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# Literature Survey On Home Automation using cloud computing

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# LITERATURE SURVEY

## 1. Home Automation as a Service

**Authors:** Anindya Maiti

This study introduces a cloud-based home automation system that minimizes the computational load on residential devices while enhancing overall functionality and accessibility. Traditional home automation systems typically rely on local devices to manage tasks such as lighting control, temperature regulation, and security monitoring. However, these systems can place a significant strain on the computational power and storage capacity of individual devices, which can limit their scalability and efficiency.

By shifting the processing load to the cloud, this system leverages the power of distributed computing to offload intensive tasks such as data analysis, machine learning, and real-time decision-making. The cloud-based architecture enables seamless integration of various smart devices, from thermostats and lights to security cameras, without overburdening the device hardware. This approach also ensures that the system can be easily scaled to accommodate new devices or expand to larger homes or buildings, providing a more flexible solution for users.

One of the key advantages of cloud-based home automation is its accessibility. Users can control and monitor their smart home devices from anywhere with an internet connection, using a smartphone or web interface. This remote access enhances user convenience and allows for the automation of tasks even when the user is away from home. Additionally, the cloud platform can collect and analyze data from devices in real-time, enabling predictive features like energy consumption optimization, personalized settings, and automated security alerts.

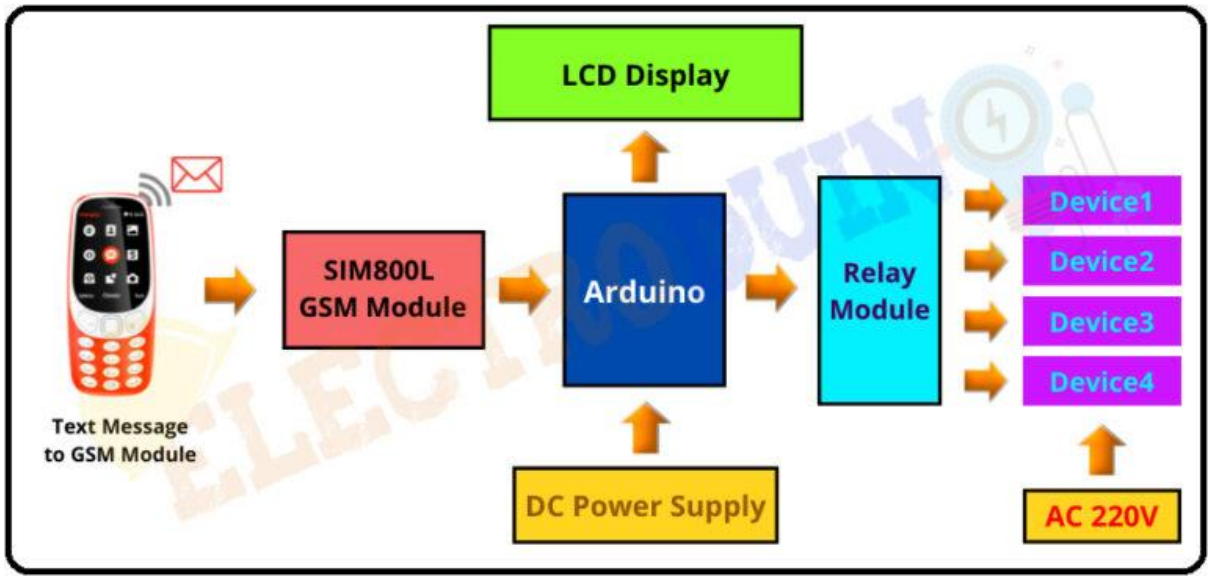
Security is another critical aspect of the system, as cloud-based solutions offer advanced encryption and authentication methods to protect user data and ensure safe communication between devices. By centralizing data storage in the cloud, the risk of data loss or device failure is minimized, and users benefit from continuous software updates and maintenance.

Overall, the cloud-based home automation system represents a significant step forward in the evolution of smart homes, offering improved scalability,

efficiency, and accessibility while minimizing the reliance on local computational resources. As cloud computing technology continues to advance, these systems are expected to become even more powerful, intuitive, and secure, further transforming how users interact with their homes.

