Gateway

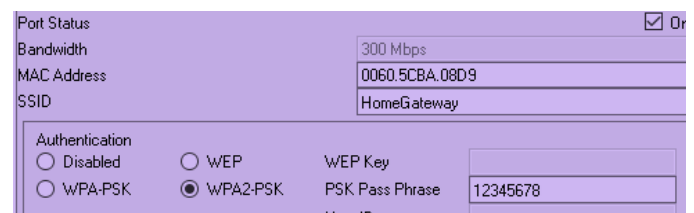


Fig: Configure Temperature Monitor

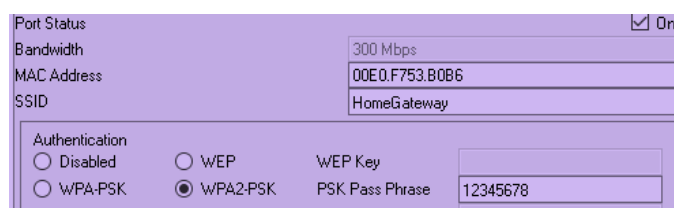


Fig: Configure Tablet or PC

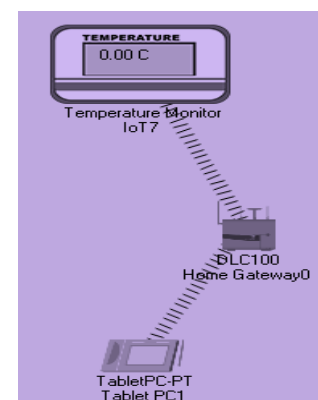


Fig: Gateway Section

3.1.4 Main Section:

In this section we maintain all elements. Entry section and Room section connected with this section using IoT custom cable. We configure this section properly by using python code.

By default programming part save a program that is main.py. We just edit it.

1st we import GPIO that is general purpose input-output. To use input output element properly. Then we import all time function. Then we implement main function.

In main function 1st we implement some pinMode functions. We see SBC port 0, 6, 9 connected with entry motion sensor, room temperature sensor and room motion sensor. And these sensors are input devices. So we declare pin 0, 6, 9 as input pin.

Then we see SBC port 1, 2, 3, 4, 5, 7, 8 connected with camera, light, door, entry LCD display, air cooler, room LCD display and heater. And these are output devices. So, we declare pin 1, 2, 3, 4, 5, 7, 8 as output pin.

Then we use while true condition because we need this part repeat infinity times.

We use 3 different variable to store our 3 input. To store 0 pin input we use variable "d". To store 6 pin input we use variable "temp" and store 9 pin input we use variable "roomd".

If motion sensor get any movement it generate 1023 value. So, if any people stand outside the door motion sensor value is 1023 otherwise its value is 0. So, if we get any movement we need to on our camera, light, door and show a message in LCD monitor. To implement this part we use simple if else condition. In if part we give a condition when d/motion sensor==1023 it on our camera, light and open our door and display show message "Welcome Home". Else we off our camera, light, door and display show message "Door Closed".

Next is room part. 1st we need to ensure that someone in the room. Because if no one inside the room, there is no need to on AC or Heater. Room motion sensor store in roomd variable. So, we use else-if ladder and in 1st if condition we check motion sensor/roomd==0 or not. If it is 0 then I turn off AC and Heater and show message in display "No People inside the Room".

Next else if part is for temperature sensor. This sensor gives us continuously temperature update. Here we store sensor value in temp variable. So, we compare $temp > 660$ or not. Means if temperature is more than 25° Celsius we turn on AC switch and turn off Heater switch and show message in display “AC-on”.

Next else if part we compare $temp < 614$ or not. Means if temperature is less than 20° Celsius we turn on Heater switch and turn off AC switch and show message in display “Heater-on”.

Next else part means temperature is in between 614 to 660. In this situation we turn off both AC and Heater switch and show message in display “Normal Temperature”.

Finally I set delay 1000ms means 1second.

Syntax:

If (entry motion == high)

On camera, light, door, show welcome message in display.

If (room motion == low)

Off AC, Heater, show message no people in room

Else if (room temperature $> 25^{\circ}$ Celsius)

On AC, off heater, show message AC on.

