Name: Wakpal Simon

Group: Four (4)

Course: Industry 4.0 Enabling Technologies

Fire & Gas Monitoring System: How It Works

We are using a flame detector alongside a gas sensor to keep an eye on potential fire risks in the grain cargo hold. This system is powered by a microcontroller like an ESP8266 and connected to a smart monitoring dashboard using Node-RED.

1. Collecting Sensor Data

The flame detector continuously checks fire or heat sources. The flame sensor picks up infrared light from flames, helping detect fires early. If detected, it flags a potential fire risk. Virtual sensors were used from mydevices.com to simulate the sensors through a the host.

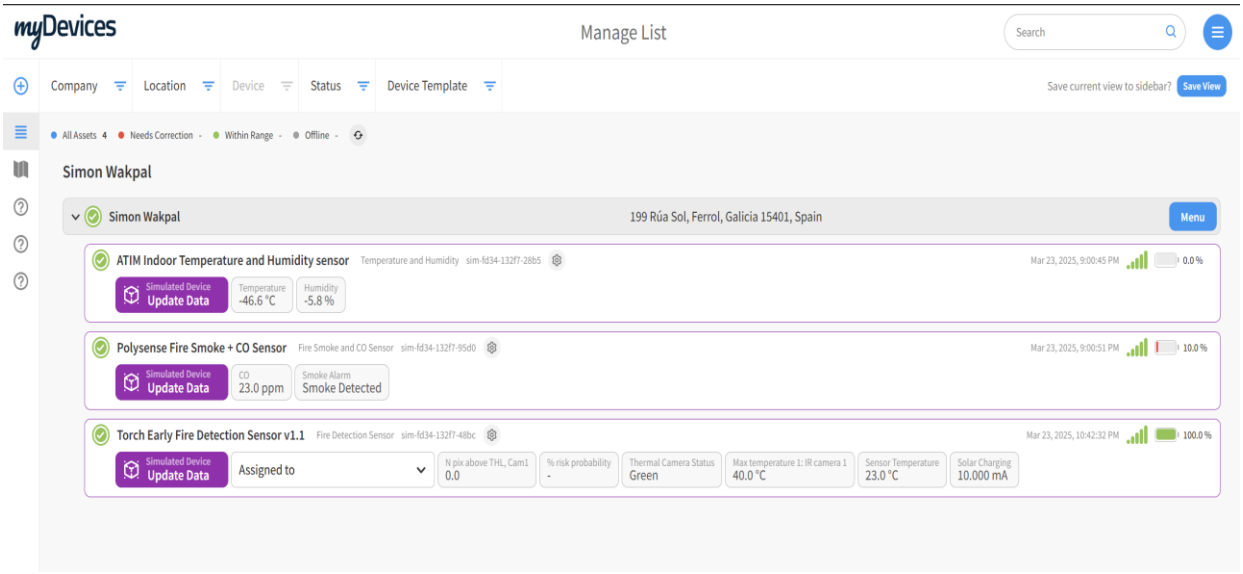

Figure 1. Shows the Virtual sensors used.

2. Real-Time Alerts & Processing

In Node-RED, the system reacts in real-time. If a flame is detected, the system immediately triggers an alert. If the gas sensor detects a leak, the system raises a warning. Data from the sensors is processed live. If dangerous conditions are detected, the system activates alerts including a visual warning where the dashboard gauge turns red and a sound alert through an optional notification or buzzer. If everything is normal, the system stays in the green or safe zone.

3. Easy-to-Read Dashboard

The monitoring dashboard makes it simple to track fire and gas risks. A gauge displays real-time sensor values. Color-coded zones, green for safety, yellow for warning, and red for danger, make it easy to understand risk levels at a glance. Even non-technical users can quickly recognize dangerous conditions.

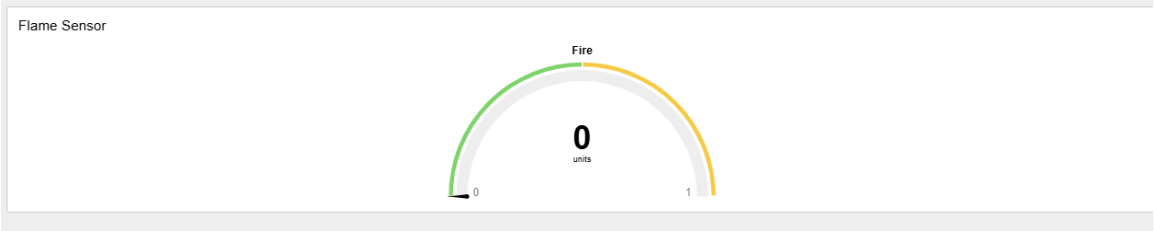

Figure 2. Dashboard display for flame detection.

4. Testing & Simulation

To ensure the system works properly, we can simulate fire and gas events using test devices like the Polysense CO sensor. This helps verify that alerts trigger correctly, and the system responds as expected.

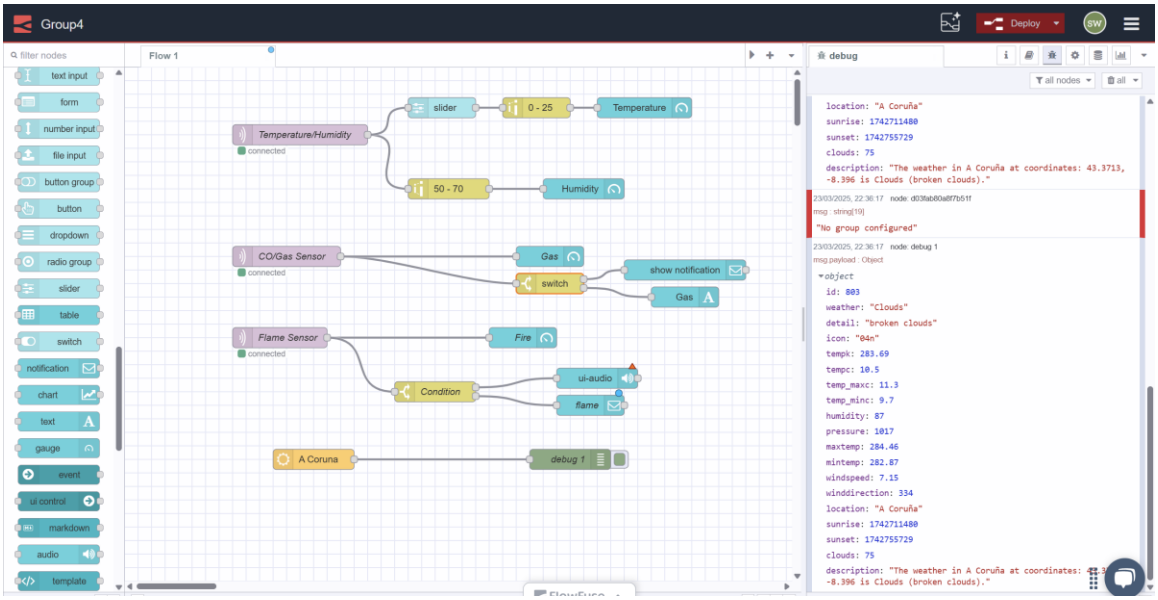

Figure 3. Node Red integration and debugging.

Why This Matters

With this setup, we can quickly detect fires or other hazards in a grain cargo hold. The combination of flame detection, gas monitoring, and real-time alerts makes it a powerful safety system.