

# Smart Home Automation System with ESP8266

---

## ◆ Project Overview

This IoT-based Smart Home Automation System uses an **ESP8266 microcontroller** to control appliances via:

- ✓ **Voice commands** (Alexa/Google Assistant)
- ✓ **Manual tactile switches** (local control)
- ✓ **Automatic light sensing** (LDR sensor)

## Key Features:

- **4-Channel Relay Control** for appliances (lights, fans, etc.).
  - **Debounced Tactile Switches** for reliable physical control.
  - **LDR-Based Automation** for energy-efficient lighting.
  - **Wi-Fi + SinricPro Cloud Integration** for remote access.
- 

## ◆ Hardware Setup

Component	GPIO Pin	Role
Relay 1	D1 (GPIO 5)	Device 1 (e.g., Light)
Relay 2	D2 (GPIO 4)	Device 2 (e.g., Fan)
Relay 3	D5 (GPIO 14)	Device 3
Relay 4	D6 (GPIO 12)	Device 4
Tactile Switches	GPIO 10, 0, 13, 3	Manual Toggle
LDR Sensor	A0	Ambient Light Detection
Wi-Fi Status LED	D0 (GPIO 16)	Connection Indicator

---

## ◆ Software & Cloud Integration

### 1. SinricPro (Voice Control)

- **App Key/Secret** configured for Alexa/Google Assistant.
- **Device IDs** mapped to relays for cloud control.
- **Real-time sync** between physical switches and app.

### 2. Automatic Light Control (LDR)

- **Analog LDR input (A0)** mapped to brightness levels (0–255).
- **Threshold-based triggering:**

### 3. Wi-Fi Connectivity

- **SSID/Password** stored in code (suggest: use WiFiManager for dynamic config).
  - **LED Indicator (D0)** shows connection status.
- 

## ◆ Project Demo

1. **SinricPro App:** Show device control via Alexa.
  2. **Serial Monitor:** Logs LDR values and relay states.
  3. **Hardware Demo:** Video of switches/relays in action.
- 

## ◆ Challenges & Solutions

Challenge	Solution
Switch debouncing	Used millis() for 250ms delay
Wi-Fi drops	Auto-reconnect in loop()
LDR false triggers	Added threshold hysteresis

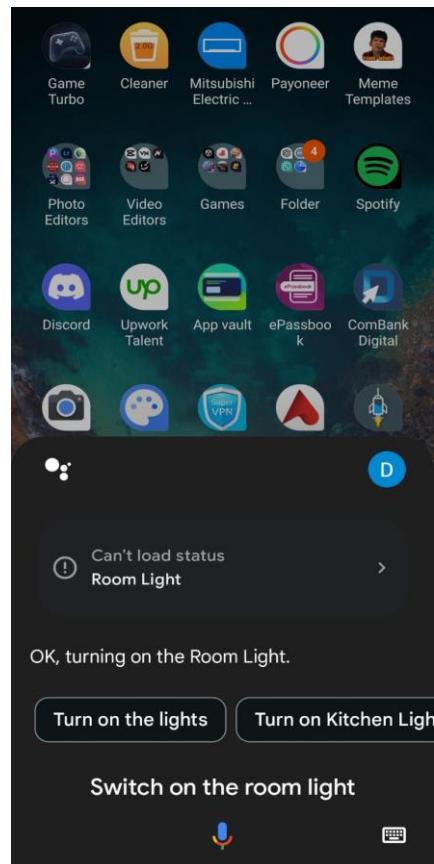
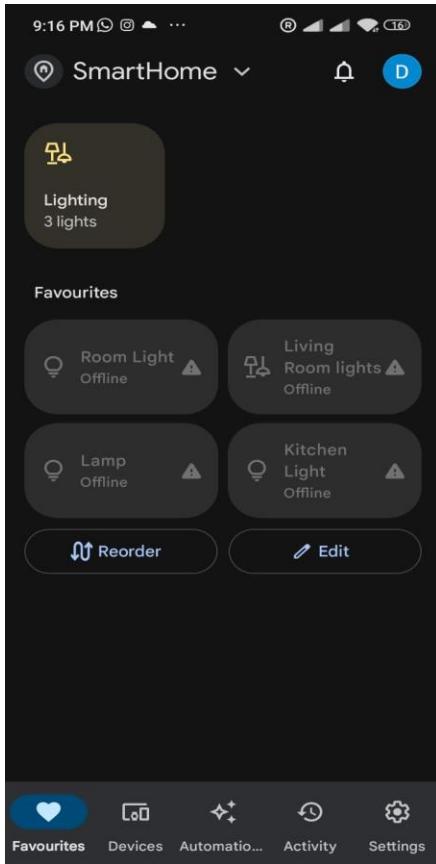
---