## 2. Design and Prototype Implementation of SMS-based Home Automation

**Authors:** H. ElKamchouchi, Ahmed ElShafee




### 1. Introduction

Home automation refers to the control of home appliances such as lighting, temperature regulation, security systems, and other household devices through a network. SMS-based home automation allows users to control their home appliances remotely using short message service (SMS), offering a simple and effective method for non-technical users to interact with smart devices. This approach ensures that even without internet access, users can control and automate their home appliances through basic mobile phone functions.

The primary objective of this project is to design and prototype an SMS-based home automation system that facilitates remote control of various devices in a home, providing convenience and security to users.

### 2. System Overview

The system involves two key components:

- **Microcontroller (Hardware)**: The microcontroller (e.g., Arduino, Raspberry Pi) is the heart of the system. It is responsible for controlling devices such as lights, fans, and security cameras based on commands received via SMS.
- **SMS Gateway**: This is a communication interface that allows the system to send and receive SMS messages. It can be achieved using a GSM module (e.g., SIM900) or a smartphone connected to the system via Bluetooth or Wi-Fi.

**3. Key Components**

- **GSM Module (e.g., SIM900, SIM800)**: This module allows the microcontroller to send and receive SMS messages. It uses a SIM card to connect to the mobile network and send commands.
- **Microcontroller (e.g., Arduino, Raspberry Pi)**: This component receives commands from the GSM module and translates them into actions to control the home appliances.
- **Relays**: Relays are used to control the state (on/off) of high-voltage appliances like lights, fans, and air conditioners. These are connected to the microcontroller.
- **Home Appliances**: Devices like lights, fans, and doors are connected to the relays for control.
- **SMS Interface (Mobile)**: A mobile phone sends SMS commands, such as "TURN ON LIGHT" or "TURN OFF FAN," to the GSM module.

**4. System Architecture**

The architecture of the SMS-based home automation system can be outlined as follows:

- **User Interface**: The user sends SMS messages to the GSM module. The message can include commands like "ON," "OFF," or more complex instructions to control specific devices or settings.
- **SMS Processing**: Upon receiving the SMS, the GSM module sends the text to the microcontroller for parsing. The microcontroller extracts the command and executes it accordingly.

- **Control Mechanism**: The microcontroller interfaces with relays to turn devices on or off based on the SMS command.
- **Device Feedback**: The system can send a confirmation SMS back to the user to acknowledge the action taken, such as "Light is turned ON."

**5. Prototype Implementation Steps**

**Step 1: Hardware Setup**

- **Microcontroller Selection**: Choose a microcontroller like **Arduino Uno** or **Raspberry Pi** for ease of integration with relays and GSM modules.
- **GSM Module Setup**: Interface a GSM module such as **SIM900** with the microcontroller. The module needs a SIM card with a mobile network connection.
- **Relay and Appliance Connections**: Connect relays to the microcontroller pins, and interface them with household appliances (lights, fans, etc.). Ensure the relay can handle the load of the devices.
- **Power Supply**: Make sure the system has an adequate power supply for the GSM module, microcontroller, and appliances.

**Step 2: Programming the Microcontroller**

- **Initialization**: Initialize the GSM module and ensure it is ready to receive messages. Establish serial communication between the microcontroller and GSM module.
- **Command Parsing**: Write code to parse incoming SMS messages. For example, the system should recognize commands like "LIGHT ON" or "FAN OFF."
- **Relay Control**: The microcontroller should control the relays based on the parsed commands. When a specific device is selected in the SMS, the corresponding relay is triggered to either complete or interrupt the circuit, turning the appliance on or off.
- **Confirmation Response**: After executing the command, the system should send an acknowledgment SMS to the user, confirming the action, such as "The light is turned on."

**Step 3: SMS Command Examples**

- "LIGHT ON" – Turns on the light.
- "FAN OFF" – Turns off the fan.
- "DOOR OPEN" – Opens the door lock (if applicable).
- "ALL OFF" – Turns off all devices.