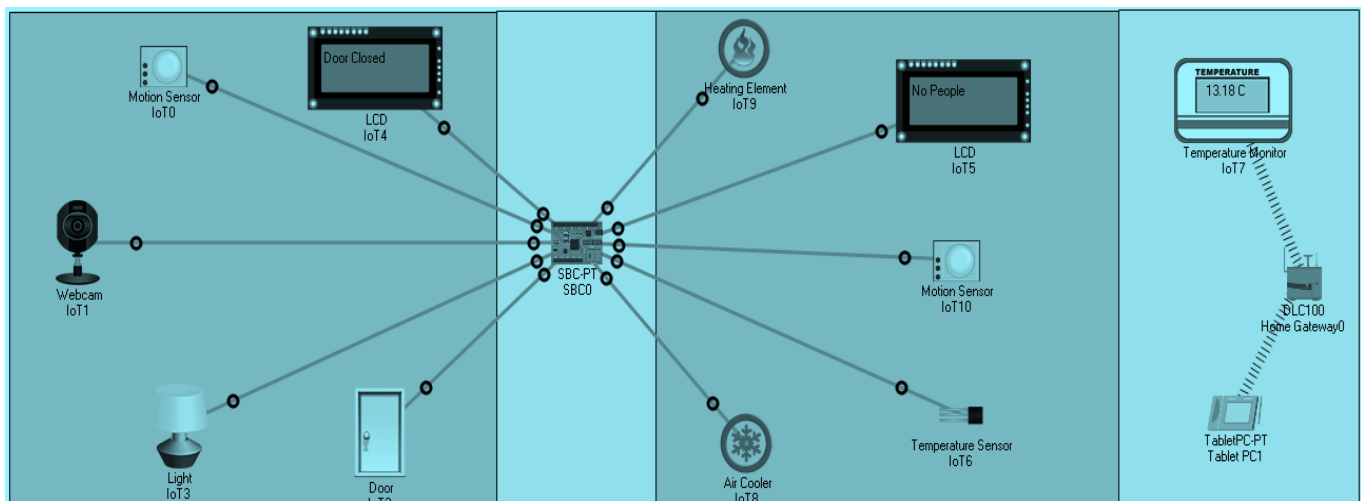
Else if (room temperature $< 20^{\circ}$ Celsius)

On Heater, off AC, show message Heater on.

Else

Off AC, Heater, show message normal temperature.

Figure:



3.2 Results and Discussions

3.2.1 Results For Entry Part:

If motion sensor find no motion then automatically it turned off camera, light, door and show door closed message in display. System show this step next 5 second.

If motion sensor find any motion then automatically it turned on camera, light, door and show welcome message in display. System show this step next 5 second.

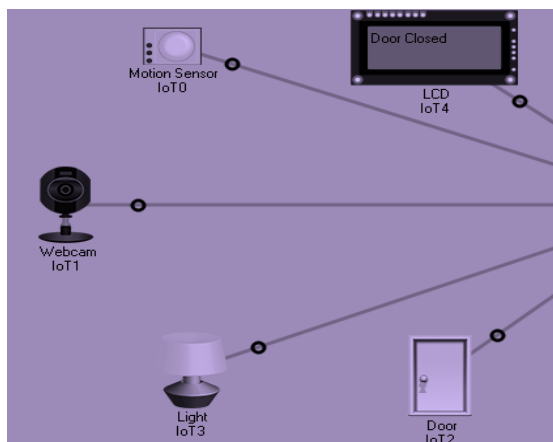


Fig: Before Motion active

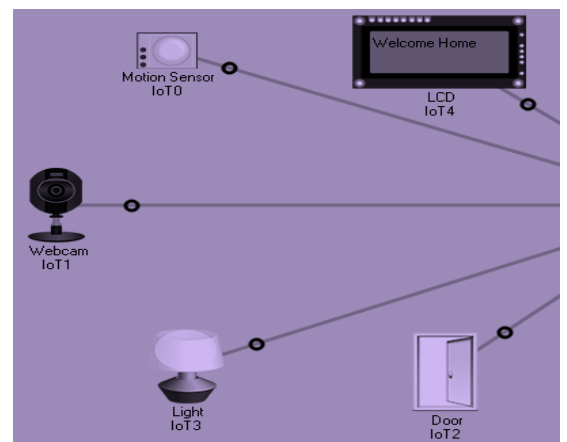


Fig: After Motion active

3.2.2 Results For Room Part:

If motion sensor find no motion then automatically it turned off AC and Heater, also show No people message in display. System show this step next 5 second.

