



# HOME AUTOMATION USING ALEXA AND IoT

1M RAJASHEKHAR REDDY, 2K TARUN, 3GP PRANITH, 4M INDIRA

1STUDENT, 2STUDENT, 3STUDENT, 4ASSISTANT PROFESSOR

1TKR COLLEGE OF ENGINEERING AND TECHNOLOGY,

2TKR COLLEGE OF ENGINEERING AND TECHNOLOGY,

3TKR COLLEGE OF ENGINEERING AND TECHNOLOGY,

4TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

## INTRODUCTION

Home Automation is the automatic control of the electron devices in home. Home automation system is designed to monitoring and controlling the various devices in remote locations can be done through a variety of communication option such as wireless LAN technologies, Internet, cellular network and so on. As the integrated circuits and microprocessors become more and more accessible and the Internet communication is a fact of today with improved availability of cellular networks, these advancements naturally should find use in modern home automation systems. Home automation system is an integrated, easy to use home automation system that can be fully operated based on speech commands. It can help one to control household appliances from a centralized control unit. Home automation system that can be integrated as a single portable device for controlling household appliances such as lighting, fan, air conditioner, television, security camera, etc

This project presents a possible solution whereby the user controls devices by using their existing mobile phone, where control is communicated with the Microcontroller from a mobile through its wi-fi interface.

In this ESP32 home automation process the home appliances are controlled and monitoring in different ways. The microcontroller used in this project is ESP32 DEVKIT V1. It is a low cost and low power microcontroller that is integrated with wi-fi and Bluetooth. A 4-channel relay is used in order to control the high voltages and high currents from the ac supply. It acts as an interface between the ESP32 and home appliances. DHT 11 temperature sensor available to monitor the real time room temperature and along with IR receiver and push buttons are also used to control the home appliances manually.

Home appliances controlling can be done different ways in this project. If the device ESP32 is connected to the internet, then the controlling can do through Arduino IoT Cloud dashboard and Amazon Alexa. If the device is not connected to the internet, then we cannot control the home appliance via Arduino IoT Cloud and Alexa. So that IR remote and push buttons are used in order to control the home appliances manually when the internet is not available.

ESP32 in this project is programmed with a source for controlling the home appliances. That source code is compiled in the Arduino IDE and uploaded to the ESP32 board with proper port. In Arduino IDE there are few IR remote controlling and Arduino IoT Cloud Controlling libraries are available. To control with those, it required to includes the all required libraries. To control the home appliances with help of IR remote, first it's required to find the hex codes of a remote, which user is need to use. For Arduino IoT Cloud controlling, the user needs to sign in with Arduino IoT cloud it is an open source, free to us

The user needs to connect the device with home appliances by using a dashboard. The dashboard consists of ON/OFF switches and Temperature gauge. To control the home appliance with voice commands in this project the Alexa is used.

The main purpose of this project is to control and monitor the home appliances anywhere in the world.

## LITERATURE SURVEY

table 1: literature survey

S.NO	SYSTEM	CONTROLLER	LIMITATIONS
1	Bluetooth based home automation system	Arduino BT	It can be operated in the certain range i.e. till the range of the Bluetooth
2	Zigbee based home automation system using cell phones	Zigbee	There are many security threats like stealing data, loss of service provided by network. The transmission rate of this technology is very low
3	Wi-fi based home automation system	Arduino	Home appliances are connected with in the Wi-fi range. The device and user need to connect for same Wi-Fi network

## PROPOSED SYSTEM

In this home automation system, the home appliances can be controlled from anywhere in the world. And device, user need not connect for a same network. In existing home automation, it can be operated in certain range those problems are overcomes in this project.

