Smart Home Security & IoT Control System with ESP32

Integrating Sensors, Actuators & Cloud for Real-Time Protection and Automation

Made with GAMMA

The Challenge: Modern Home Security Needs

Lack of Remote Monitoring

Traditional systems often lack the ability to monitor your home from anywhere, leaving gaps in security when you're away.
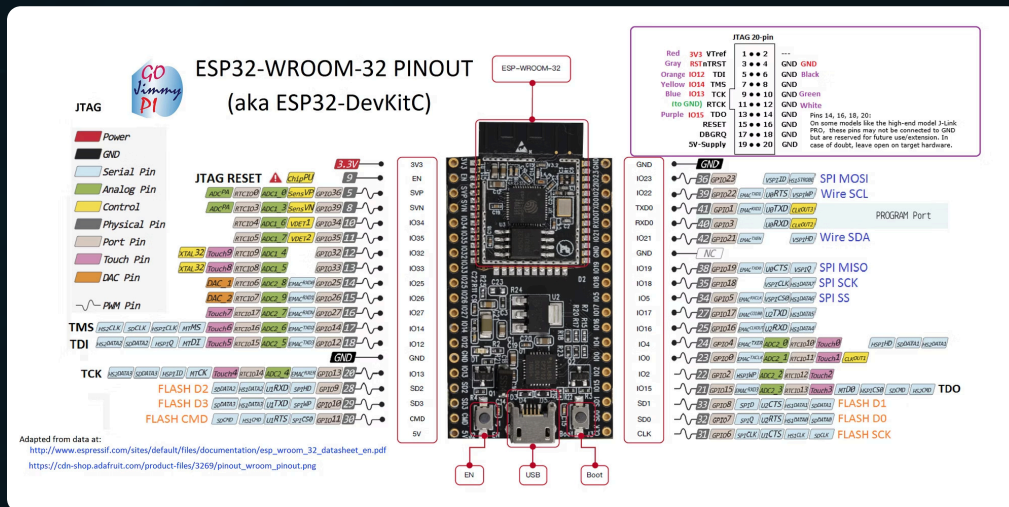
Ineffective Manual Controls

Reliance on manual controls and frequent false alarms can reduce the overall effectiveness and convenience of security systems.

High Cost & Complexity

Many advanced solutions are expensive and complex to install, limiting access to cutting-edge home protection.

ESP32: The Heart of Smart Home Innovation

- **Powerful Dual-Core Microcontroller:** Delivers robust processing for complex tasks.

- **Built-in Wi-Fi & Bluetooth:** Enables seamless wireless connectivity for IoT applications.

- **Versatile GPIO Pins:** Supports a wide array of sensors and actuators, making it highly adaptable.

- **Cloud Communication Ready:** Facilitates secure, real-time data exchange with platforms like HiveMQ and Supabase.

Sensor Suite for Comprehensive Security & Automation

Our system integrates essential sensors to provide robust detection and intelligent automation:

LDR (Light Dependent Resistor)

Automatically adjusts lighting based on ambient light levels, enhancing energy efficiency and convenience.

IR (Infrared) Sensor

Detects unauthorized motion, triggering immediate alerts for potential intrusions.

Keypad

Provides secure, password-based access control for your main entry points, replacing traditional keys.

Actuators Bringing Security & Convenience to Life

These components translate sensor data into actionable responses, securing your home and simplifying daily routines:

Servo Motor

Precisely controls the door locking and unlocking mechanism, enabling automated access.

Buzzer & LED

Provide immediate, high-impact audible and visual alarms upon intrusion detection, deterring threats.

LCD Display

Offers a clear user interface for status updates, password input feedback, and system notifications.

Cloud Integration: HiveMQ MQTT Broker & Supabase

Leveraging cloud services for seamless, real-time data management and remote control:

HiveMQ MQTT Broker

- **Real-time Data Transmission:** Instantly sends alerts and status updates.
- **Lightweight Protocol:** Efficient for IoT devices with limited resources.
- **Scalable & Reliable:** Ensures continuous, dependable communication.

Supabase Backend

- **Secure Data Storage:** Logs all events, user data, and system interactions safely.
- **Remote Access:** Allows monitoring and control from any internet-connected device.
- **Instant Notifications:** Delivers real-time alerts to your smartphone or web browser.

How It Works: From Detection to Action

A step-by-step breakdown of the system's operational flow:

1	2	3
Secure Entry	**Intrusion Alert**	**Cloud Notification**
User enters password on keypad. If correct, the servo motor unlocks the door. Invalid attempts trigger alerts.	IR sensor detects unauthorized motion. The buzzer sounds, and LED flashes, signaling an intrusion.	System publishes event to HiveMQ. Supabase logs the event and instantly notifies the user remotely via app/web.

Visual Storytelling: Before & After Automation

Left: Dark home with manual door lock and no alerts.

Right: Smart home with automated lighting, instant intrusion alerts, and remote access.

Real-World Impact & Benefits

Enhanced Security

Multi-layered detection and immediate alarms provide superior protection.

Energy Savings

Automated lighting control optimizes energy consumption and reduces utility bills.

Peace of Mind

Remote monitoring and instant cloud notifications ensure you're always connected to your home.

Scalable System

Easily adaptable to integrate additional sensors and smart devices, growing with your needs.

The Future of Home Security is Smart, Connected, and Secure

Join the IoT revolution: safer homes, smarter living.

ESP32-based systems democratize advanced home security, making cutting-edge protection accessible to everyone. Cloud integration enables proactive, data-driven safety, ensuring your home is always secured and monitored.

Ready to build your own? Let's secure the future together!