Smart Home Automation System

Abstract

This project showcases a **Smart Home Automation System** built using the **ESP32 Ontomise development board**, integrated with **ESP RainMaker** — a third-party cloud-based IoT platform provided by Espressif. The system enables remote and local control of home appliances such as lights, fans, and other electronics through a smartphone, offering a plug-and-play experience without the need for custom app development.

The system is designed to be low-cost, scalable, and ideal for modern households seeking automation with minimal complexity and maximum convenience.

Objectives

- Automate electrical appliances using Wi-Fi control
- Use **ESP RainMaker** for app-free setup and control
- Maintain low hardware cost
- Ensure user-friendly setup and configuration
- Enable voice assistant support via RainMaker (Alexa/Google Assistant)

Hardware Components

Component	Purpose
ESP32 Ontomise	Core Wi-Fi-enabled microcontroller
Relay Module	Switching mechanism for appliances
AC-DC Supply	Power for ESP32 and relay
Casing	Enclosure for safe and compact use

Software Integration: ESP RainMaker

- **No custom app required**
- Use **ESP RainMaker mobile app** (Android/iOS)
- Control devices over Wi-Fi
- Add devices using QR code or provisioning
- Voice assistant integration (Alexa, Google Home)
- Optional: Schedule ON/OFF timers from the app

System Architecture

1. ESP32 is programmed with RainMaker firmware
2. Relay modules connected to GPIO pins control devices
3. User provisions device using the RainMaker app
4. Appliances are toggled through the app or voice command
5. ESP32 responds and updates device status in real time

Features

- Seamless remote control via smartphone
- Cloud-based device provisioning and updates
- Works with Amazon Alexa & Google Assistant
- No backend server maintenance required
- Multiple device support

- Secure & encrypted communication

Future Expansion

- Add support for sensors like:
    - Temperature/Humidity
    - Motion Detection (PIR)
    - Power/Energy Monitoring
- Add auto-scheduling based on weather/time
- Support for scene automation (e.g., “Night Mode” turns off all appliances)
- Integration into smart home hubs or custom dashboards

Cost Breakdown (per unit)

Item	Approx. Cost (INR/USD)
ESP32 Ontomise Board	₹400 / $5
Relay Module (2CH/4CH)	₹250 / $3
Power Supply	₹200 / $2.5
Casing + PCB	₹300 / $4
Total BOM	**₹1,150 / $14.5**

Revenue Model

Metric	Estimate
Retail Price	₹3,000 / $35–40

Gross Profit/Unit	~₹1,800 / $21
Target Sales (Year)	500 units
Revenue (Year)	₹15,00,000 / $18,000+

Expansion Strategy:

- Partner with real estate builders for smart home kits
- Offer installation service (₹500–₹1000 extra per unit)
- Monthly maintenance plan (₹99 for priority support)
- B2B model for offices, hotels, clinics

Deliverables

- Fully functional smart device with 2 or 4 relay outputs
- Power supply
- User guide for RainMaker setup
- QR code provisioned unit ready to use

Conclusion

This Smart Home Automation system using **ESP32 and ESP RainMaker** is a practical and scalable solution for modern living. It eliminates the need for custom app development while offering powerful automation features via a secure, cloud-connected ecosystem. The low-cost hardware combined with ready-made app infrastructure makes it ideal for DIY users, tech-savvy homeowners, and commercial use.