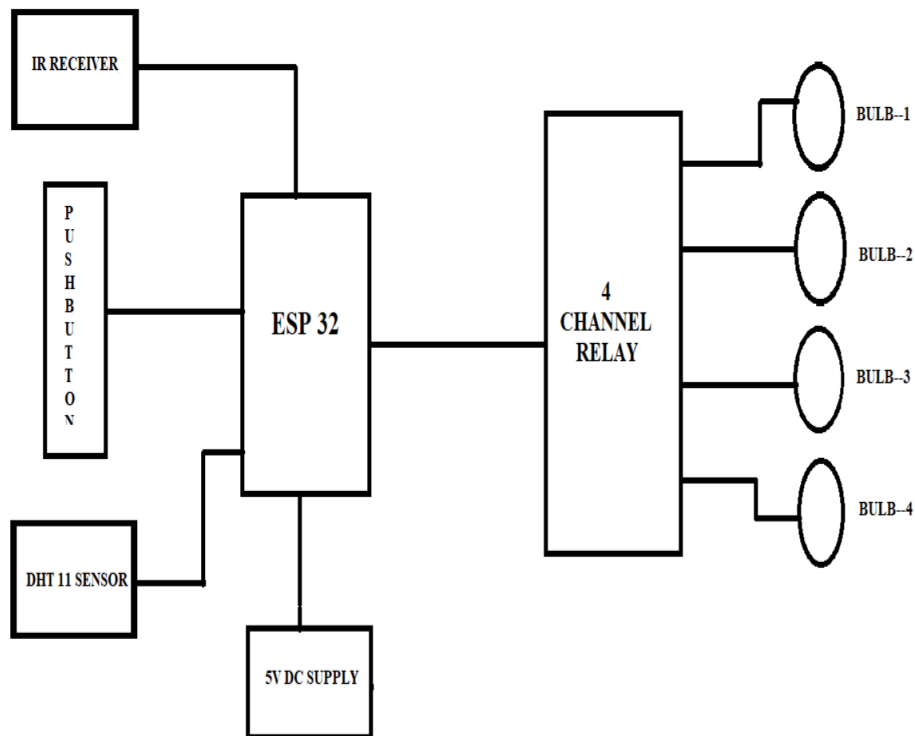


fig:1 Proposed System Block Diagram

The microcontroller used in this project is ESP32 device name is ESP32 DEVKIT V1. ESP32 is a low cost, low power microcontroller which is integrated with wi-fi and Bluetooth. To control the device, it needs to be programmed with a source code. 4 channel relay is a suitable board. It is used to control the high currents and high voltages from the ac supply. It is act like an interface between the microcontroller and the home appliances 11 Temperature sensor. Digital Humidity and Temperature sensor is used find the real time room temperature and the humidity. IR receiver, it is used to control the appliances with help of remote by decoding the remote hex codes. To control manually with IR remote the it is used. Push buttons are also used to control the home appliances manually in the absence of internet. A 5volts DC power supply is given to the ESP32. And the home appliances are used in the project is bulbs.

## HARDWARE DESCRIPTION

### ➤ ESP32

ESP32 DEV kit v1 is one of the boards created for the development of ESP-WROOM-32 module. ESP 32 is a microcontroller boasts Wi-fi, Bluetooth, Ethernet with low power all only in single chip.

By using the wi-fi and Bluetooth functionalities ESP32 is interface with other systems through SPI / SDIO or I2C / UART interfaces

Power to the ESP32 is supplied from the on-board USB port or directly via the vin pin. The power source is automatically selected. ESP32 can be operated with an external supply of 6 v to 20 v. But the recommended voltage range for ESP32 is between 7 to 12 volts.



fig:2 ESP32

### ➤ 4 CHANNEL RELAY

The 4 channel Relay module is a type of suitable board which can be used to control the high currents, high voltages, high current loads such as motors, solenoid valves and lamps as well as AC load.

It is designed to interface with microcontrollers such as ESP32, Arduino, PIC and few more. The relays terminals (COM, NO and NC) are being brought off with screw terminals. The status of the relay is indicated by the LED



fig:3 4 Channel Relay

The module is supplied with power via the pin labelled VCC and ground via the pin labelled GND. The relays are energized with low inputs to the IN1, IN2, IN3 and IN4 inputs.

There are four relays that each provide dry contact outputs. That is to say that each relay provides a common (COM), normally open (NO) and a normally closed (NC) terminal.

