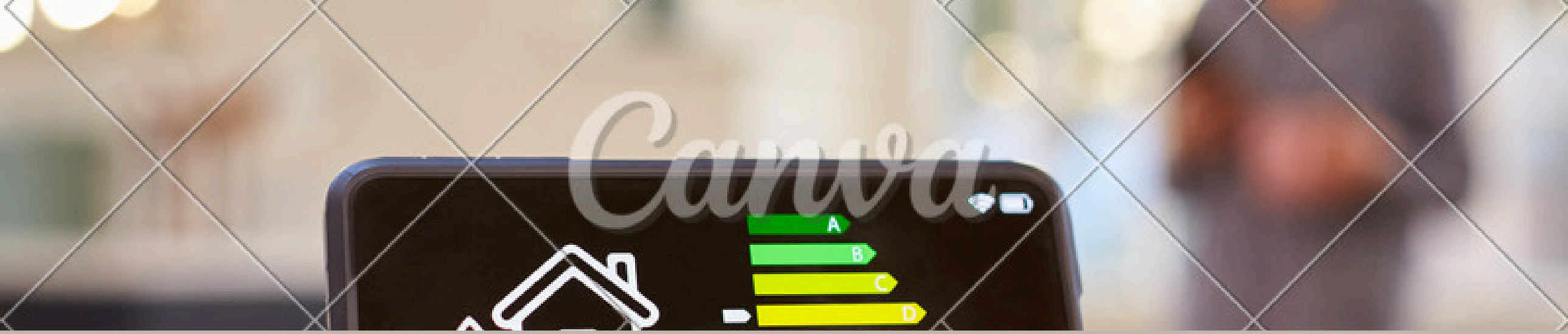


# Smart Home Energy Analysis and Control

**Team Members:**

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# WHAT IS SMART HOME ENERGY ?

- **Real-time monitoring** of electrical appliances
- **Automated control** based on power consumption
- **Energy optimization** and cost reduction
- **Smart scheduling** for appliance management
- **Cloud-based data storage** and analysis

# KEY FEATURES:

- Multi-sensor current monitoring
- Web-based control interface
- Real-time data visualization
- Automated fault detection
- Energy consumption analytics

# WHY SMART ENERGY MONITORING?

- Energy wastage in homes and offices
- Lack of real-time monitoring systems
- Manual control inefficiency
- Need for data-driven decisions

- Smart home market growing rapidly
- IoT adoption increasing
- Energy efficiency becoming priority
- Government regulations on energy consumption

# CHALLENGES IN ENERGY MONITORING SOLUTIONS

Current energy monitoring systems often lack **real-time data**, leading to inefficiencies and increased costs for consumers.

Many households remain unaware of their **energy consumption patterns**, resulting in unoptimized usage and unnecessary expenses.

Our project aims to address these issues by providing a comprehensive **smart monitoring solution** to enhance energy efficiency and user awareness.

# PROJECT GOALS AND OBJECTIVES

The primary objective is to develop a **responsive system** for real-time energy monitoring and efficient control of devices.

Secondary goals include enhancing user experience through an intuitive interface and providing insightful analytics for energy consumption optimization.

# HARDWARE COMPONENTS

**Core Components:**

- ESP32 Development Board (Main controller)
- PZEM-004T Power Meter (Main power monitoring)
- 3x ACS712 Current Sensors (Individual appliance monitoring)
- 3x Relay Modules (Appliance control)
- OLED Display (Local data display)
- Breadboard & Jumper Wires (Connections)

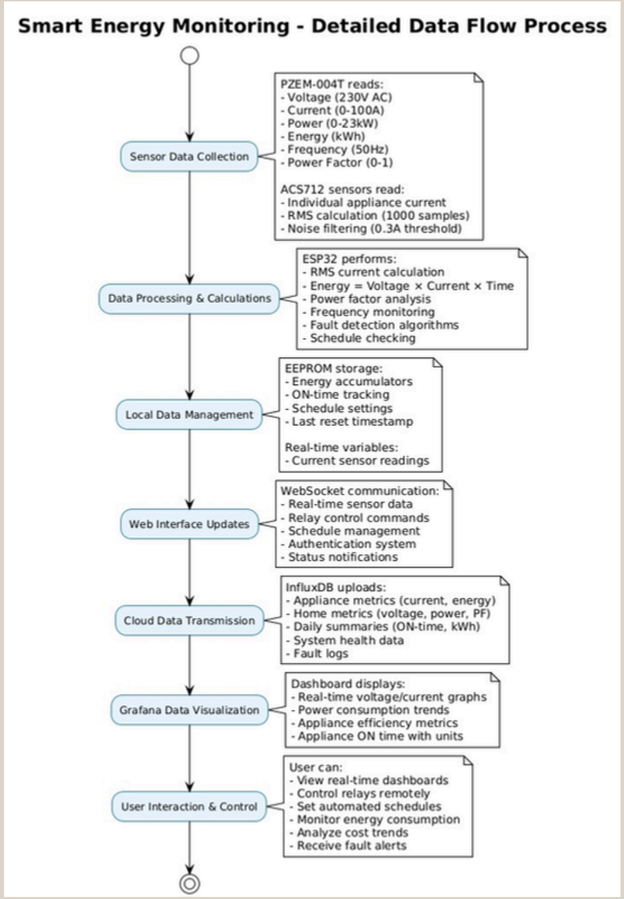
# SOFTWARE COMPONENTS

- Arduino IDE (ESP32 programming)
- C++ Programming (Main application logic)
- HTML/CSS/JavaScript (Web interface)
- InfluxDB (Cloud database)
- WebSocket (Real-time communication)

