

# Home Automation using Arduino IOT Cloud

Pyda Sravan Kumar<sup>1</sup>, Nenavath Tarun<sup>2</sup>, Bhukya Saritha<sup>3</sup>, Dr. Y. Srinivasulu<sup>4</sup>, Mr. Bhalakrishna<sup>5</sup>

<sup>1,2,3</sup>B. Tech Scholars, Dept. of Electronics and Communication Engineering, SNIST, Hyderabad-501301, India.

<sup>4</sup>Dr.Y.Srinivasulu, Dept. of Electronics and Communication Engineering, SNIST, Hyderabad-501301, India.

<sup>5</sup>Mr.Bhalakrishna, Associate Professor, Dept. of Electronics and Communication Engineering, SNIST, Hyderabad-501301, India.

\*\*\*

**Abstract** - A Home robotization is a content which gains fashion ability day by day, because of large advantages. One can achieve home robotization by simply connecting home appliance electrical bias to the internet or pall storehouse. The reason for this swell demand of network enabled home robotization is reaching the meridian in recent days for its simplicity and similar affordability. Platforms grounded on pall computing help to connect to the thing's surroundings so that one can find it easy to pierce anything and everything at any time and place in a stoner-friendly manner using custom defined doors.

**Key Words:** Home Automation, Internet of things, Assistant.

## 1. INTRODUCTION

Beforehand in 1926, Nikola Tesla envisaged a "connected world." He told Colliers Magazine in an interview (Kennedy, 1926) "When wireless is impeccably applied, the whole Earth will be converted into a huge brain, which in fact it is, all effects being patches of a real and metrical whole(...) and the instruments through which we shall be suitable to do this will be astonishingly simple compared with our present telephone. A man will be suitable to carry one in his vest fund." Kevin Ashton was the first to use the term Internet of effects (IoT). As Ashton wrote in the RFID Journal (June 22, 2009) "If we had computers that knew everything there was to know about effects - using data they gathered without any help from us - we'd be suitable to track and count everything, and greatly reduce waste, loss and cost. We'd know when effects demanded replacing, repairing or recalling, and whether they were fresh or past their stylish." In the same time, Gerstenfeld (1999) published his work "When effects Start to suppose," in which he envisaged the elaboration of the World Wide Web as being a state in which "effects start to use the Net so that people do not need to. In addition, early exemplifications of colorful prototype bias include dealing machines in the 1980s performed by the Computer Science Department of Carnegie Mellon University. Since also, understanding of the possible breadth of IoT has come much more inclusive, comprising a wide range of operation disciplines, including health care, serviceability, transportation, and so on, as well as particular, home, and mobile operation scripts.

## 1.1 Background

The conception of "Home robotization" has been in actuality for several times. "Smart Home", "Intelligent Home" are terms that followed and have been used to introduce the conception of networking appliances within the house. Home robotization Systems (HASs) includes centralized control and distance status monitoring of lighting, security system, and other appliances and systems within a house. HASs enables energy effectiveness, improves the security systems, and clearly the comfort and ease of druggies. In the present arising request, HASs is gaining fashion ability and has attracted the interests of numerous druggies. HASs comes with its own challenges. substantially being, in the present day, end druggies especially senior and impaired, indeed though monstrously served, are not seen to accept the system due to the complexity and cost factors.

## 1.2 Iot Concepts

With specialized advancements, our commerce with information systems is changing, both at work and during rest time. Information, detector, and network technology are getting decreasingly small, more important, and more constantly used. People no longer only encounter information technology at common points in their lives, similar as in services or at divisions, but as information and communication architectures, which are present in adding areas of everyday life. These architectures are characterized by the fact that they not only include classic bias, for illustration, PCs and mobile phones, but that information and communication technology is also bedded in objects and surroundings. The Ubiquitous Computing vision of Mark Weiser implies that computers, as we presently know them, "vanish," or, more precisely, move into the background. Everyday objects and our immediate terrain also assume the tasks and capacities of computers (Weiser and Brown, 1996). Through the physical embedding of IT, everyday objects and our everyday terrain come "smart," that is, able of processing and furnishing information, but not inescapably intelligent in the sense of mortal cognitive intelligence. In another largely regarded composition, Weiser together with Brown introduced the notion of "Calm Computing." They also relate to a connected world full of computers. Still,