### ➤ DHT 11

The DHT 11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin



(no analog inputs pins needed). It's fairly simple to use, but requires careful timing to grab data. You can get new data from it once every 10 seconds.

fig: 3 DHT 11

### ➤ IR RECEIVER

IR receiver is the wireless technology that conveys information or data to devices through infrared (IR) radiation. Infrared is electromagnetic energy at a wavelength or wavelengths somewhat longer than those of red light.



fig: 4 IR receiver

IR receiver transmits IR waves to few distance. Receiver detects reflected IR waves and produces voltages accordingly. If there is no obstruction of IR sensors then there will be not be any reflected IR waves and hence there is no voltage output of IR receiver.



## ➤ PUSH BUTTONS

Push buttons are simple switches performing ON /OFF operations on the electric circuits. These are generally metal or thermoplastic switches that are intended to easy access to the user.

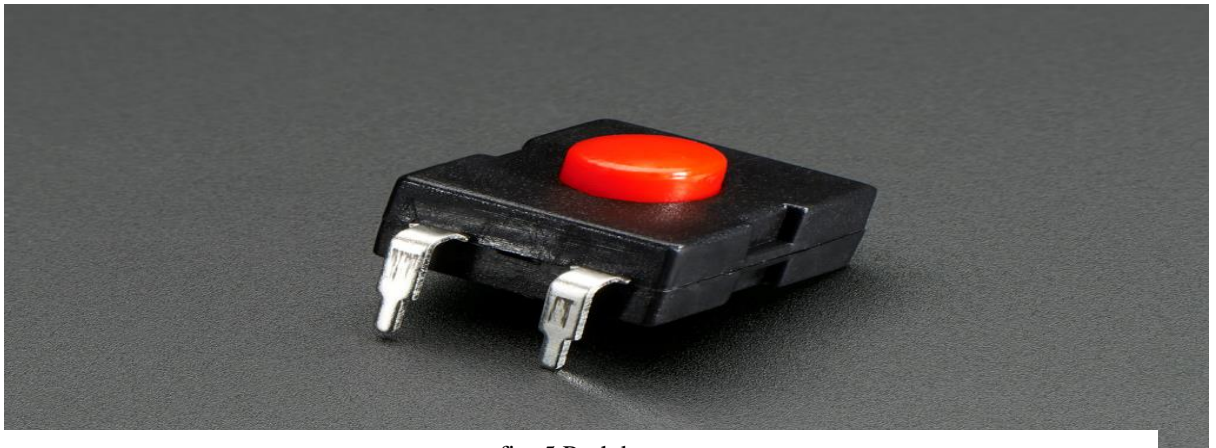


fig: 5 Push button

It comes into two fundamental types: momentary and non-momentary. Push button switches are the part of product line and depending on the application. They come in various styles. The push button is utilized in calculators, toys, telephones, electronics and commercial appliances. In industrial and commercial applications push buttons can be connected together by mechanical linkages. So that one act of button can cause ON and other act cause OFF operation.

## SOFTWARE DESCRIPTION

### ➤ ARDUINO IOT CLOUD

Arduino IoT Cloud is an online platform which used to create, deploy as well as monitor the IoT projects and applications. The Arduino IoT Cloud is a cloud solution to configure, program and connect the IoT devices using the Arduino IoT Cloud service

### ➤ ARDUINO IDE

Arduino Integrated Development Environment (Arduino IDE) is an editor of a text for writing the code, those codes are uploaded to the board. By using the Arduino IDE, we can communicate with the devices with help of a source code. Arduino IDE is an open source that is used to write the codes easily and uploaded to the any board. Arduino IDE can be used with any Arduino board. Arduino IDE is text editor like a notepad with different types of features. It used for code writing, compiling the code and uploading the code to the different Arduino boards.

### ➤ ALEXA

Amazon Alexa, in simple term it is known as Alexa, it is a voice assistant technology largely it is based on the Polish speech synthesizer named Ivona, which is started by Amazon in 2013. In this home automation project, the home appliances are controlled by using Alexa as well. Alexa provides a dashboard type interference as well like ON/ OFF. And also control through voice commands.