**Step 4: Testing**

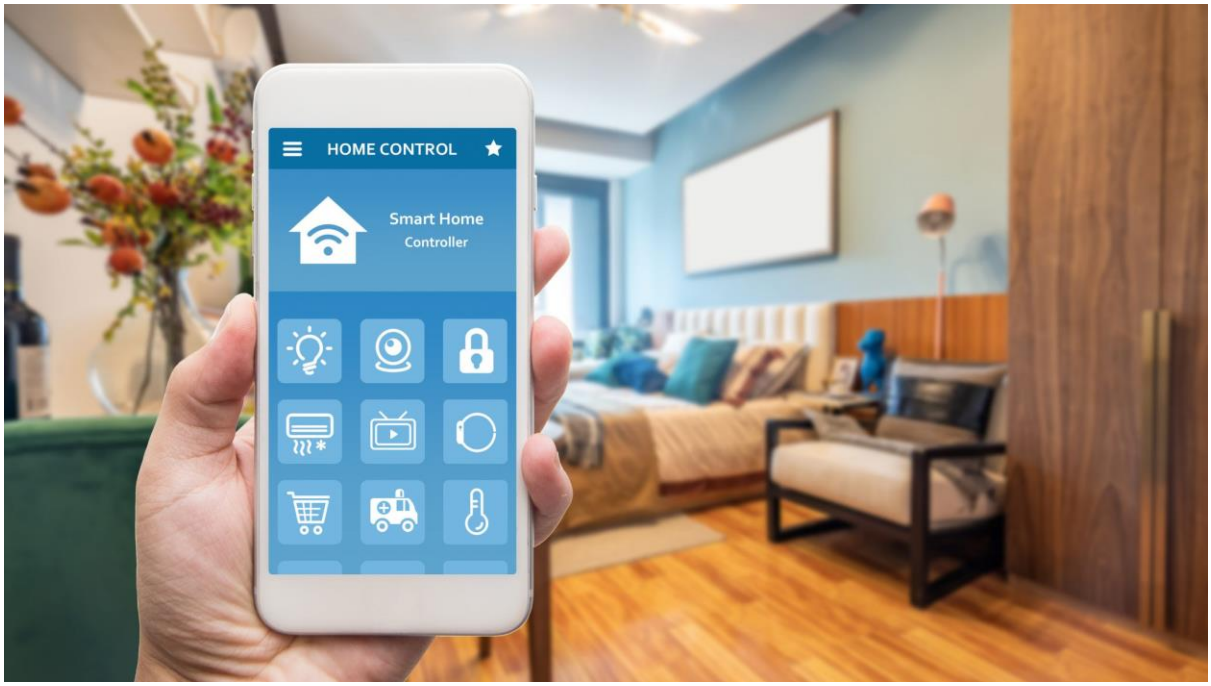
- **Send SMS Commands**: Test the system by sending SMS commands from a mobile phone. Observe the behavior of the connected appliances, and verify the response.
- **Refinement**: Refine the code to handle additional edge cases such as incorrect commands or multiple simultaneous device controls.

**6. Challenges and Solutions**

- **Network Connectivity**: In some areas, network coverage may be weak, which can affect the GSM module's ability to receive commands. A solution would be to ensure that the GSM module is placed in an area with good signal strength.
- **Security Concerns**: SMS commands could be intercepted, allowing unauthorized access. Encrypting the SMS content or adding PIN-based authentication can mitigate this issue.
- **Limited Command Complexity**: SMS-based control is limited in complexity compared to internet-based home automation systems. The system can be extended by integrating voice recognition or adding automated rules based on SMS interactions.

## 3. Home Automation Using Cloud Computing and Mobile Devices

**Authors:** Darshan Sonar, Nilesh Dengle, Sachin Kangude, Dattatraya Gawade




1. Introduction

Home automation refers to the use of technology to control and manage home appliances and systems like lighting, heating, security, and entertainment. Traditional home automation systems often rely on local networks and manual intervention. However, with the rise of cloud computing and mobile devices, home automation has become more flexible, scalable, and accessible. Cloud-based home automation allows for remote control, automation, and monitoring of devices through smartphones and other mobile devices. This makes it easier for users to manage their homes, whether they are at home or away.

2. System Overview

Cloud-based home automation systems use a combination of cloud platforms, smart devices, and mobile apps to provide an integrated solution. The cloud platform serves as the central hub where data from devices is stored and processed. Mobile devices, through apps, act as the interface through which users can interact with their home automation system, controlling devices and setting automation rules.

Key components of such a system include:

- Cloud Platform: A service like AWS, Google Cloud, or Microsoft Azure to host data and manage devices.

- Mobile Application: An app running on smartphones that allows users to send commands to devices and monitor their status.
- Smart Devices: IoT-enabled devices like lights, thermostats, locks, sensors, and cameras that can be controlled remotely.

