



# INTRODUCTION

- Environmental monitoring involves the systematic collection and analysis of data on various environmental parameters to assess and manage the health of our surroundings.
- This includes tracking air quality, temperature, humidity, noise levels.
- The primary goal is to detect changes or hazards that may impact human health, ecosystems, or industrial processes.
- With the advent of IoT, these systems have evolved to provide real-time, automated, and remote monitoring solutions.

## OBJECTIVE OF THE PROJECT

- **Real-Time Monitoring:** To continuously monitor and record environmental parameters in real-time for timely insights.
- **Data Analysis and Visualization:** To collect, process, and display environmental data on IoT platforms for easy interpretation.
- **Enhanced Safety and Compliance:** To assist industries in adhering to environmental regulations and ensuring workplace safety.
- **Multi-Parameter Integration:** To combine various sensors into one system for comprehensive monitoring.
- **Cost-Effective Solution:** To offer an affordable and scalable system compared to traditional monitoring solutions.

## EXISTING SYSTEM

The existing system of an IOT based industry environment quality monitoring system is implemented with single parameter sensor like air quality monitoring or other sensor to detect the industries indoor environment quality.

### CHALLENGES IN EXISTING SYSTEMS:

- High initial setup and maintenance costs.
- Limited scope due to single-parameter monitoring.
- Lack of real-time visualization and remote accessibility.
- Poor adaptability for varying industrial needs.

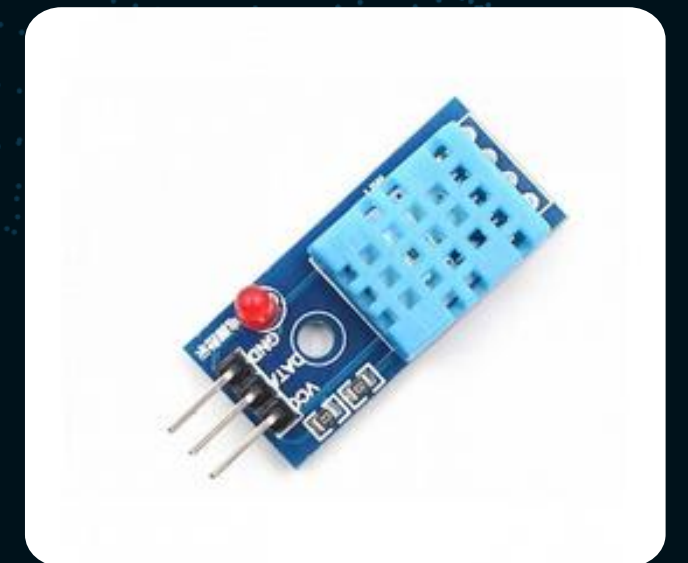
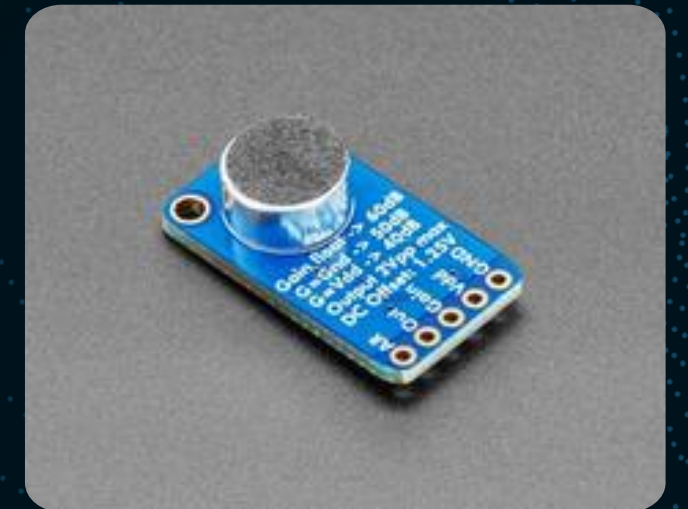
Our system addresses these issues by integrating multiple sensors into a single platform, offering a complete and affordable solution.



# HARDWARE REQUIREMENTS



- Microcontroller: ESP32 for data processing and Wi-Fi connectivity.
- Sensors:
  - MQ-135: Detects gases like NH<sub>3</sub>, CO, NO<sub>x</sub>, and smoke.
  - DHT11: Measures temperature and humidity.
  - MAX9814: Monitors noise levels in decibels.
  - buzzer
- Power Supply: 5V for powering the sensors and microcontroller by USB port.



## SOFTWARE REQUIREMENTS

- **Arduino IDE:** For coding and programming the ESP32 microcontroller.
- **ThingSpeak:** An IoT platform for real-time data storage and visualization.
- **Wi-Fi Configuration:** Enables seamless cloud connectivity and remote access.