only in cases of service provision or when a need exists for commerce do those computers or their separate services come “visible”; at other times, those capabilities are “calm in the background, and not protrusive or indeed visible to the druggies (Weiser and Brown, 1996). The core generalities comprising IoT, as well as affiliated generalities and models, will be presented in the ensuing sections.

### 1.3 Iot Framework

The brief discussion in the following paragraph of specialized, profitable, and social issues reveals that IoT encompasses a wide area of motifs and disciplines. Aimed at structuring the field, we propose the following four-subcaste “Internet of effects Framework ” (Figure1.1). At the core, ultramodern information and communication technologies from the specialized foundation of IoT (covered in subcaste 1). IoT generates a network of unambiguously identifiable physical objects(effects). Networking, and therefore also the capability to communicate, doesn't only relate to mortal actors but also to the objects (or effects) involved. These effects are equipped with miniaturized processors and selectors, for illustration, mechanical rudiments, temperature regulators, and audio or video affair bias that can be employed to control the objects and the terrain. This allows for conforming objects and surroundings to our requirements, interacting with the situation, and the provisioning of information and services according to specific situational conditions, that is, they come “smart objects” and “smart surroundings” (covered in subcaste 2). The automatic identification via RFID is frequently regarded as the base for IoT. Detectors and selectors expand functionality by landing countries and the prosecution of conduct or goods in reality. This results in eventuality for new services, including consumer products as well as new business processes and business models (covered in subcaste 3).

## 2. Resources Used

### Hardware Components Used: -

1. ESP32 Wroom Module
2. HCSR501- Passive IR Motion sensor
3. DHT11 – Temperature and Humidity Sensor
4. MQ2 Smoke and Gas sensor
5. AC Wall Sockets and Plugs
6. Plastic Casing
7. 8- Channel Relay Module
8. AC to DC Converter (2A)
9. Connecting wire

### Software Components Used: -

1. Arduino IDE
2. Arduino IOT Cloud Remote

### 2.1 Hardware Description

#### 2.1.1 Esp32 Wroom Module: -

ESP32 is a series of low- cost, low- power systems on a chip microcontroller with integrated Wi- Fi and binary-mode Bluetooth. The ESP32 series employs either a Ten silica Xtensa LX6 microprocessor in both binary- core and single- core variations, Xtensa LX7 binary- core microprocessor or a single- core RISC- V microprocessor and includes erected- in antenna switches, RF balun, power amplifier, low- noise admit amplifier, pollutants, and power- operation modules. ESP32 is created and developed by Espressif Systems, a Shanghai- grounded Chinese company, and is manufactured by TSMC using their 40 nm process. (2) It's a successor to the ESP8266 microcontroller.

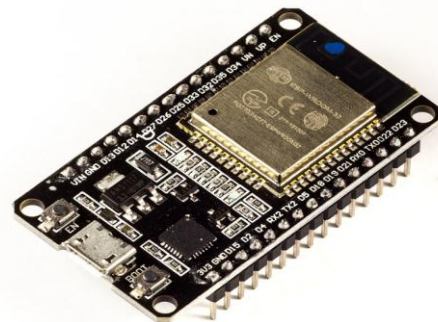


Fig -1: ESP32 Wroom Module

#### 2.1.2 HCSR501-PIR Motion Sensor: -

PIR detectors allow you to smell stir, nearly always used to descry whether a human has moved in or out of the detectors range. They're small, affordable, low- power, easy to use and do not wear out. For that reason, they're generally set up in appliances and widgets used in homes or businesses. They're frequently appertained to as PIR," Passive Infrared"," Pyroelectric", or" IR stir" detectors. PIRs are principally made of a pyroelectric detector (which you can see below as the round essence can with a blockish demitasse in the center), which can descry situations of infrared radiation. Along with the pyroelectric detector is a bunch of supporting circuitry, resistors and capacitors. It seems that utmost small layman detectors use the BISS0001(" Micro Power PIR stir Sensor IC"), really a veritably affordable chip. This chip takes the affair of the detector and does some minor processing on it to emit a digital affair palpitation from the analog detector. For numerous introductory systems or