3. How the System Works

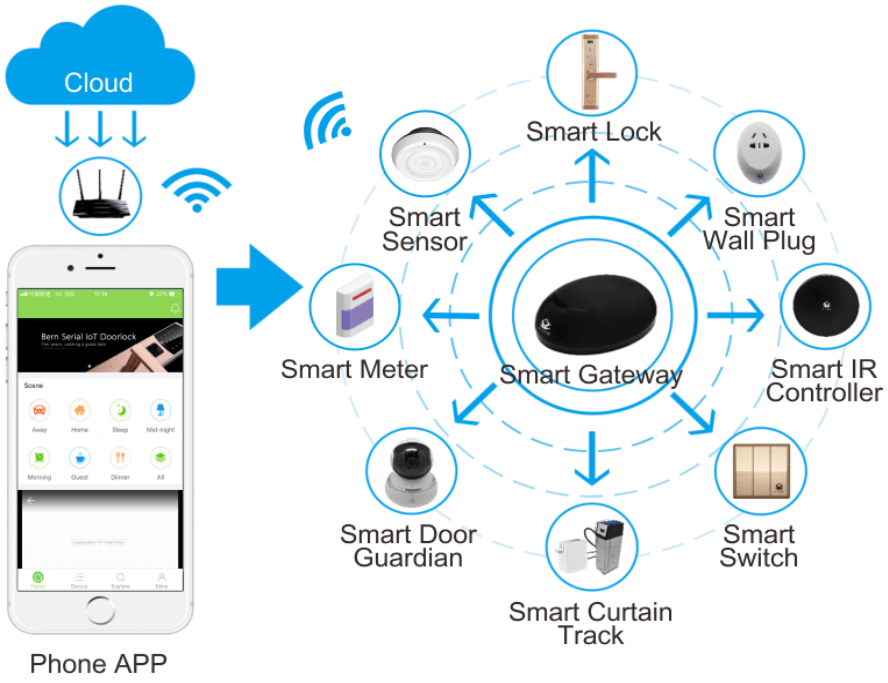
1. Device Setup: Smart devices are connected to the home Wi-Fi and registered on the cloud platform.
2. Mobile Interaction: Users can control the devices using a mobile app. For example, turning lights on/off or adjusting the thermostat remotely.
3. Automation: Users can create rules such as "If the temperature is below 18°C, turn on the heater." The cloud platform processes these rules and takes action.
4. Real-time Feedback: The system can notify users with updates like "Motion detected" or "Front door unlocked" to provide real-time monitoring.

4. Advantages

- Scalability: The cloud provides virtually unlimited storage and processing power, making it easy to add devices and scale the system.
- Remote Access: Users can control their devices from anywhere, at any time, as long as they have an internet connection.
- Security: Cloud providers offer strong encryption and multi-factor authentication to ensure data security.
- Cost-Effective: Reduces the need for costly infrastructure by relying on cloud services.

## 4. Enabling Mobile Devices for Home Automation Using ZigBee

**Authors:** Alexandru-Corneliu Olteanu, George-Daniel Oprina, Nicolae Tapus, Sven Zeisberg




Enabling mobile devices for home automation using ZigBee involves integrating ZigBee-based devices with mobile apps to control and monitor smart home systems. ZigBee is a low-power, wireless communication protocol designed for short-range, low-data-rate applications, making it ideal for home automation. Mobile devices, such as smartphones and tablets, can interact with ZigBee-enabled devices through a gateway or hub that connects ZigBee networks to the internet. This allows users to control devices like lights, thermostats, security cameras, and door locks remotely using a mobile app. The app communicates with the gateway, which translates the commands into ZigBee signals that are sent to the corresponding devices. With ZigBee's ability to support mesh networking, it ensures robust and reliable communication between devices, even in larger homes. The use of ZigBee enables mobile devices to be a central control point for smart home systems, offering convenience, energy efficiency, and improved security while maintaining low power consumption for connected devices.

# IOT role in home automation

The **Internet of Things (IoT)** plays a crucial role in **home automation**, revolutionizing the way homes are managed, controlled, and monitored. IoT refers to the network of interconnected devices that communicate and share data with each other via the internet. In the context of home automation, IoT enables a seamless and smart environment by connecting various household devices and systems to improve convenience, efficiency, security, and energy management. Here's how IoT contributes to home automation:

## 1. Smart Home Devices

IoT facilitates the use of various **smart devices** within the home, which can be controlled remotely or automatically. These devices include:

- **Smart thermostats**: Allow homeowners to control heating and cooling remotely, set schedules, or automate temperature adjustments based on occupancy or weather conditions.
- **Smart lighting**: Enables users to control lights remotely, set schedules, or adjust lighting levels based on activity or time of day.
- **Smart locks**: Provide remote access control, enabling users to lock or unlock doors via smartphones or voice commands.
- **Smart appliances**: Devices like refrigerators, washing machines, and ovens can be monitored and controlled remotely, providing convenience and energy efficiency.