## PROGRAMMING LANGUAGE

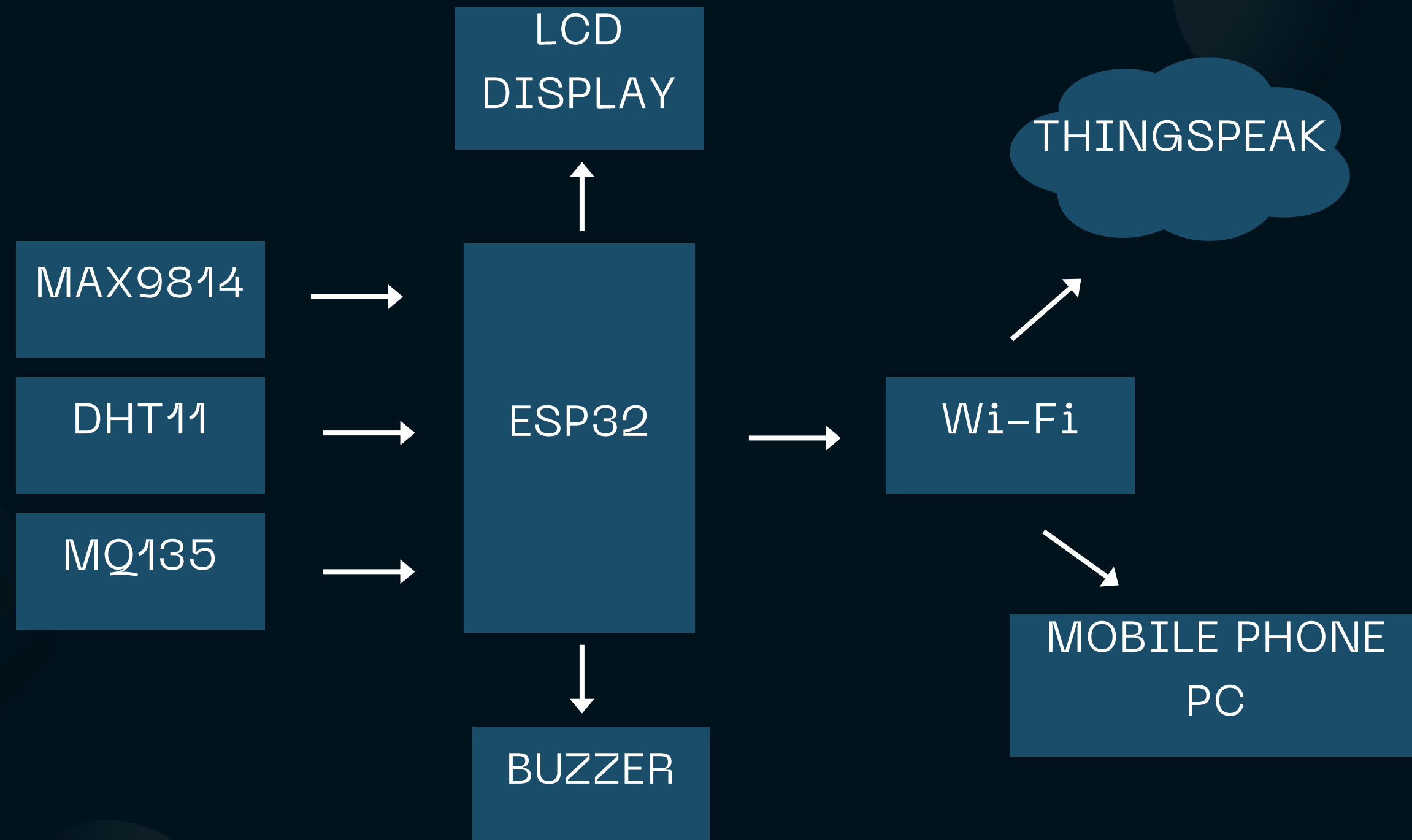
- Using C and C++ programming for programming ESP32

## PROCESS FLOW

- Sensors collect environmental data in real-time.
- Data is processed by ESP32, which acts as the central microcontroller.
- The processed data is sent to the ThingSpeak cloud platform via Wi-Fi.
- Data is visualized on dashboards, enabling remote monitoring and analysis.
- Alerts can be configured for parameter thresholds, ensuring timely responses.



# BLOCK DIAGRAM



## FUTURE ENHANCEMENT

- **Advanced Analytics:** Integrate AI for trend prediction, hazard detection, and automated alerts.
- **Expanded Sensor Array:** Add sensors for CO<sub>2</sub>, PM2.5/PM10, and VOCs for broader monitoring.
- **Scalability:** Design for smart cities, industries, and agriculture with LoRaWAN/NB-IoT connectivity.
- **Regulatory Compliance:** Ensure adherence to environmental standards for certification.



## CONCLUSION

- The IoT-based Environment Quality Monitoring System offers a holistic approach to environmental monitoring by integrating multiple sensors into a single, scalable platform.
- Its real-time capabilities, cost-effectiveness, and adaptability make it an ideal solution for industries aiming to improve environmental standards while maintaining operational efficiency.
- This system bridges the gap in current monitoring solutions, paving the way for smarter, data-driven decision-making in industrial environments.