products that need to descry when a person has left or entered.



Fig -2: PIR Motion Sensor

**2.1.3 DHT11-Temperature and Humidity Sensor: -**

DHT11 is a low- cost digital detector for seeing temperature and moisture. This detector can be fluently connived with any micro-controller similar as Arduino, Raspberry Pi etc. to measure moisture and temperature presently. DHT11 moisture and temperature detector is available as a detector and as a module. The difference between this detector and module is the pull- up resistor and a power- on LED. DHT11 is a relative moisture detector. To measure the girding air this detector uses a thermistor and a capacitive moisture detector. DHT11 detector consists of a capacitive moisture seeing element and a thermistor for seeing temperature. The moisture seeing capacitor has two electrodes with a humidity holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in moisture. For measuring temperature this detector uses a Negative Temperature measure thermistor, which causes a drop in its resistance value with increase in temperature. To get larger resistance value indeed for the lowest change in temperature, this detector is generally made up of semiconductor pottery or polymers. The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree delicacy. moisture range of this detector is from 20 to 80 with 5 delicacies. The slice rate of this detector is 1Hz.



Fig -3: DHT11 Sensor

**2.1.4 MQ2 Smoke and Gas Sensor: -**

A device that's used to descry or measure or cover the feasts like ammonia, benzene, Sulphur, carbon dioxide, bank, and other dangerous feasts are called as an air quality gas detector. The MQ135 air quality detector, which belongs to the series of MQ gas detectors, is extensively used to descry dangerous feasts, and bank in the fresh air. This composition gives a brief description of how to measure and descry feasts by using an MQ135 air quality detector. An MQ135 air quality detector is one type of MQ gas detector used to descry, measure, and cover a wide range of feasts present in air like ammonia, alcohol, benzene, bank, carbon dioxide, etc. It operates at a 5V force with 150mA consumption. Preheating of 20 seconds is needed before the operation, to gain the accurate affair.



Fig -4: MQ2 Smoke and Gas Sensor

**2.1.5 AC Wall Sockets and Plugs: -**

AC power entrapments and sockets connect electric outfit to the interspersing current (AC) mains electricity power force in structures and at other spots. Electrical entrapments and sockets differ from one another in voltage and current standing, shape, size, and connector type. Different standard systems of entrapments and sockets are used around the world. Entrapments and sockets for movable appliances came available in the 1880s, to replace connections to light sockets with wall-mounted outlets. A proliferation of types developed for both convenience and protection from electrical injury. moment there are about 20 types in common use around the world, and numerous obsolete socket types are set up in aged structures. Collaboration of specialized norms has allowed some types of entrapments to be used across large regions to grease trade in electrical appliances, and for the convenience of trippers and consumers of imported electrical goods. Some multi-standard sockets allow use of several types of entrapments extemporized or unapproved attachments between inharmonious sockets and entrapments may not give the full safety and performance of an approved socket- draw combination.





Fig -5: AC Wall Sockets and Plugs

**2.1.6 Plastic Casing: -**

All the electronics should be protected in any project or a product. Cases are the plastic structures which enclose all the components of a system and confine it into a unit. This makes it a lot more portable and safer.

These cases may be premade or custom made. These cases are mostly done using injection molding or blow molding.