## 2. Automation and Scheduling

IoT allows users to set up **automated routines** and schedules for various devices. For example:

- Lights can turn on and off based on time of day or occupancy.
- Smart thermostats can adjust temperatures according to the time of day, occupancy, or energy consumption preferences.
- Security cameras and alarms can be set to activate automatically when the system detects unusual activity or when the homeowner is away.

## 3. Remote Control and Monitoring

With IoT integration, homeowners can control their devices **remotely**, typically through smartphones, tablets, or computers. This provides the ability to:

- Monitor and control home systems from anywhere in the world.
- Check the status of devices (e.g., whether a door is locked, if the oven is on).
- Receive real-time alerts and notifications in case of security breaches, equipment malfunctions, or energy spikes.

## 4. Enhanced Security

IoT devices greatly enhance home **security systems** by integrating sensors, cameras, motion detectors, and alarms. These smart security features can:

- Detect unauthorized access and send immediate alerts to homeowners or security services.
- Automate surveillance camera recording and remote viewing.
- Control security gates, door locks, and even alarm systems from anywhere.
- Use smart doorbells with video feeds to allow homeowners to interact with visitors remotely.

## 5. Energy Efficiency and Conservation

IoT helps in monitoring and controlling **energy usage** in real time, which can lead to significant cost savings and environmental benefits:

- Smart thermostats and lights adjust based on occupancy or preferences to optimize energy consumption.
- Smart appliances can operate during off-peak hours to reduce energy costs.
- IoT-based energy monitors track electricity usage patterns, providing insights on potential savings.

## 6. Health and Wellness

IoT devices also contribute to improving the health and wellness of the household:

- **Smart air purifiers** and **humidifiers** automatically adjust based on air quality or humidity levels.
- Wearable health devices can sync with home systems to track sleep patterns, fitness, and other health metrics, and make adjustments to environmental settings like lighting and temperature for better well-being.

## 7. Voice Control and Integration

Many IoT-enabled home automation systems integrate with **voice assistants** like Amazon Alexa, Google Assistant, or Apple Siri, enabling users to control devices with voice commands. For example, users can:

- Ask for the temperature, adjust the lights, lock doors, or even set up specific scenes (e.g., "movie night" mode).
- Integration with smart speakers allows for hands-free operation of IoT devices.

## 8. Smart Energy Management

IoT-based **smart grids** and energy meters help in managing and optimizing power usage in homes. Smart meters provide real-time data on energy consumption, allowing homeowners to:

- Track energy usage patterns.
- Control appliances to avoid peak electricity rates.
- Implement energy-saving practices by automating when certain devices are used.