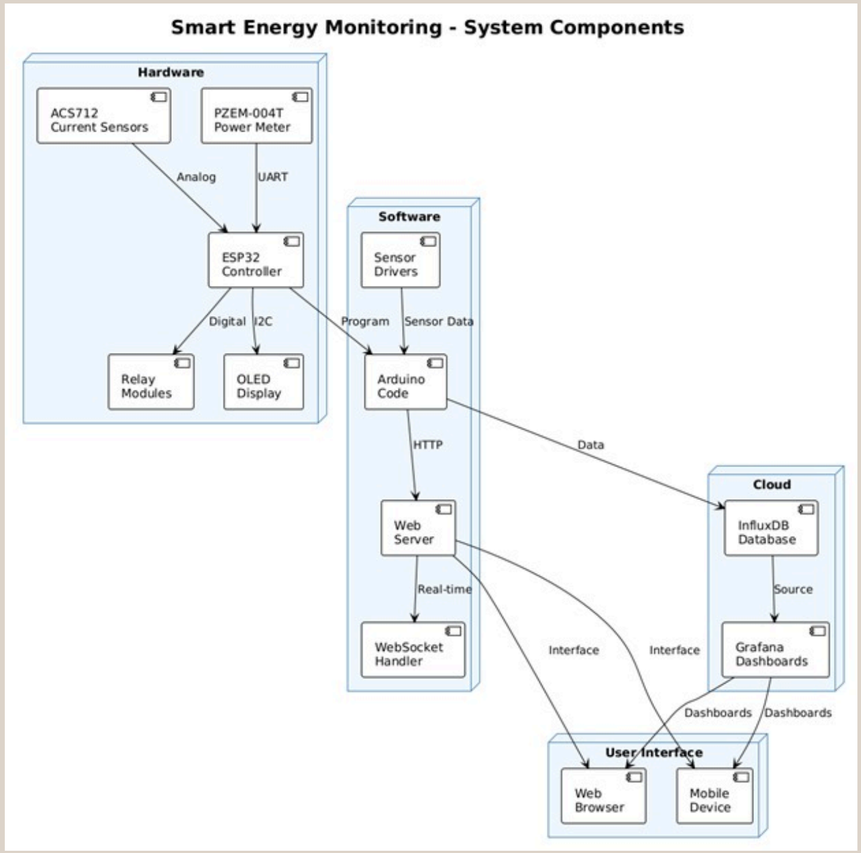
**Libraries Used:**

- ESPAsyncWebServer (Web server)
- ArduinoJson (Data handling)
- PZEM004Tv30 (Power meter)
- Adafruit_GFX (Display)
- WiFi & HTTPClient (Cloud connectivity)

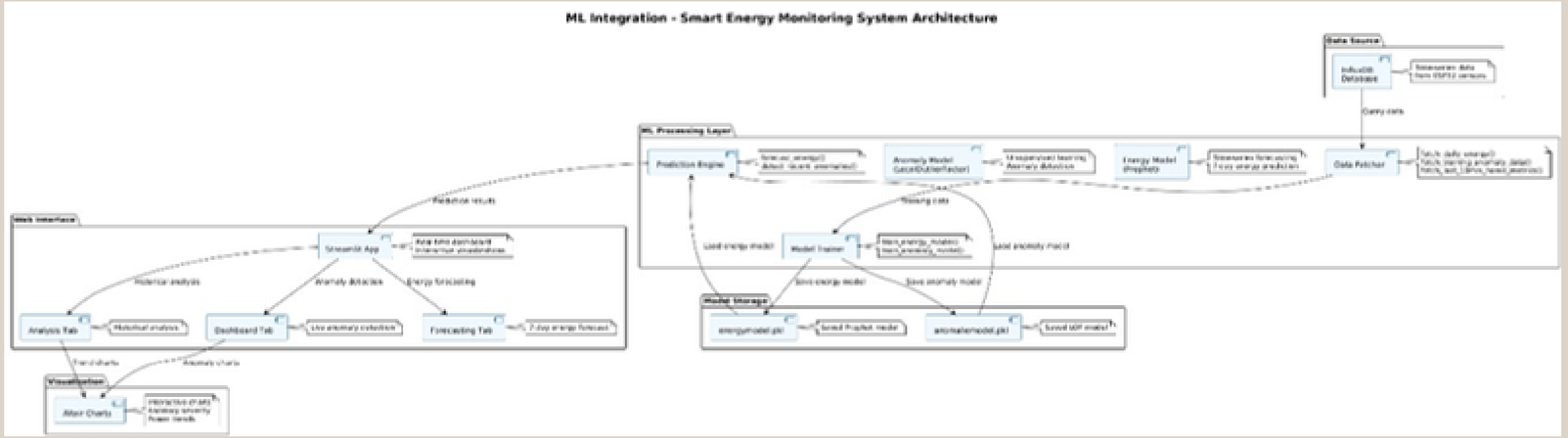
# WORKING FLOW OF PROJECT



# SYSTEM COMPONENTS



# ML-INTEGRATION



# ML-INTEGRATION