### ➤ EMBEDDED C

Embedded C is an extension version or variant of C programming language. The Embedded C language is purely dependent of hardware. While C programming language is hardware independent. In this project the source code used is in the Embedded C language only. This Embedded C code is written in Arduino IDE compiler and uploaded to the ESP32 board.

## IMPLEMENTATION

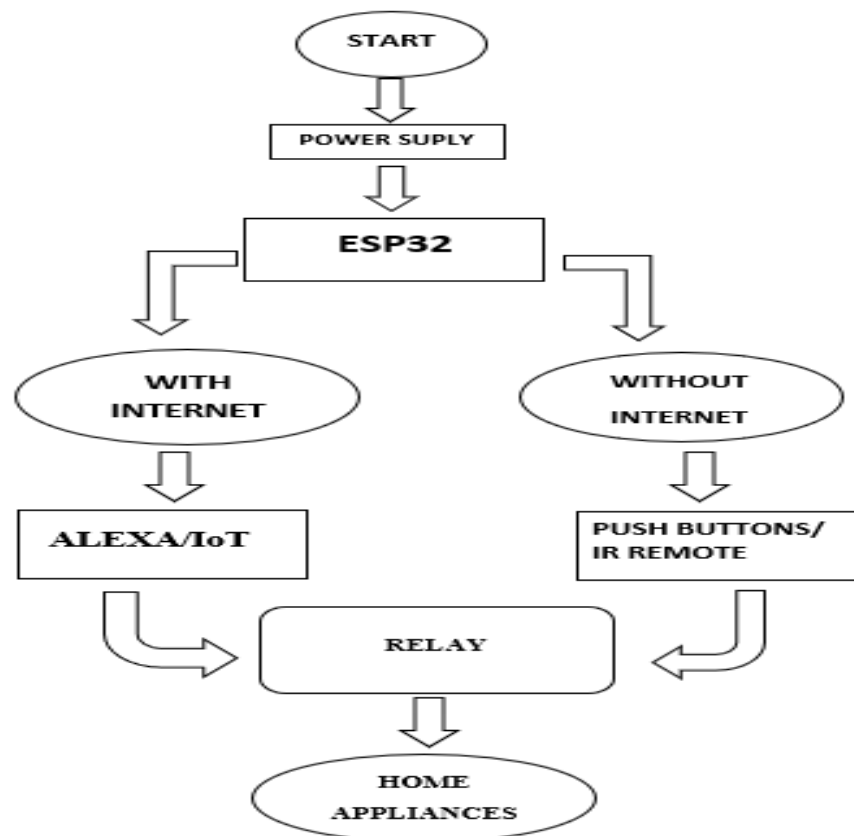


fig:6 Flow Chart

First give the power supply to the home automation system. If the ESP32 device is connected to the internet it indicated with the blue light then, Then the home appliances are controlled by using Alexa and Arduino IoT Cloud with help of Relay. In case if the device is not connected to the internet the appliances can be controlled by using the push buttons and IR remote. Relay is act as an interface between the home appliances and ESP32.