**2.1.7 8-Channel Relay Module: -**

A relay is an electrically operated switch. It consists of a set of input outstations for a single or multiple control signals, and a set of operating contact outstations. The switch may have any number of connections in multiple contact forms, similar as make connections, break connections, or combinations thereof. Relays are used where it's necessary to control a circuit by an independent low- power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used considerably in telephone exchanges and early computers to perform logical operations. The traditional form of a relay uses an electromagnet to close or open the connections, but other operating principles have been constructed, similar as in solid- state relays which use semiconductor parcels for control without counting on moving corridor. Relays with calibrated operating characteristics and occasionally multiple operating coils are used to cover electrical circuits from load or faults; in ultramodern electric power systems these functions are performed by digital instruments still called defensive relays.



Fig -7: 8- Channel Relay Module

**2.1.8 AC-DC Converter: -**

AC- DC Power Supply 220V- 5V Motor module is with temperature protection, over current protection and short circuit protection. High trustability, high perfection, safer, more stable. Super small volume, stable affair voltage, easy installation, etc. Extensively used in post and telecommunications, artificial control, instrumentation, fire control and signal control, and other electronic systems.



Fig -8: AC-DC Converter

**2.1.9 Connecting Wires: -**

Line is generally formed by drawing the essence through a hole in a bone or draw plate. line needles come in colorful standard sizes, as expressed in terms of a hand number. Cables are used to bear mechanical loads, frequently in the form of line rope. In electricity and telecommunications signals, a" line" can relate to an electrical string, which can contain a" solid core" of a single line or separate beaches in stranded or pleated forms. generally spherical in figure, line can also be made in square, hexagonal, flattened blockish, or other cross-sections, either for ornamental purposes, or for specialized purposes similar as high-effectiveness voice coils in loudspeakers. Edge- crack coil springs, similar as the Slinky toy, are made of special flattened line.



Fig -9: Connecting Wires

## 2.2 Software Description

### 2.2.1 Arduino IDE: -

Arduino is an open- source tackle and software company, design, and stoner community that designs and manufactures single- board microcontrollers and microcontroller accoutrements for erecting digital bias. Arduino boards are available commercially from the sanctioned website or through authorized distributors. Arduino board designs use a variety of microprocessors and regulators. The boards are equipped with sets of digital and analog input/ affair (I/ O) legs that may be connived to colorful expansion boards ('securities') or breadboards (for prototyping) and other circuits. The boards feature periodical dispatches interfaces, including Universal periodical machine (USB) on some models, which are also used for loading programs. The microcontrollers can be programmed using the C and C programming languages, using a standard API which is also known as the Arduino language, inspired by the Processing language and used with a modified interpretation of the Processing IDE. In addition to using traditional compiler toolchains, the Arduino design provides an intertwined development terrain (IDE) and a command line tool developed in Go. Arduino is an open-source prototyping platform. Arduino boards are suitable to read inputs- light on a detector, a cutlet on a button, or a Twitter communication- and turn it into an affair- cranking a motor, turning on an LED, publishing commodity online. You can tell your board what to do by transferring a set of instructions to the microcontroller on the board. It's like the brain of a design. Because it's so flexible and open source, Arduino is the stylish result if you're interested in creating interactive objects or surroundings no matter, your artists, contrivers or potters. One of Seed Studio's aphorism is "Grow the Difference", which has now come part of the culture of the company. This isn't just reflected from what we're doing in depleting open- source culture, but also from our products. Ever since the company funded, we're continuously creating our own open platform to separate from the being one. Then at Seed, you can find not only Arduino boards, similar as Arduino Nano and Arduino Mega, but also numerous boards that deduced from Arduino similar as Seeeduino, a common trouble by Seeed Studio and Arduino.

