Prepared by group - 03

Fire and Hazard Detection for Buildings using CAN and IoT

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Project Guide:

- Mr. Marapalli Rohith Reddy

Introduction :

•**Objective:** This project aims to develop a fire and hazard detection system using ESP32 modules with CAN communication and IoT integration. The system will use MQ sensor, DHT11 sensor, and flame sensor to monitor environmental conditions and send real-time alerts via Blynk, ensuring faster response and enhanced safety in buildings.

•**Sensors Used:**

- •**MQ Sensor** – Detects harmful gases.
- •**DHT11 Sensor** – Monitors temperature and humidity.
- •**Flame Sensor** – Detects fire.

•**Communication:** Two **ESP32 modules** communicating using **CAN protocol** for reliable transmission.

•**IoT Integration:** Sends real-time sensor data to **Blynk** for remote monitoring and instant alerts.

•**Purpose:** Enhances building safety by providing **early detection** and **quick response** to fire and hazardous conditions.

Problem Statement :

Fire outbreaks and hazardous gas leaks in buildings can lead to severe damage, loss of life, and property destruction. Traditional fire alarm systems often lack real-time monitoring and efficient communication between multiple sensors. There is a need for a smart, interconnected system that can detect fire, monitor air quality, and provide early warnings to prevent accidents.

Objective of project:

- To detect fire, hazardous gases, and temperature variations in buildings.
- To use MQ sensor, DHT11 sensor, and flame sensor for real-time environmental monitoring.
- To enable reliable communication between two ESP32 modules using CAN protocol.
- To send real-time alerts and sensor data to the Blynk IoT platform for remote monitoring.
- To enhance building safety by providing early detection and quick response to fire and hazardous conditions.

System Overview :

Sensors for Detection

DHT11 Sensor: Measures temperature and humidity.
MQ Sensor: Detects hazardous gases.
Flame Sensor: Identifies fire presence.

ESP32 Modules & CAN Communication

Two **ESP32 microcontrollers** communicate over the **CAN protocol** for efficient data transmission.

