

"ENVIROGUARD"

"Protects against heat and gas leakage Also Monitoring Environmental behaviors based on cloud."

Prepared By	Submitted To
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Project Title: "EnviroGuard" - Protects against heat and gas leakage Also Monitoring Environmental behaviour based on cloud.

Course: Embedded Systems and IoT Lab

Team Members:

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Abstract:

EnviroGuard monitors temperature and gas levels. It automatically turns on a fan if the temperature exceeds 32°C and sends an alert if a gas leak is detected. All data is sent to a mobile app. This project uses IoT technology with ESP32 and sensors like DHT11 (for temperature and humidity) and a gas sensor.

1. Introduction

EnviroGuard is a system designed to enhance safety in your environment by constantly monitoring key factors like temperature and gas levels. It uses sensors to measure the temperature and humidity, sending the data to a mobile app. When the temperature exceeds a specific threshold, such as 32°C, the system automatically triggers the fan to cool down the space. Additionally, the system includes a gas sensor that detects any leakage and sends an immediate alert to your phone for timely action. You can also manually control the system through the mobile app. The system uses cloud technology to store and process the data, ensuring real-time monitoring and control from anywhere. This setup provides an effective way to maintain a safe and comfortable environment.

2. Objectives

1. **Fan Control:** Turn the fan on automatically if the temperature goes above 32°C.
2. **Gas Detection:** Send an alert to your phone when gas is detected.
3. **Real-Time Monitoring:** See the current temperature and gas levels on the app.
4. **Manual Control:** You can also turn the fan on or off directly from the app.

3. System Architecture

3.1 Components Used

ESP32: Microcontroller for controlling the system.

Sensors:

1. DHT11 for temperature and humidity
2. Gas Sensor (MQ4) for gas detection

Actuator:

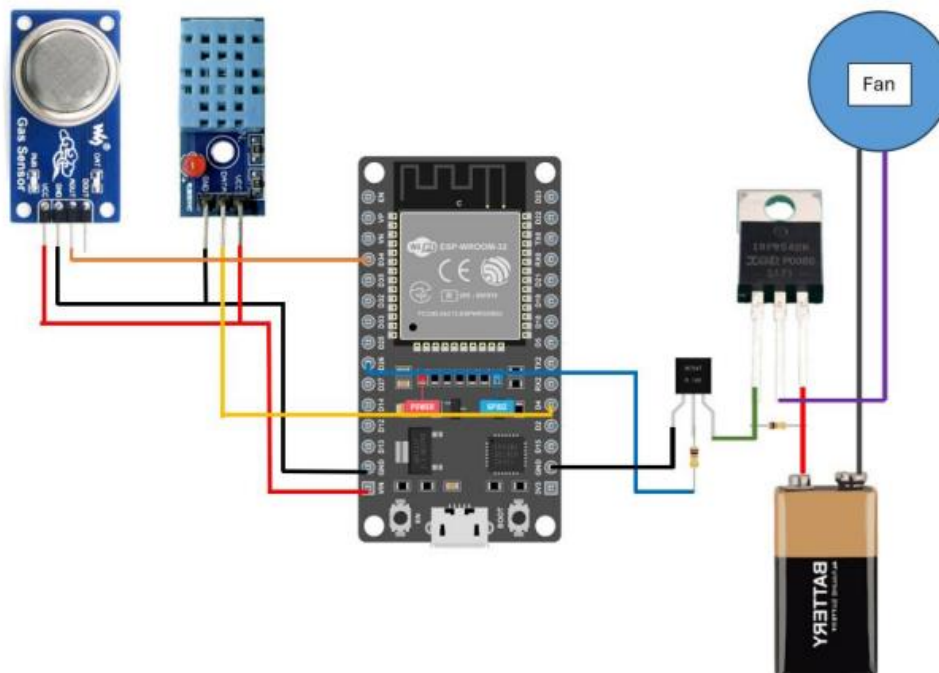
1. Fan (DC Motor) controlled by a relay

Mobile App: Built with **Blynk**

Cloud Platform: Blynk for data transmission.

3.2 Project Circuit Diagram

Sensors send data to the ESP32. The ESP32 controls the fan and sends data to the Blynk app. Users can see the data and control the fan through the app.



4. Methodology

4.1 Hardware Design

- Connect the DHT11 and gas sensors to the ESP32 microcontroller board.
- Use a relay to control the fan.

4.2 Software Design

- Use the Blynk app to create an intuitive user interface for the system, allowing users to monitor and control the devices remotely. The app provides easy access to view sensor data and control the fan or other components.
- The code for the system is written in blynk library using the Arduino IDE, providing the necessary logic to read sensor data, send it to the cloud, and perform actions like turning the fan on or off based on temperature and gas readings.