If motion sensor find motion and temperature is greater than 25⁰ Celsius then system automatically turned on AC and turned off Heater, also show AC- on message in display. System show this step next 5 second.

If motion sensor find motion and temperature is less than 20⁰ Celsius then system automatically turned on Heater and turned off AC, also show Heater- on message in display. System show this step next 5 second.

If motion sensor find motion and temperature in between 20⁰ - 25⁰ Celsius then system automatically turned off AC and Heater, also show Normal temperature message in display. System show this step next 5 second.

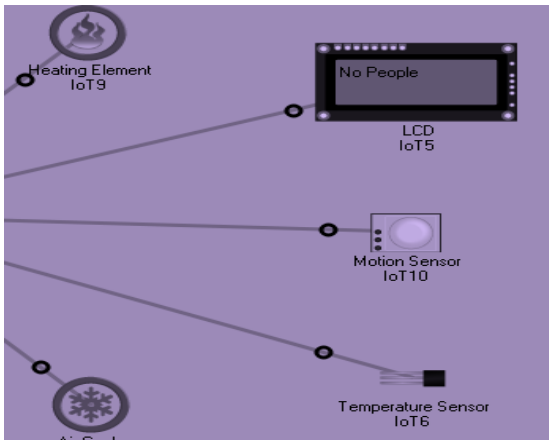


Fig: Before Motion active

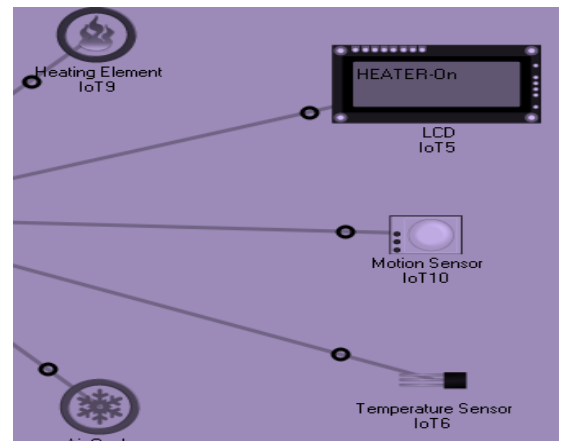


Fig: Temperature < 20⁰ Celsius

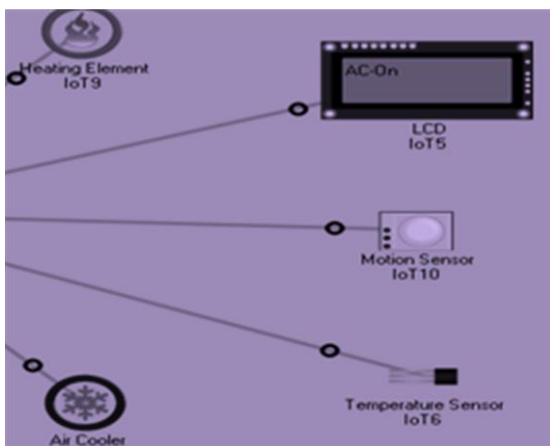


Fig: Temperature > 25⁰ Celsius

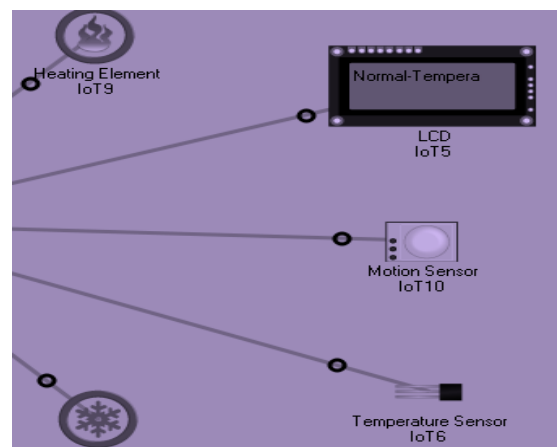


Fig: Temperature in-between 20⁰ - 25⁰ Celsius

3.2.3 Results For Gateway Part:

Here we see the current temperature in temperature monitor. We also monitoring the system using our Tablet or PC.