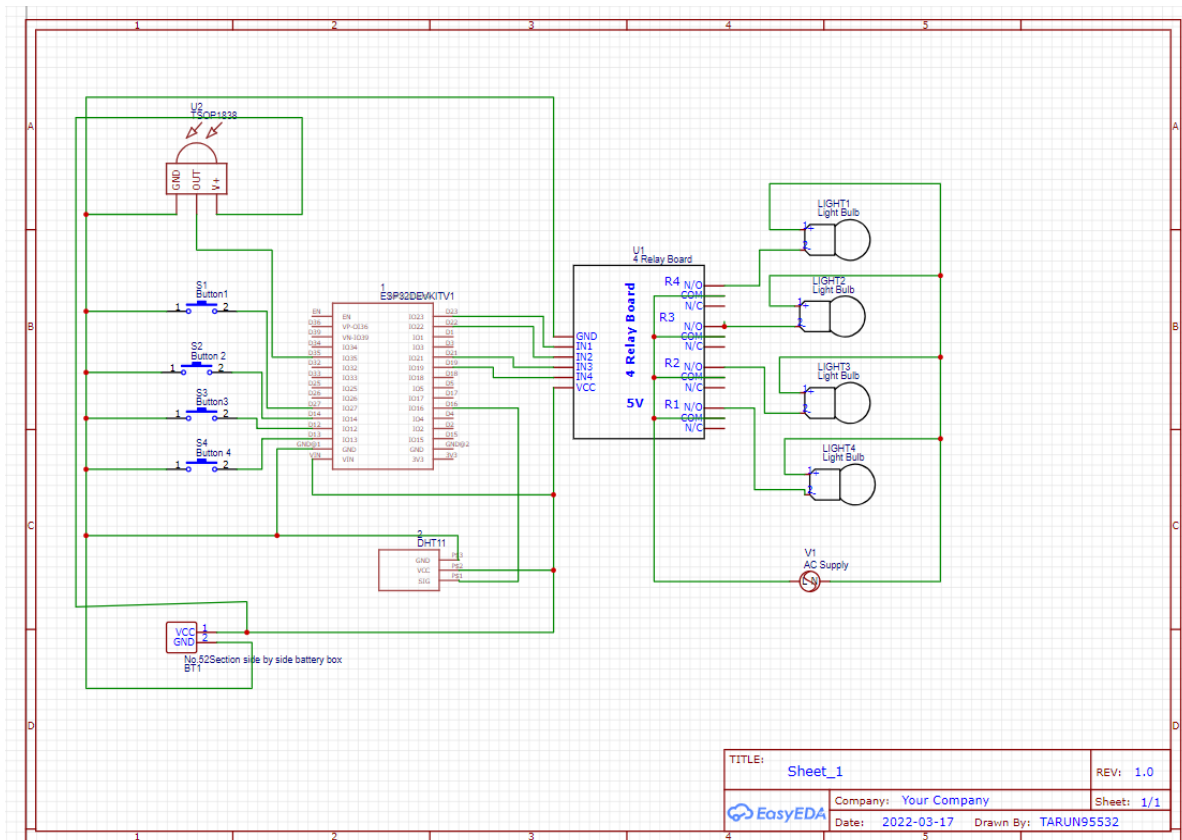


fig: 7 Schematic Diagram

The circuit is very simple, D23, D22, D21 & D19 GPIO to control the 4-channel relay module. And the GPIO D13, D12, D14 & D27 connected with pushbuttons to control the relay module manually. We have used the INPUT\_PULLUP function in Arduino IDE instead of using the pull-up resistors with each push button. As per the source code, when the control pins of the relay module receive a LOW signal, the relay will turn on and the relay will turn off for the HIGH signal in the control pin.

IR remote receiver (TSOP1838) connected with D35. And the DHT11 sensor connected with RX2 (GPIO16). If you want to use the latched switches instead of pushbuttons, then just connect the switches instead of the pushbuttons across GPIO pins and GND.