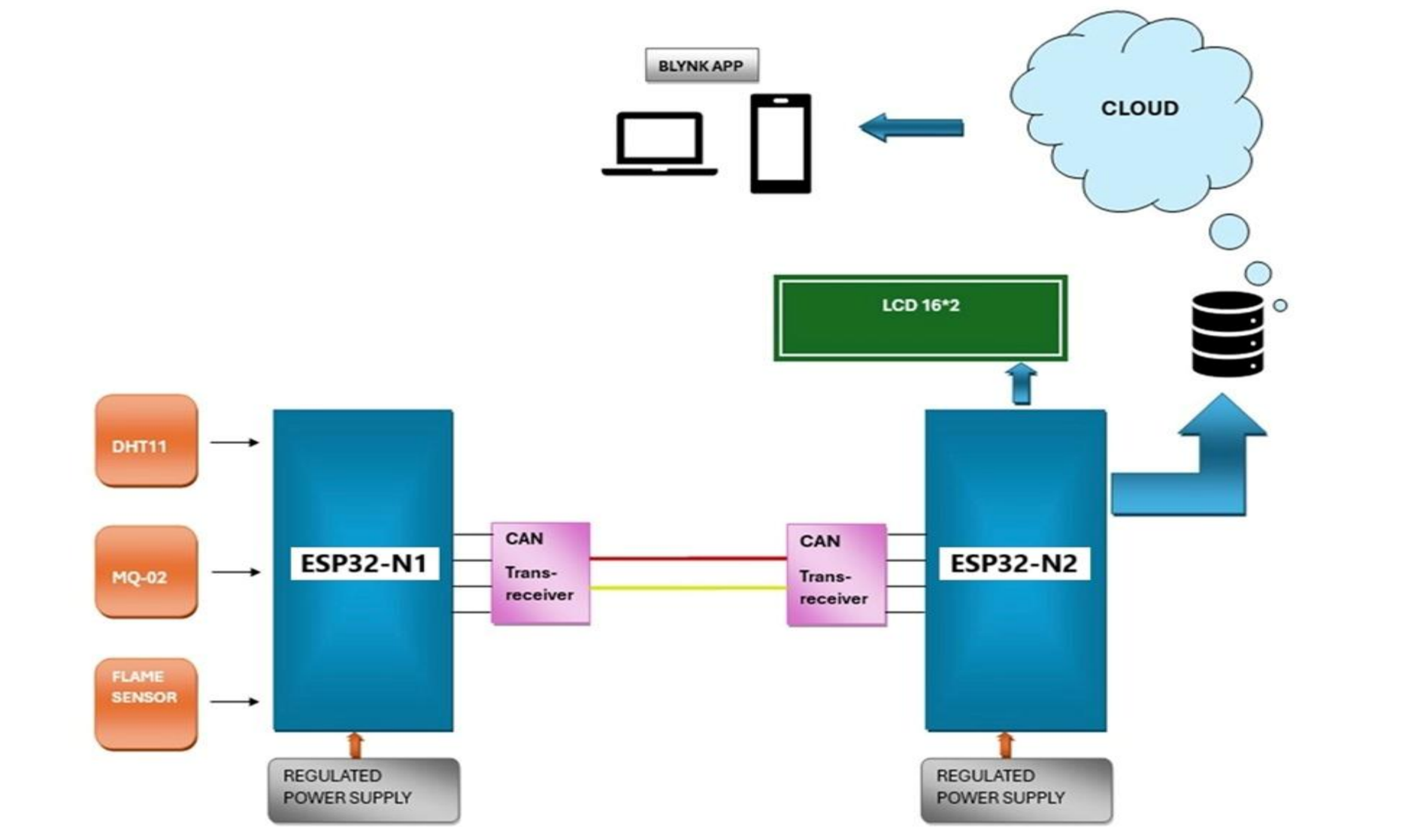
IoT Connectivity & Remote Monitoring

Sensor data is sent to the **Blynk IoT platform**, allowing users to **remotely monitor** the building's safety status.

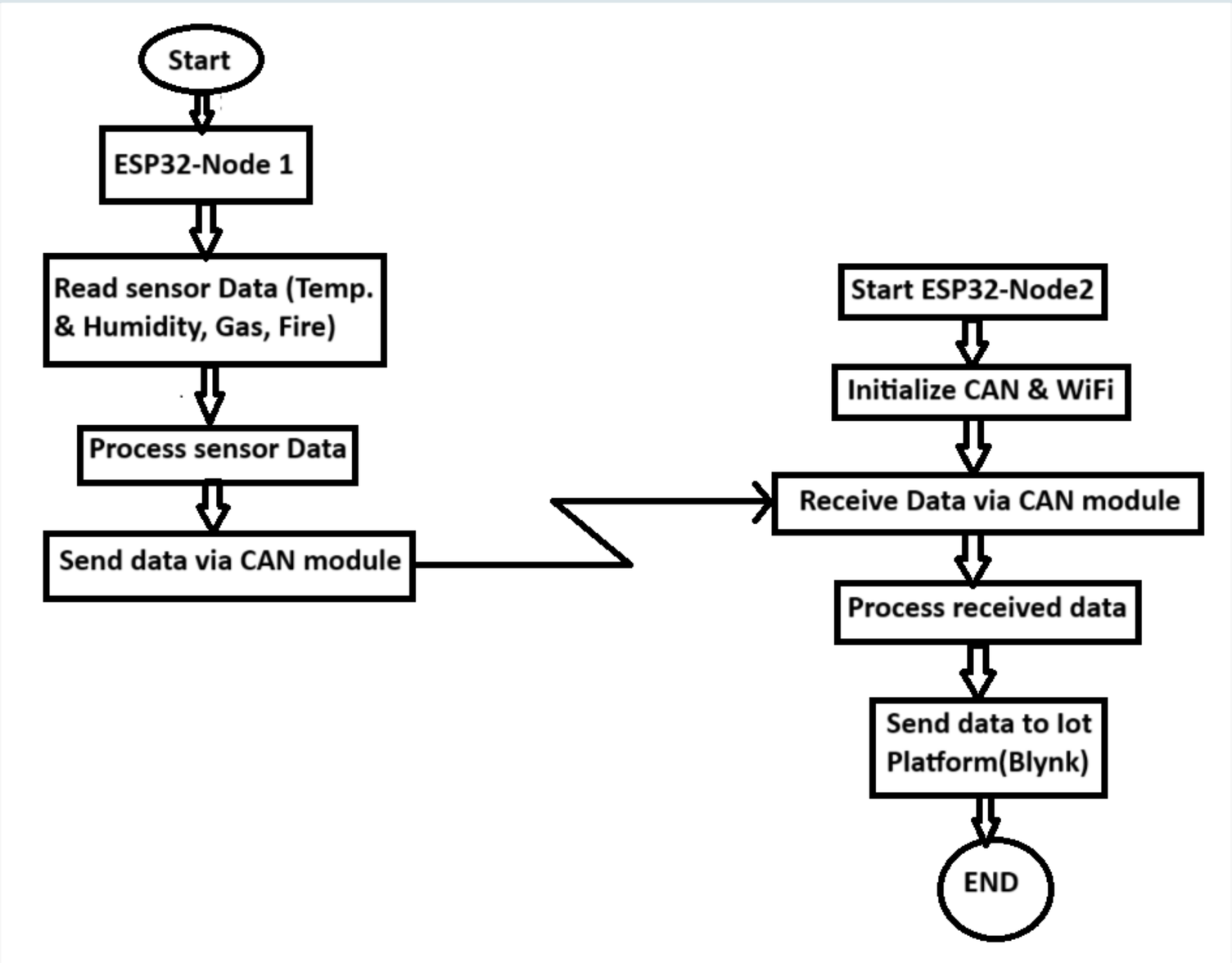
Alerts & Safety Measures

The system triggers **alerts and notifications** for early warning, helping to prevent hazards and ensuring quick response.