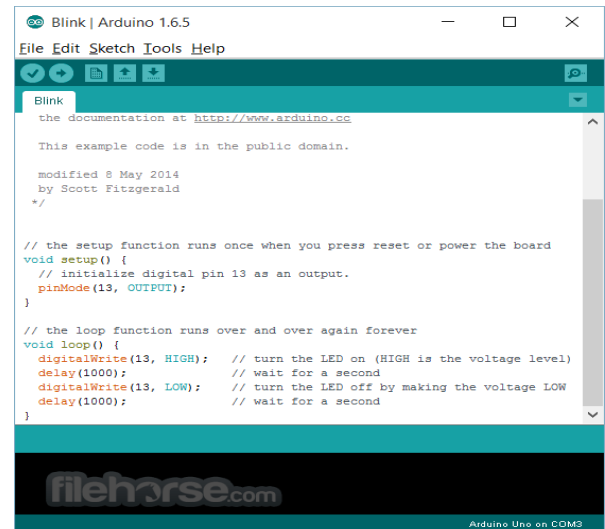


Fig -10: Arduino IDE

### 2.2.2 Arduino IOT Cloud Remote: -

The Arduino IoT Cloud Remote is free a companion app to their Arduino IoT Cloud, an online interpretation of the Arduino IDE operation. systems in the Arduino IoT Cloud are called "effects" and they represent the tackle and software used to make a design. By creating a dashboard for the "thing", the design can be controlled via the Arduino IoT Cloud Remote app, for illustration a robot controlled from your smartphone. Or the thing can shoot data, from your detectors directly to your smartphone. Arduino boards are suitable to read inputs- light on a detector, a cutlet on a button, or a Twitter communication- and turn it into an affair- cranking a motor, turning on an LED, publishing commodity online. You can tell your board what to do by transferring a set of instructions to the microcontroller on the board. It's like the brain of a design. Because it's so flexible and open source, Arduino is the stylish result if you're interested in creating interactive objects or surroundings no matter, your artists, contrivers or potters. One of Seeed Studio's aphorism is "Grow the Difference", which has now come part of the culture of the company. This isn't just reflected from what we're doing in depleting open- source culture, but also from our products. Ever since the company funded, we're continuously creating our own open platform to separate from the being one.

#### Features: -

- **Data Monitoring** – you can easily monitor your Arduino's sensor values through a web dashboard.
- **Variable-Synchronization** -variable synchronization allows you to sync variables across devices, enabling communication between devices with minimal coding.

- **Scheduler** - schedule jobs to go on/off based on specific set time.
- **Over-The-Air (OTA) Uploads** - upload firmware to devices remotely.
- **Webhooks** - integrate your project with another service web services.
- **Amazon Alexa Support** - control the devices using Alexa voice assistant.
- **Dashboard Sharing** - share your data with anyone.

### 2.2.3 Using Arduino IOT Cloud: -

With the Arduino IoT Cloud desktop or mobile platform, you can snappily connect, manage and cover your bias from anywhere in the world. Arduino IoT Cloud allows you to automatically produce any law to program your device with- just add a couple of lines to customize it how you want. If you 're new to Arduino don't worry there's illustration law for hundreds of detectors and selectors.

The following steps will guide you to start using the Arduino IoT Cloud:

- Install the Arduino Create Agent plugin.
- Creating a Thing
- Building the Sketch
- Creating the dashboard

### 3. Working of Circuit

#### 3.1 Circuit Diagram: -

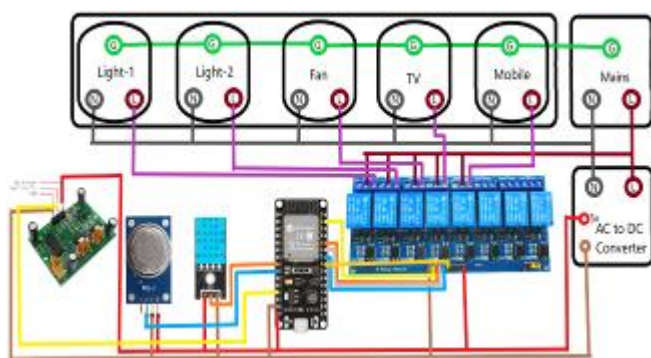


Fig -12: Circuit Diagram

#### 3.2 Circuit Working:-

- The system first converts the ac supply to dc 5v output. To power the dc 5V components.