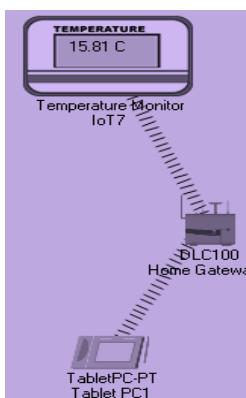


Fig: Gateway Part

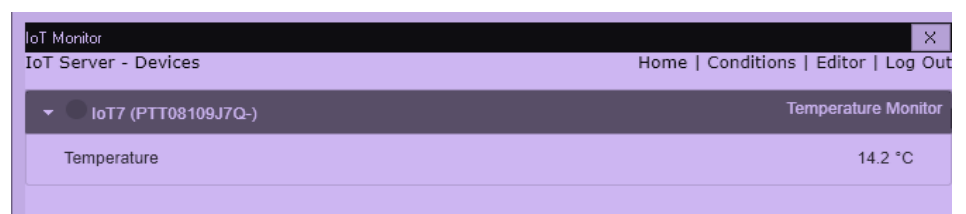
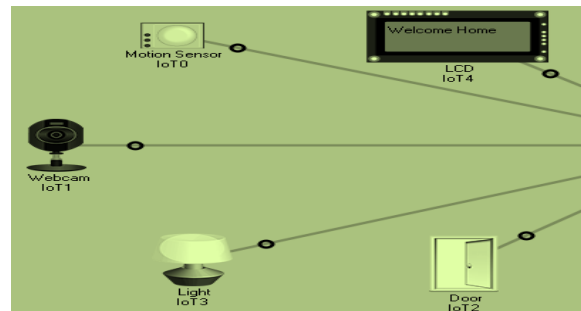


Fig: Internet of Things Server Devices.

3.2.4 Analysis and Outcome

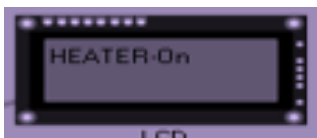
Here we see that from main function program if sensor 1 input is 1023 system automatically on camera, light, door and show welcome message in display.

```
('Room Temperature is:', 509)
('Sensor2 Input Is:', 0)
('Sensor1 Input Is:', 1023)
('Room Temperature is:', 509)
('Sensor2 Input Is:', 0)
```



Here we see that from main function program if sensor 2 input is 1023 system automatically on AC, Heater and show display messages maintain some condition.

```
('Room Temperature is:', 518)
('Sensor2 Input Is:', 1023)
('Sensor1 Input Is:', 0)
('Room Temperature is:', 518)
('Sensor2 Input Is:', 1023)
```



So, analysis all outcomes we say that our system work perfectly.

Chapter 4

Conclusion

4.1 Introduction

In this project, we try to implemented smart home using new released cisco packet, because this version included different IOE device used for home automation.

We used home Gateway to register smart device on it to control them and Microcontroller (MCU) to interconnect different sensor and IOE device.

Also MCU provide programming environment to manage different device, different programming language available on MCU but I used python to control the devices.

4.2 Practical Implications

- We try to use many smart devices to implement our home that helps to lead human life comfortably.
- These system will automatically take necessary measures according to the needs of the environment.
- In this project our main implications is to transform the analog system into digital system.

4.3 Scope of Future Work

Here, this project is created for educational purpose. We considered the most important requirements only, many more features and details can added to our project in order to obtain more user friendly applications. In future we can upgraded it and may become part of amazing technology. Implement coding we always avoid syntax and logical error.

References

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2. Cisco Packet Tracer for Beginners by kalyan chinta
3. Google Link: <http://www.ijstr.org/final-print/feb2020/Implementation-Of-Smart-Home-By-Using-Packet-Tracer.pdf>
4. YouTube Link: <https://youtu.be/8Yq3KDu4Sgo>