Smart Home Control

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Abstract.

We are in quest of time that we can use for our comfort in our daily hectic lives, and with the rapid advancement of technology, we may think of and use numerous technologies in our day-to-day lives to make our lives easier and save our valuable time. As a result, SHC was born (smart home control). In this many devices are attached with a single demonstrator which combines to construct an IoT. Smart home control is our topic which brings Amazon Web Services, RPi & Message Queuing Telemetry Transport app whole combination beneath one rooftop and regulated using an app with the security of data using AWS. This is built in such a way that it controls the devices wisely and secures the data that only the user can check. The integration of IoT with AWS is good in terms of user data security. In this, the blades of the fan rotate according to the temperature inside the room, the lights which sense the environment whether it is dim or lighting according to this it will switch on & off with the help of an app, and the door sensor can sense If the door is open or someone is breaking in, the door sensor gives the user a notice using simple notification service. Hence the app will be updating the user with the results and saving their time and helping in avoiding irrelevant worries.

Keywords—Amazon Web Service Simple Notification Service, IoT, Message Queuing Telemetry Transport, Amazon Web Services, Amazon Web Service Dynamo Database, RPi.

1. INTRODUCTION

In 1966, home automation was introduced to make user's living easier and more feasible. Jim Sutherland is the inventor of ECHO IV that handles temperature and other appliances. As the forefront emerges in 2021, smart home techniques have gathered a large number of customers due to advancements in automatics. Smart Home is a subgenre of everyday computing that covers advanced technologies with the primary goal of providing convenience, protection, smart living, and efficiency improvements to the consumer. Internet-of-Thing has dominated this advancement of technology in recent years. A program that collects data and runs using detectors. IoT-based smart home control collects data from numerous sensors around the house and exchanges it with other devices that work according

to the individual's preferences. This study document describes an Internet-of-Things-based smart house with intelligence that regulates lights, and fan swiftness, and alerts the homeowner concerning the safety of the main door, all while safeguarding the home's sensitive data. We can use our smartphones to keep an eye on these devices. The house's lighting is controlled via an app, and while the fan's speed adjusts in response to variations when the temperature and humidity of the surrounding environment change, AWS sends a message to the mobile application. Different kinds of home control with various thoughts are available in many research publications. Combining machine learning and IoT has the potential to create an intelligent control system.

Voice command, clapping, or just instructing through the app to turn on/off lights is common in most smart home controls, but it might be troublesome when the user is outdoors or unable to deliver a signal. As with many other parts of Smart Home Control, an App can be used to modify the fan's speed, though this doesn't always correspond accordingly with house temp. A theft alarm is included in several Sensor-based surveillance devices that can be triggered again for the tiniest of reasons, bringing annoyance to the user. Personal data theft has become increasingly widespread as technology has advanced. To address this, we are storing our sensor readings on AWS, Amazon Web Services is a division of Amazon that provides cloud computing platforms and secures user data. Limiting access to those whom the user chooses to share it with. AWS IAM, or AWS Identity and Access Management, is used by users to access the data. AWS IAM assists users in securely managing access to AWS services and resources.

2. LITERATURE REVIEW

In the current system, research into smart home control focuses on resolving issues such as power consumption range of operation and overall system cost. Various means, including SMS and Email, are employed to automate the appliances. The research described here focuses on making a wireless smart home accessible quickly and easily. Everyone has access to this automated system, which helps to eliminate manual labor. It's low-cost, safe, and convenient. In comparison to prior systems, access is quick.

Because of its multiple advantages, smart home control is becoming increasingly popular. The rise in demand for network-connected smart home control is due to the fact that it has lately gotten simpler and more affordable. In project [1,] we use an Internet of Smart home control automation based on the Internet of things to give the customer complete authority across all remote control aspects over her or his residence. The automation system will be controlled by the web, a central host Device and a packet PC running a Windows mobile application.

This study [2], which was published in 2021, proposes a more advanced home automation system that uses an Android application to control and monitor household gadgets. The Internet of Things is at the heart of this strategy . Every unique household without appliances is planned and executed with the need of any human interruption with the house computerization. In this framework, the Ras pi4 will be connected to a variety of detectors with the ability to measure degree and steaminess,sources of light, power, and other variables.

When it comes to the automation of smart homes and buildings, the internet of things (IoT) has played a critical role. IoT and cloud computing are used to automate smart homes and structures. Individuals occupying any property can enjoy their safety thanks to rule-based event processing, convenience and ease of use. This study [3] indicates usage of IoT in smart home automation was comprehensively explored in this study. After commands and controls were conveyed through electrical wire, it was adopted in the twenty-first century. The radio band interference had an impact on their signals.