- The system then runs the connection code and tries to connect to the Wi-Fi.
- The system will try until it is successful. And then tries to connect to the Arduino Iot cloud.
- It establishes secure connection with Arduino cloud.
- The device directly relays the data to the cloud and receives the data whenever the user updates in the app.
- The user can then control all the devices using the Arduino Iot cloud remote app or web dashboard.
- Whenever the user tries to switch on the device. The relay gets actuated and the appliance is powered on.
- The status of the relays and devices get updated in a timely manner. And the commands in cloud are stored so, that they can be passed on to the devices whenever they come online.
- The user gets the temperature and humidity data along with smoke notification in the app.
- The system detects a fire through the smoke sensor and switches off all the electrical systems.
- The motion sensor detects the presence of the people in the room and keeps the appliances on. If there is no movement the appliances will be automatically switched off.
- The pir sensor is calibrated in such a way that the device will get switched off after a 30 min non active period.
- The sensitivity of the pir sensor can also be calibrated manually by the user, to control the actuation threshold.

### 4. Results

#### 4.1 Project image: -



Fig -13: Final Device





Fig -14: Insides of the device



Fig -18: (Switched off light1)

#### 4.2 Dashboard: -

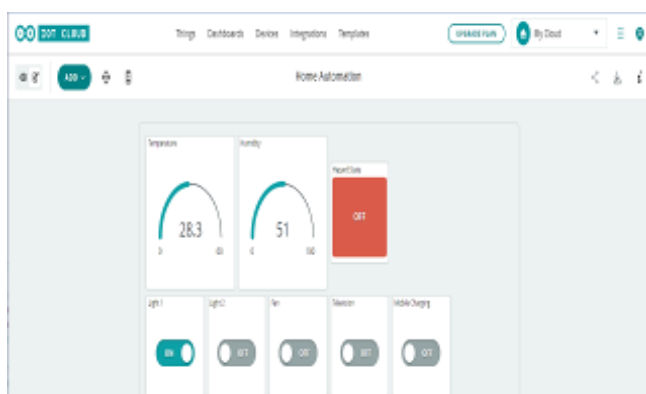


Fig -15: Web Dashboard

#### 4.3 Demonstration stages: -



Fig -16: Deactivated State



Fig -17: Activated State (Switched on light1)

#### 5. Applications

- Home automation
- Automation of offices
- Home Security
- Creating better enterprise solutions. ...
- Integrating smarter homes. ...
- Innovating agriculture. ...
- Building smarter cities. ...
- Upgrading supply chain management. ...
- Transforming healthcare. ...
- Installing smart grids. ...
- Revolutionizing wearables.

#### 6. CONCLUSION

The home robotization using Internet of effects has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled ever through internet. The designed system not only monitors the detector data, like temperature, gas, light, stir detectors, but also actuates a process according to the demand, for illustration switching on the light when it gets dark. It also stores the detector parameters in the pall (Gmail) in a timely manner. This will help the stoner to dissect the condition of colorful parameters in the home anytime anywhere.

#### Future Scope

Using this system as frame, the system can be expanded to include colorful other options which could include home security point like landing the print of a person moving around the house and storing it onto the pall. This will reduce the data storehouse than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or rainfall stations. This kind of a system with separate changes can be

enforced in the hospitals for disabled people or in diligence where mortal irruption is insolvable or dangerous, and it can also be enforced for environmental monitoring.

## REFERENCES

- <https://www.espressif.com/en/products/socs/esp32>
- [https://espressif.com/sites/default/files/documentation/esp32-pico-d4\\_datasheet\\_en.pdf](https://espressif.com/sites/default/files/documentation/esp32-pico-d4_datasheet_en.pdf)
- <https://www.sparkfun.com/products/15569>