## 9. Convenience and Personalization

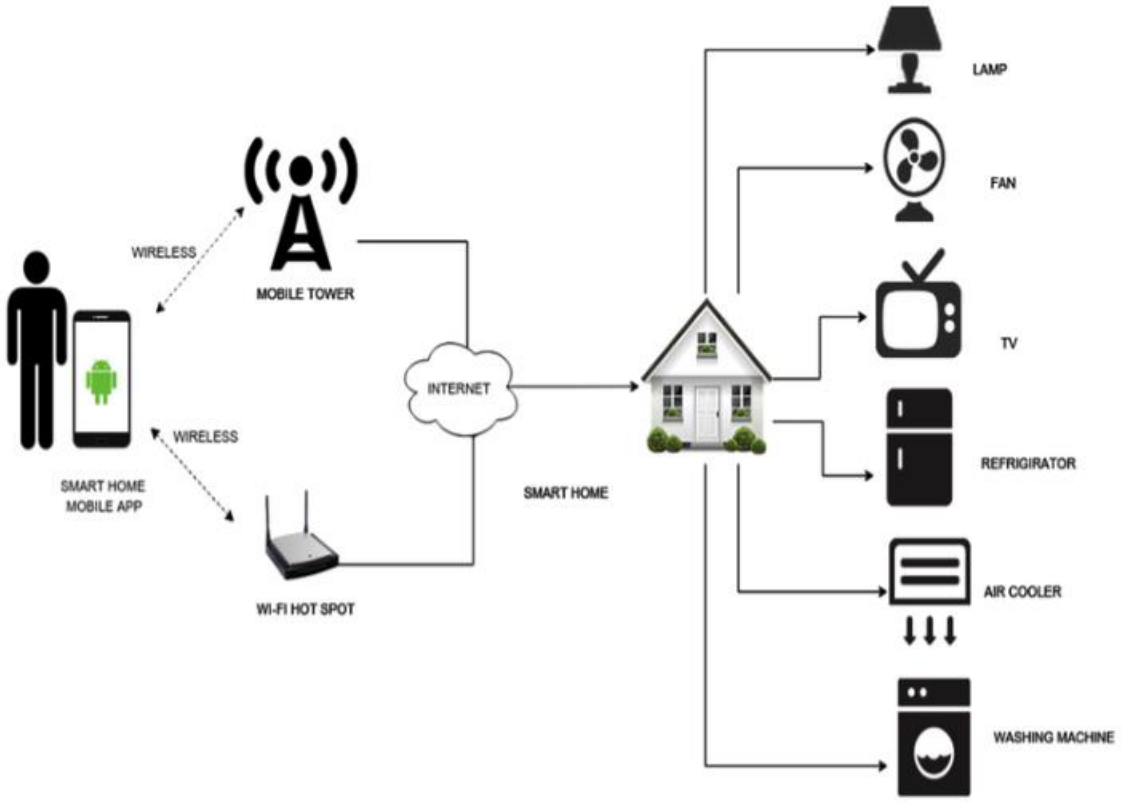
systems in home automation provide a high level of **personalization** based on the habits and preferences of the user. Some examples include:

- Smart lighting that adjusts based on the time of day or activity (e.g., brighter lights for reading, dimmed lights for relaxation). IoT
- Climate control systems that remember your preferred temperatures and adjust automatically when you return home.

## 10. Integration with Other Technologies

IoT allows **interoperability** with various other technologies, such as home entertainment systems, artificial intelligence (AI), and even **smart city infrastructure**. For example:

- Home automation systems can integrate with **AI-powered algorithms** to learn user preferences and optimize energy use.
- IoT-enabled homes can sync with larger **smart city** systems, such as traffic control, waste management, and public safety features.



# Relation between IOT and cloud computing

The **Internet of Things (IoT)** and **cloud computing** are closely related because they work together to enable the collection, processing, and storage of data from connected devices in a seamless and scalable way. Here's how IoT and cloud computing are interconnected:

- 
- **IoT** devices generate vast amounts of data (e.g., sensor readings, device statuses, environmental data).
- The **cloud** provides a scalable platform to store, manage, and retrieve this data. Cloud storage can accommodate the large volume of data generated by IoT devices, ensuring it is available for analysis and decision-making.

## 2. Data Processing and Analysis

- IoT devices collect raw data, which often needs to be processed and analyzed to extract useful insights.
- The **cloud** offers powerful computing resources (e.g., virtual machines, big data platforms) that can process and analyze this data in real-time or in batches, enabling advanced analytics like predictive maintenance, anomaly detection, and more.
- Cloud services can also run machine learning and artificial intelligence models on this data to gain insights that would be hard to process on the devices themselves.

## 3. Scalability and Flexibility

- The **cloud** allows IoT systems to scale easily. As the number of devices grows or as more data is collected, cloud computing resources can be scaled up or down to handle the increased load**.**
- This scalability is essential for IoT applications where the number of devices and data points can grow rapidly over time.

## 4. Remote Access and Control

- Cloud-based platforms enable **remote access** to IoT devices. Users can manage and monitor devices from anywhere in the world through web dashboards or mobile apps connected to the cloud.
- Through the cloud, IoT devices can be controlled, configured, and updated remotely, which is especially important in large-scale or distributed IoT deployments.

### 6. Security and Data Backup

- The **cloud** offers security measures like encryption, access control, and backup to protect the data generated by IoT devices. Cloud providers often have more robust security infrastructure than many IoT devices can provide locally.
- Regular backups and disaster recovery mechanisms are also easier to implement with cloud solutions, helping ensure data integrity and availability.

## REQUIREMENTS NEEDED :

- Rasberrypi
- Relays
- LED
- JUMPERS