As a result of growing scientific innovations that have better organized our lifestyles, home automation has increased in recent years. Almost everything has changed immensely, & everything is now mechanized. For a range of home automations, this research [4] presents a method for merging actuators, detectors and other info points. The system is called qToggle, and it operates by utilizing a computer's compatibility and ability. The foundation for a simple and standard communication mechanism is the Application Programming Interface (API).

In [5] literature, various home automation systems with various standards and implementations have been presented. The purpose of this research is to show how to use Arduino and Thing Speak to create a cost-effective home automation system using IoT. Almost every component of a smart home is controlled by software. The proposed approach saves energy, is eco-friendly, and extends the life of digital products. This study will present a mechanism for IoT developers and researchers to perceive, digitalize, and regulate dwellings in the future IoT. In addition, this study exemplifies how IoT applications may make life easier.

3. OBJECTIVES

The goal of this project is to create a Smart Home Control system that focuses on a few aspects of development.

- Create a system for home automation.
- Use devices that are simple to set up.
- Make it usable for inexperienced users or individuals with disabilities
- Make it expandable so that future add-ons can be added.
- Encourage standardization.
- To ensure data security.

4. PROPOSED SYSTEM

In this system, we are using Raspberry Pi and establishing an internet connection which will be integrated with Amazon Web Services. LDR will be used for the lighting purpose to detect the lighting around the surroundings which will be then connected to the MQTT application. We are using a sensor named DHT11, for temperature and humidity readings which will be uploaded to DynamoDB.

MQTT AWS services and a dashboard with python are used as software and python we used to code the Light Emitting Diode LDR, MQTT Dashboard, Temperature and humidity sensor and door sensors and the information was transmitted to Dynamo DataBase.

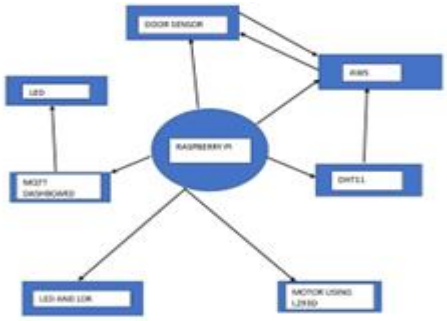

Diagram 1. Flow chart of our proposed system.

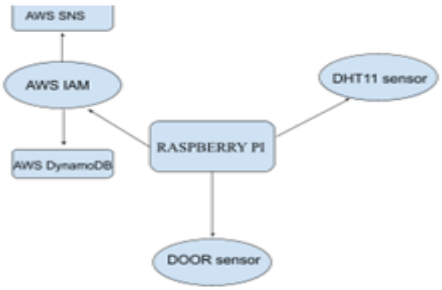

Diagram 2. Amazon Web Services Block Diagram

The workflow direction :
RasPi is the project's main hub and it's not only directly linked to the sensors, but it is also connected to Amazon Web Services Command Line Interface via the RPi's console. Because the console is also used for AWS instructions, the python coding is done using the python Editor on the RPi device. When it comes to lighting, LDR absorbs as much light as it can from its surroundings. If LDR captures any, according to our code utilizing the if-else statement,

LED is directed to produce a large amount of high abundant light.to shut down the LDR, on the other hand, notices a weak light and commands light emitting diode to switch on irrespective of the quantity of light that is available. In addition, the Message Queuing Telemetry Transport application is accessible linked to the light source, enabling the consumer to control. Depending upon their preferences, they can turn it on or off. Using the MQTT app, to run the system, the user must click a button. Python is used to programme the DHT11 sensor. The data from the sensors on a regular basis are sent to the AWS Database, which was built for the purpose of storing these facts. These are some of the services we've linked to DHT11, which is where the door sensor is stored, and DynamoDB information in the form of tables that were produced. It's the only way to get the data by users who have been granted access by the IAM service.

The following are the model and sensors that were used in this project:

A. HARDWARE REQUIREMENT:

MOTOR: A photoresistor is a type of LDR that decreases resistance when light passes through the Surface that is fragile.
Light Dependent Resistor, a photoresistor is a device that reduces resistance as a result of light falling on the delicate surface.
LED: Light When current passes through an emitting diode, it produces light.

1) Raspberry Pi:
The RPi 3 is a compact processor which can be utilized for coding.This boasts a I.4 gigahertz 64bit with four core CPU and double-band Wi-Fi four USB 2.0 ports, LAN, 4.2/BLE, and Bluetooth. This moves things around the motor. This motor has the ability to drive 2 DC motors parallelly.