4.3 Communication Protocol

- The ESP32 connects to a Wi-Fi network, sending data like temperature and gas levels to the Blynk cloud. This keeps the data updated all the time and lets you check it from anywhere with internet.
- The Blynk app then pulls this data from the cloud and shows it on the screen. This way, users can easily watch what's happening and quickly respond if anything changes. It's a simple and effective way to keep track of everything.

EnviroGuard Project: Working Process

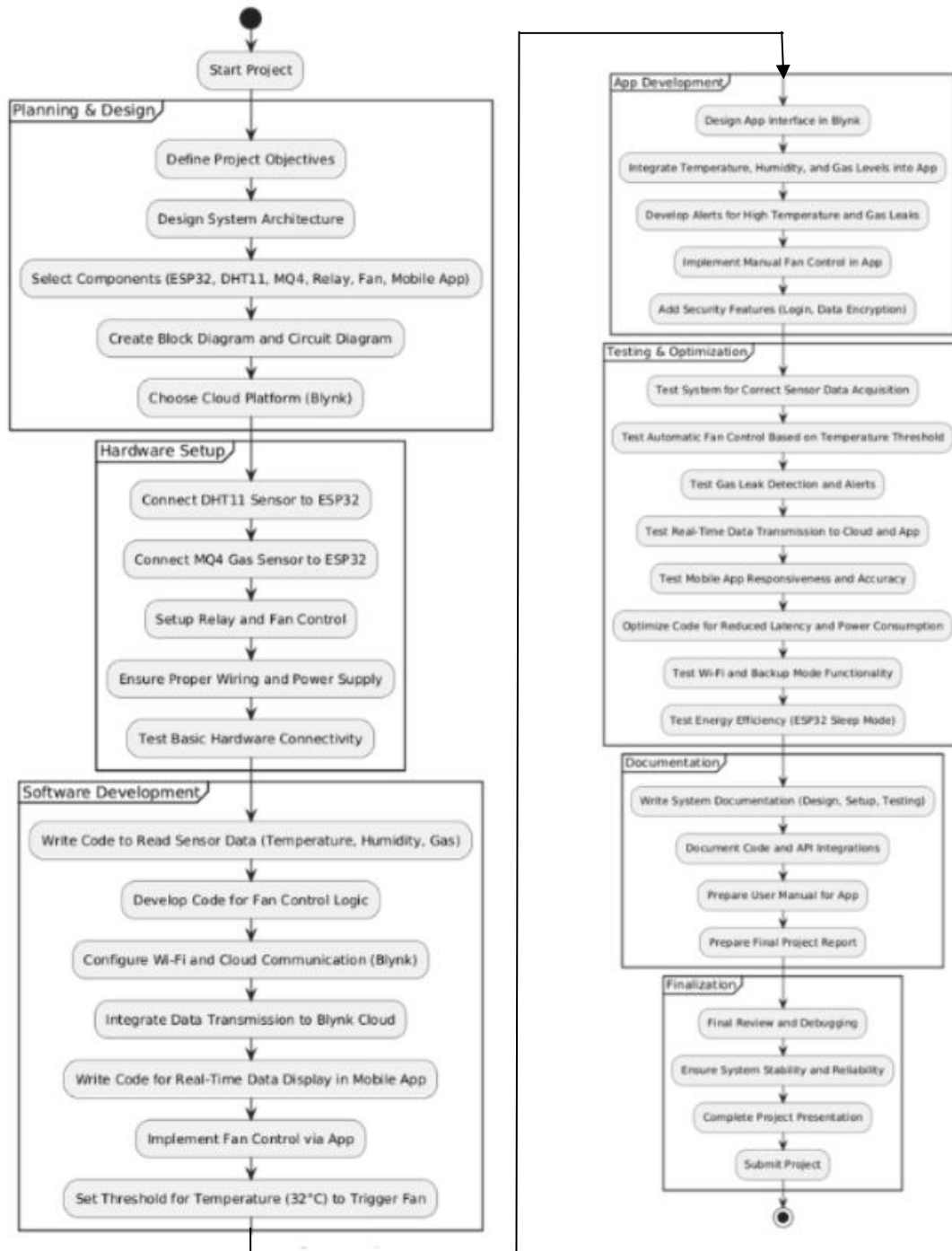


Fig. Working Methodology

5. Implementation

5.1 Sensor Data Acquisition

- The DHT11 sensor keeps an eye on the temperature and humidity in the air and sends this info to the system right away for analysis.
- The gas sensor checks for any gas leaks, helping keep things safe by spotting dangerous gases. If a leak is found, the system quickly alerts the user and takes action.
- Both sensors send their data to the mobile app, so the user can get live updates.