Block Diagram :



System Architecture :



Key components :

- **Hardware:**

1. Sensors: DHT11(for temperature & humidity), MQ02, Flame sensor.
2. ESP32 with CAN Bus Shield.
3. CAN Transceivers: MCP2515.

- **Software:**

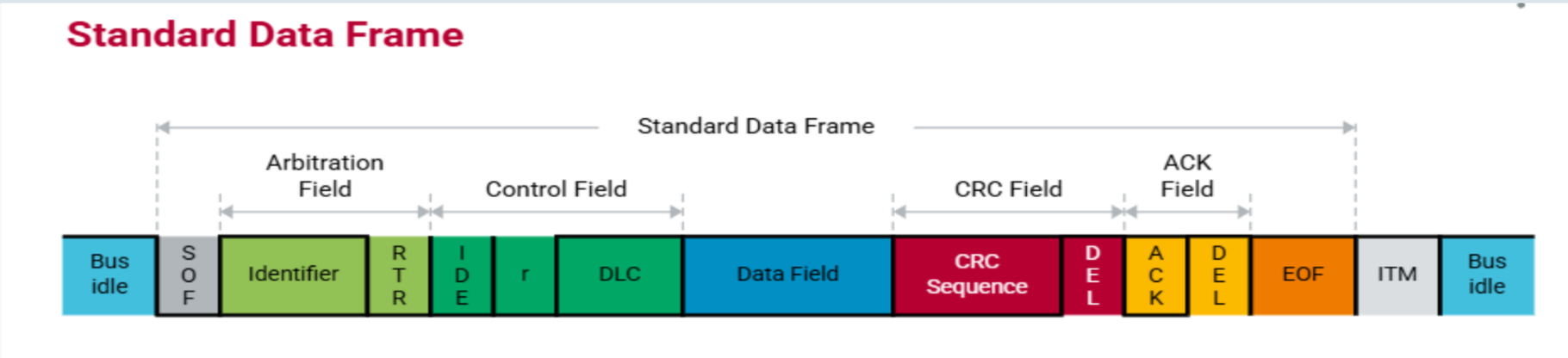
1.Programming

2.Language: Embedded C

3. IoT Platform : Blynk

4. Compiler: Arduino IDE

CAN Protocol :



•CAN is a communication protocol that allows multiple microcontrollers to exchange data without a host computer.

•It is robust, reliable, and widely used in industrial and automotive systems.

•Supports real-time data transfer with error detection and message prioritization.

•Works on a multi-master, peer-to-peer network, making it ideal for critical applications.

•Used in embedded systems, automation, and IoT for efficient data exchange.

RESULT AND DATA VISULIZATION :

COM4

```
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: No Flame, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: No Flame, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: No Flame, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: No Flame, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: No Flame, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: Flame Detected!, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: Flame Detected!, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: Flame Detected!, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: No Flame, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: Flame Detected!, Gas Level: Safe Gas Levels
Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: Flame Detected!, Gas Level: Safe Gas Levels
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Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: No Flame, Gas Level: Safe Gas Levels
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Received data from ID: 0x100
Temperature: 28.60 °C, Humidity: 51.00 %, Flame Status: No Flame, Gas Level: Safe Gas Levels
```

RESULT AND DATA VISULIZATION :

1.Real-Time Hazard Monitoring:

1. Continuous monitoring of temperature, gas, humidity, and flames.
2. Immediate hazard detection and alert generation.

2.Reliable Data Communication:

1. Uses **CAN protocol** for real-time, loss-free communication.

3.IoT Integration:

1. Sensor data is uploaded to the cloud via ESP32 for remote access.
2. Real-time monitoring via Blynk App.

4.Alerts & Notifications:

1. Instant alerts via mobile app/email.
2. LCD display for local alerts.

5.Data Logging & Visualization:

1. Cloud storage for historical data analysis.
2. Graphical visualization via IoT dashboards.

6.Enhanced Safety Measures:

1. Early detection to prevent hazards.
2. Ensures better safety compliance in buildings/industries.

7.Scalability & Modularity:

1. Easy to add more sensors without affecting system performance.

Advantages :

•**Real-Time Monitoring**: Continuous data collection and instant feedback.

•**Scalable and Flexible**: Easy to add more sensors and expand the system.

•**Cost-Effective**: Affordable components and efficient data transmission.

•**Reliable Communication**: CAN protocol ensures robust data transfer

even in noisy environments.

Future scope :

- **Integration with AI**: Predictive analysis for Fire and Hazardous Situations.
- **Smart City Applications**: Integration with other IoT-based smart city solutions.
- **Mobile Application Development**: More interactive user interfaces for end-users.
- **Broader Environmental Monitoring**: Extend to water and soil quality monitoring.

Conclusion :

• The system provides a real-time, reliable, and cost-effective solution for surrounding environment monitoring.
• The design is scalable and flexible, suitable for both urban and industrial applications.
• Seamless integration with IoT platforms allows for cloud storage and real-time data visualization.
• Helps in addressing environmental and public health challenges by providing accurate data.

Thank you