Diagram 3. Raspberry Pi Board

2) DHT11:
It's a popular temperature and humidity sensor that uses an eight-bit microprocessor to produce temperature and humidity estimates. Serial data for temperature and humidity.

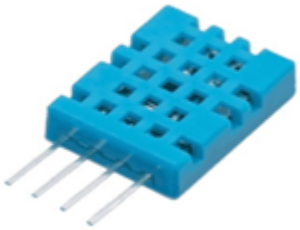

Diagram 4. Distributed Hash Table 11 sensors

3) DOOR SENSORS:
This is a magnetic sensor which permits the door to open and close. One part will be attached to the board, while the other will be free to move around.

Diagram 5. Door Sensors

B. SOFTWARE IMPLEMENTATION

We installed paho-mqtt, to control lights via MQTT by employing certain commands. The paho mqtt protocol creates an establishment with customers' applications. This message is published/sent by the broker. Subscriber refers to the person who receives the message. We had several snags along the way, but they were all resolved.

Urlparse takes this and validates the Address text, it provides an entity containing characteristics for each component with url. It gives you a better experience. A standardized method of storing resources

The next step is to establish a new user in Amazon Web Services Identity & Access Management, Secret and access credentials are shown. It was finished by visiting a particular location and entering the necessary information, after which it led you.We're taken to a welcome page that informs us that an account was successfully created containing the name of the user, to gain access, you'll need the secret and access credentials . In order to retrieve the table from the console. The use of commands was employed. AWS settings aws content index DynamoDB with the SNS.SNS that will be used by door Sensor to transmit notifications along with the topic's specifics. We had to execute the command, From the console, configure the message for SNS.

In terms of hardware, we utilized connecting wires to link the Raspberry Pi. A SNS, a Motor-engine power unit and a Distributed Hash Table 11 sensors are all attached to the breadboard underneath the LED-LDR.The following are the project's inputs and outputs:

1)Lighting (LED – LDR) is the first sensor.

If light is low or insufficient, the light from the environment serves as the input. The LED will then be turned on by the LDR. And what if the ambient light is sufficient, the LED can be turned off. Will be turned off

2)The Lighting sensor, which uses MQTT, is the second sensor.

The LED represents a glow in light which could be turned on and off using Message queuing telemetry transport app. "Light On" & "Light Off" applications are available. These can be used to control the LED.

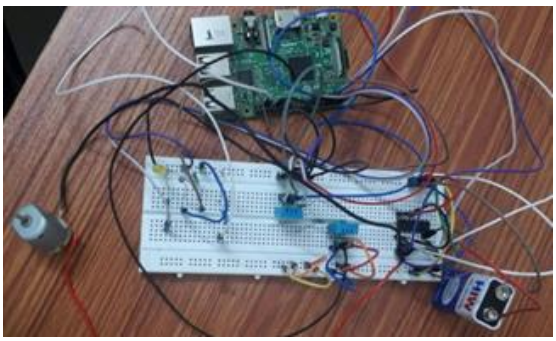

Diagram 6. Hardware Components

3) The sensor for thermal detection (Distributed Hash Table 11-Amazon web services)

The Distributed Hash Table 11 sensor is accustomed to monitor changes in temperature of neighborhood areas. The thermal sensor is also linked to Amazon web services, allowing the AWS DynamoDB to track the thermal and humid variations. Amazon web services and thermal sensors are linked to the RasPi using the AWS CLI, Dynamo Database index stores the corresponding temperature values.

4)Motor-Distributed Hash Table 11

Motor-Engine will spin at 20% of its regular speed if the temperature is between 5 and 15.This will revolve at the pace users set when temp falls somewhere in the range of Sixteen and Twenty three degrees Celsius at fifty-five percent.When the temperature is between 24 and 30 degrees Fahrenheit, it will spin at 70% of its maximum speed. If the temperature had risen to beyond 30 degrees. The motor-engine will spin at a constant speed 95 percent of the time.

5. RESULTS AND DISCUSSION

1)*Using Mqtt application and normal light*.

Both the Light Dependent Resistor, and the Application can regulate the lights, and the LED is successfully powered upon using Ldr.