## RESULTS

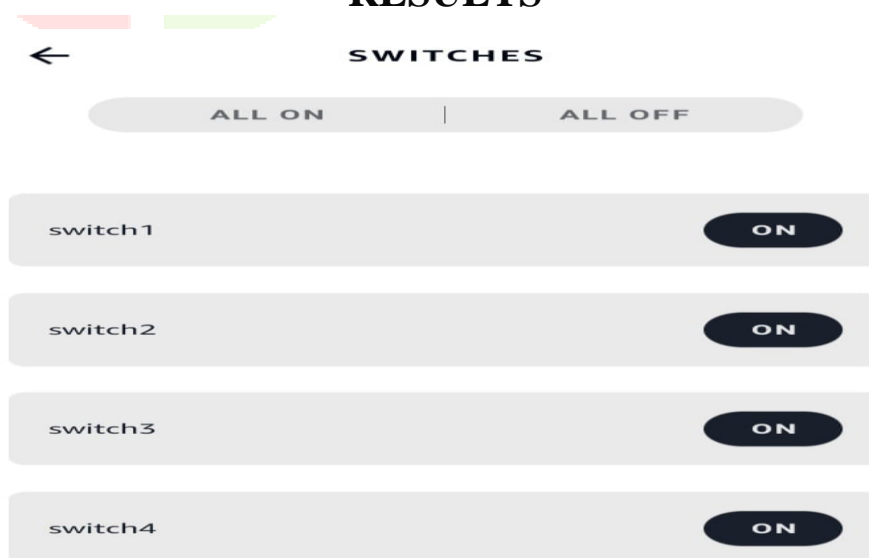


fig: 8 Alexa Dashboard



In Alexa home appliances can be control both by voice commands as well as the dashboard. When all switches are turned ON.

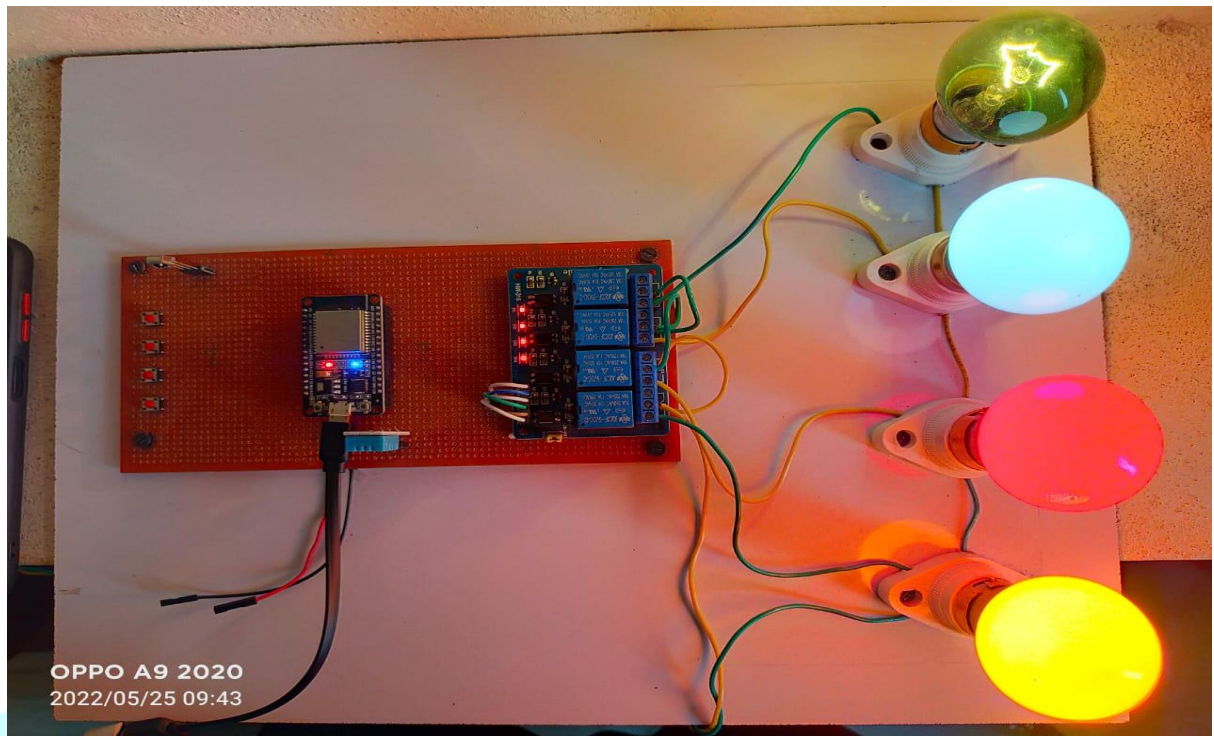


fig: 9 Project Output

Also, similarly home appliances can be controlled by using Arduino IoT Cloud.

## CONCLUSION

The home automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple home appliances to it and the appliances were successfully controlled remotely through internet also can monitor the functionality of the appliances from anywhere throughout the world. Also, by using this project we are monitoring the real time room temperature as well.

## REFERENCES

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