## ◆ Future Improvements

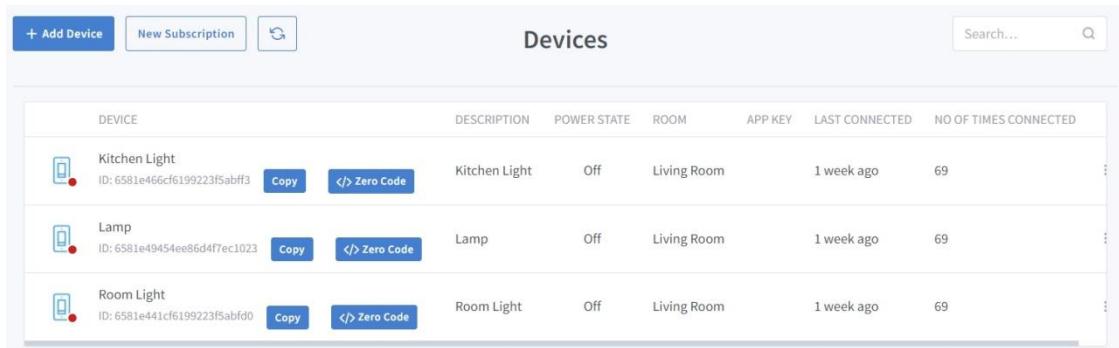
- **Add OTA Updates** for remote firmware upgrades.

- **Integrate MQTT** for cross-platform control (Home Assistant).
  - **Energy Monitoring** with current sensors.
- 

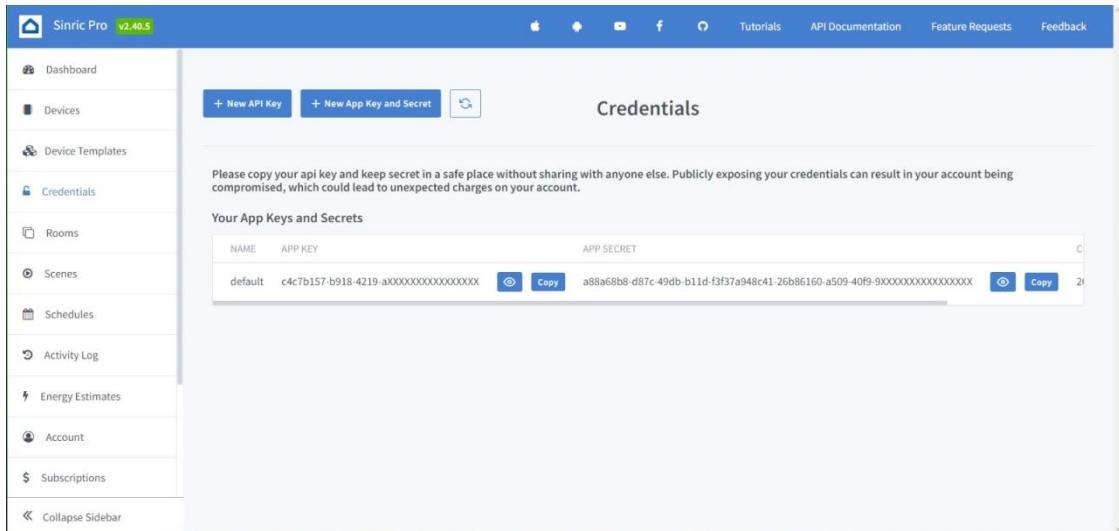
## CONTROLLING BY GOOGLE ASSISTANT AND GOOGLE HOME APP:



## CLOUD SETUP ON SINRIC PRO:

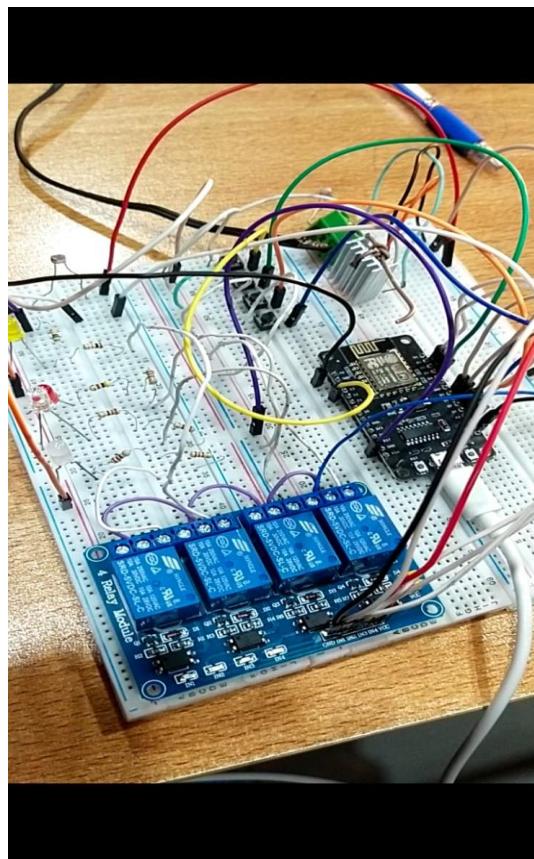
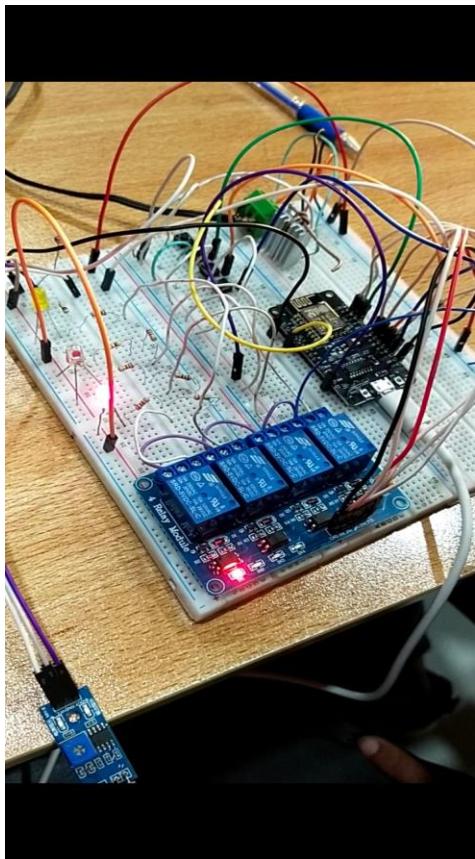


The screenshot shows the Sinric Pro cloud interface under the 'Devices' section. It lists three devices: 'Kitchen Light', 'Lamp', and 'Room Light'. Each device entry includes its name, ID, description, power state, room, app key, last connected time, and number of times connected. Buttons for 'Copy' and 'Zero Code' are available for each device.



The screenshot shows the Sinric Pro cloud interface under the 'Credentials' section. It displays a warning message: 'Please copy your api key and keep secret in a safe place without sharing with anyone else. Publicly exposing your credentials can result in your account being compromised, which could lead to unexpected charges on your account.' Below this, it shows a table for 'Your App Keys and Secrets' with one row for 'default'. The table columns are NAME, APP KEY, APP SECRET, and actions (Copy, Delete).

## CIRCUIT :



## ◆ Why Hire Me?

- ✓ **Proven IoT Expertise:** Demonstrated ability to integrate hardware + cloud.
- ✓ **Clean & Modular Code:** Easy to scale for larger projects.
- ✓ **Problem-Solving:** Debugged debounce, Wi-Fi stability, and sensor accuracy.

Let's build your next IoT project! 