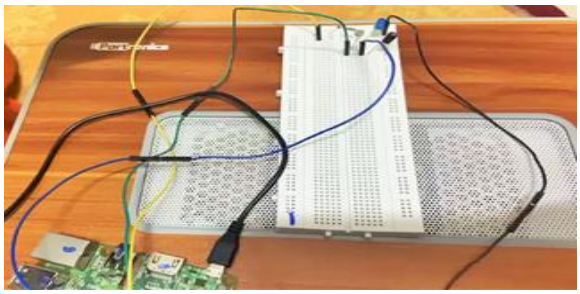

Diagram 7. Utilizing Ldr to switch off/on LED

As illustrated in Fig 11, our foremost accomplishment was to develop an on/off button for LED blinking using the Message Queuing Telemetry Transport Dashboard Application. With this, the user may turn on/off the lights from anywhere.

Diagram 8. The smartphone view of the MQTT app.

The desirable features are depicted in Figures 12 and 13. Whenever the "Light Off" switch is pressed, the LED turns off, but when the "Light On" switch is pressed, the LED turns on.

2) Temperature and motor speed Change

The information is typically collected using the DHT11 sensor. As illustrated in Fig 14, the humidity and temp are shown in the terminal. After successfully completing the account creation, the following step would be to use the DynamoDatabase to construct indexes. As illustrated in Fig 15, two tables were prepared for our purposes: one for SNS data and one for temp data. As seen in Fig 16, the table for temp difference stores the value handed down by the sensor. As per the data, the speed-engine of the motor changes in lockstep with the temp and humidity in the surroundings, as illustrated in Fig 17.

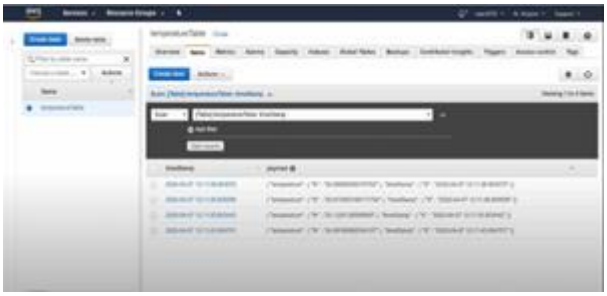

Diagram 9. Amazon Web service DynamoDB table

Diagram10. Humidity & Temperature in DynamoDB table

3) Door Sensor

This door detector keeps track of the progress of the doors and notifies the user if they are closed or open. Amazon web services are used to keep data records in DynamoDB, including the door status, and to send out an SNS notice. If the state of the door alters, the SNS links to the RaspPi using Amazon Resource Number and AWS CLI .
SNS is used to show the notice that warns the user each instant the door opens or shuts, as illustrated in Fig 19. The moment the door opens, it records the data, and when it is closed, it informs the state through notification.

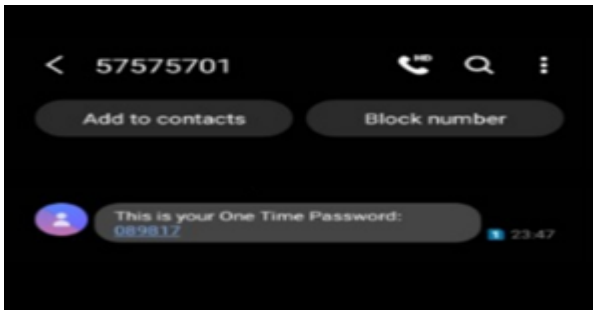

Diagram 11. Amazon Web service SNS alert

6. CONCLUSION

The advantages of merging Message queuing telemetry transport, the amazon web service application and Ras Pi to provide greater home automation functionality is demonstrated in our study. Using the surroundings and the user's choices to successfully alter the lights and fan speed. Tables are used to store and display data (temperature and humidity) taken by the DHT11 sensor using AWS DynamoDB. With Amazon Web Services,Access Management & Amazon Web Service Identity protects security of customer's information, which shall be viewed with a small number of persons if the user permits it.The primary purpose of smart home control is to provide the user with a trouble free and excellent lifestyle, with all functions and gadgets accessible with a single touch. The Ras Pi 3b plus combined with Ras Pi operating system was used to accomplish this project, as it has a greater processor response time (1.4GHz) and higher Ethernet throughput.In response to their surroundings, all of the devices listed above respond fast and appropriately.
For future development, the present scheme would be modified to include a power management mode, which will assist users by ensuring that when the system is turned on, all of the equipment linked to it spends the minimal energy possible, reducing overall power usage. Smart Home control will bring a huge change in day-to-day lifestyle in the approaching age, thanks to sophisticated technology. We can apply Machine Learning to forecast daily power use, keep track of it, and provide computed pricing.

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