5.2 Mobile Application Features

- The app shows important info like temperature, humidity, and gas levels in real time, making it easy to keep track of the environment, no matter where you are.
- Users can also control the fan directly from the app, turning it on or off to keep the temperature just right.
- If anything goes wrong, like a high temperature or gas leak, the app will send an alert so users can act fast and prevent problems.

5.3 Security Features

- The Blynk app has a secure login, so only authorized users can access the data and control the system.
- All the data shared between the ESP32 and the app is encrypted, keeping everything private and safe from unauthorized access.

6. Result Analysis

The fan automatically turns on when the temperature exceeds 32°C, ensuring that the environment remains cool and comfortable. This action is triggered by the data received from the DHT11 sensor. If the gas sensor detects a gas leak, the system immediately sends an alert to the app, notifying the user of the potential danger. This ensures a quick response to prevent any accidents. Users can also manually control the fan through the app, allowing them to adjust the settings based on their preferences or specific needs. The app continuously updates in real-time, providing users with live data on temperature, humidity, and gas levels, ensuring they stay informed at all times.

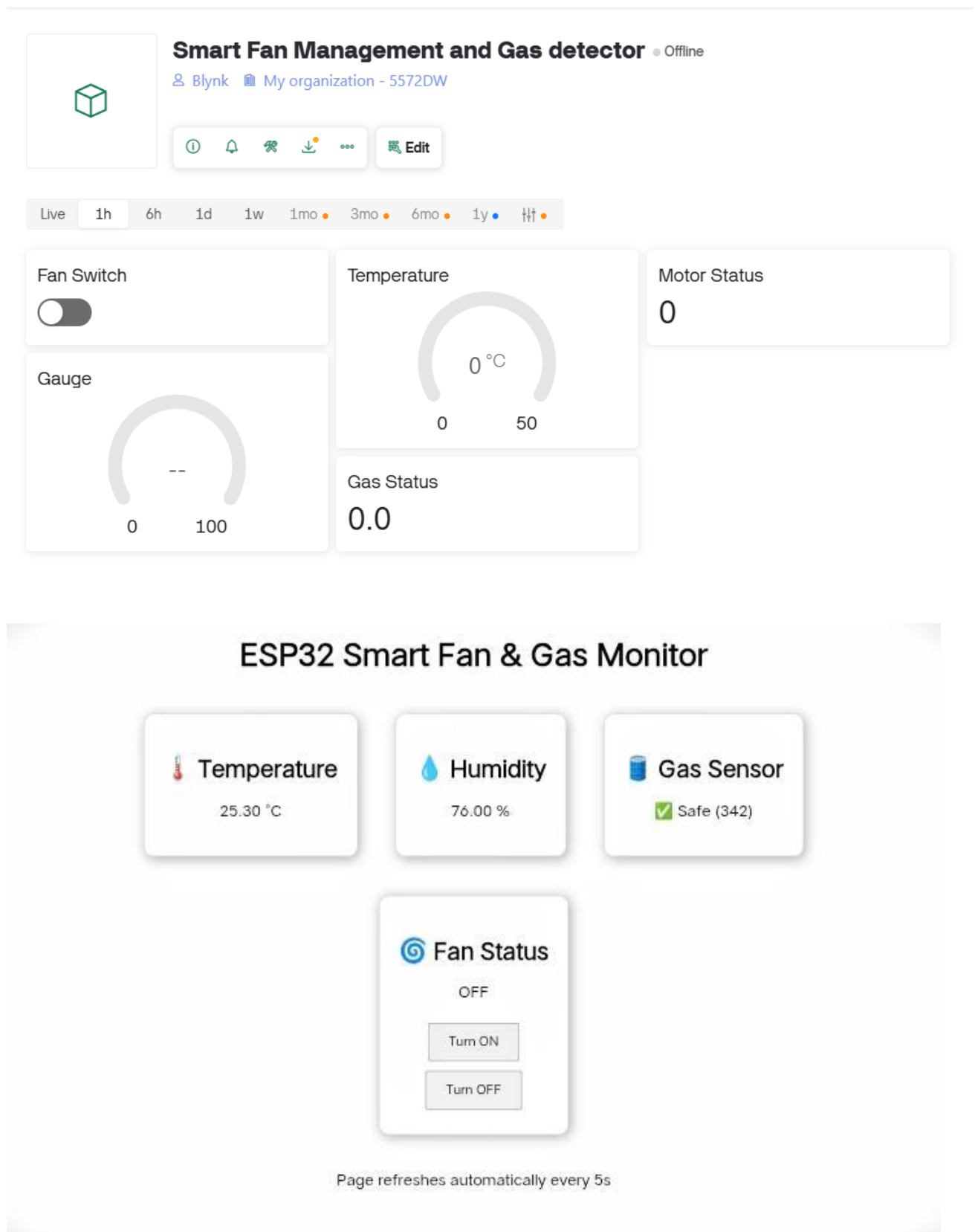


Fig . All cloud information shown in Blynk Server

7. Challenges Faced and Solutions

Wi-Fi Problems: If the Wi-Fi goes down or is unavailable, the system switches to backup mode. In this mode, the fan keeps working based on set limits or manual control, so the system still works even without internet.

Power Use: To save energy, the ESP32 goes into sleep mode when it's not using data. This helps use less power, making the system more efficient and saving battery for portable setups.

Latency in Data Transfer: There could be a delay in sending sensor data from the ESP32 to the mobile app. Optimize the code to reduce delays and ensure real-time data transfer.

8. Contribution to Our Project

Real-Time Monitoring and Control: Unlike many systems, "EnviroGuard" lets users see the temperature and gas levels in real time through a mobile app. You can control the system from anywhere because it uses the cloud.

Automatic Fan Control: Our system doesn't just alert you when the temperature is high; it automatically turns on the fan when the temperature goes above 32°C. This makes sure the environment stays comfortable without you needing to do anything.

Gas Leak Detection and Alerts: Many systems monitor either temperature or gas, but our project does both. It detects gas leaks and sends an alert to your phone, so you can take action immediately.

Energy Saving: To save energy, our system uses the ESP32 microcontroller in a power-saving mode when it's not in use. This makes the system efficient and great for long-term use.

Customizable Mobile App: The mobile app for "EnviroGuard" is easy to use and lets you adjust the fan settings whenever you want. Other systems might not give you this kind of control.

Cloud Data Storage: Our system stores all the data (like temperature and gas levels) in the cloud, so you can check it anytime, anywhere. This makes it safer and more reliable than systems that store data locally.

In short, "EnviroGuard" stands out because it combines automatic control, real-time monitoring, gas leak detection, energy savings, and easy-to-use mobile app features. These make it better and more user-friendly than many other similar systems.

Our Contributions:

Each team member played an important role in making the "EnviroGuard" system a success. Here's what everyone did:

1) **Tanvir Parvez (221-15-5378):**

- a) **Software Development:** Took care of setting up the Blynk server and made sure it worked with the ESP32 to send data in real-time.
- b) **Code Integration:** Wrote and connected the code to make the sensors work properly and control the fan.

2) **Most. Tanjila Ahmed Meem(221-15-4979):**

- a) **Hardware Setup:** Set up the physical parts like the DHT11 temperature sensor, MQ4 gas sensor, and the relay to control the fan.
- b) **Working Method:** Helped plan how everything would work together smoothly in the system.

3) **Md. Awal Hadi(221-15-5345):**

- a) **Documentation:** Wrote everything down clearly so the project steps were easy to follow.
- b) **Testing:** Tested the system to make sure everything worked as expected and the app showed the correct data.

The team worked together to create a simple and effective system, combining software, hardware, and testing skills.

9. Future Scope

Use Additional Sensors: The system can be upgraded to include more sensors, such as a CO2 sensor to detect carbon dioxide levels or a smoke detector for fire safety. These additional sensors will increase the functionality and safety of the system.

Mobile App Enhancement: The mobile app could be enhanced with more features like showing historical data, providing detailed reports, or even offering remote control for additional devices.

Voice Control: In the future, you could talk to "EnviroGuard" using voice assistants. This way, you could control the system just by your voice.

10. Conclusion

“EnviroGuard” is a helpful system that keeps your environment safe by checking the temperature and gas levels all the time. If the temperature goes too high, above 32°C, it automatically turns on a fan to cool things down and make the space more comfortable. If the system detects any gas leak, it quickly sends an alert to your mobile phone to warn you. You can also control the fan manually through the mobile app if needed. This makes it easy to adjust things whenever you want. The system is simple to use and works automatically, so you don’t need to worry about constantly checking for changes. “EnviroGuard” helps protect you, your family, or your workplace from risks like high temperatures and gas leaks. It makes your space safer and more comfortable, giving you peace of mind. With its sensors, cloud system, and easy-to-use app, it offers a smart way to keep things under control without much effort.

11. References

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