

		
<b>Laboratory 9: GPS Integration (ESPHome To Home Assistant Map)</b>		
<b>Name:</b>	<b>ID:</b>	<b>Section:</b>
<b>Name:</b>	<b>ID:</b>	<b>Section:</b>
<b>Date:</b>	<b>Due date:</b>	

## Objectives

- To integrate GPS (latitude and longitude) into smart sensors for location tracking.
- To display sensor positions on Home Assistant's interactive map.
- To understand how location data can be used for monitoring and automation in IoT systems.

## Hardware and Software Requirements

Component	Function
ESP32 DevKit	Main controller board
DHT11 Sensor	Measures temperature and humidity
MQ-2 Sensor	Detects gas concentration
LDR Sensor	Detects light intensity
PIR Sensor	Detects human motion
Fan (Relay-controlled)	Air circulation control
LED	Indicates brightness or darkness

Component	Function
Active Buzzer	Emits sound alarm on gas detection
Home Assistant + ESPHome	Visualization and automation control

## Step 1 — Setup and Upload the ESPHome Code

- Use the following ESPHome YAML configuration (no modification needed):

Yaml:

```

sensor:
  # DHT11
  - platform: dht
    pin: GPIO4
    model: DHT11

  temperature:
    name: "Living Room Temperature"
    id: temp_living
    accuracy_decimals: 1

    latitude: 19.9057
    longitude: 99.8355

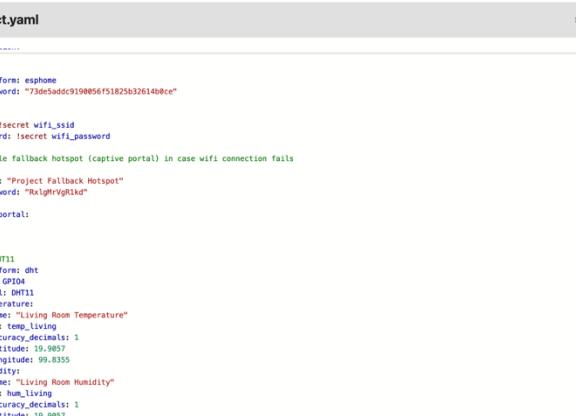
  humidity:
    name: "Living Room Humidity"

```

id: hum\_living  
accuracy\_decimals:  
latitude: 19.9057  
longitude: 99.8355  
update\_interval: 10s

This configuration enables:

- Temperature and humidity monitoring via DHT11
  - Gas detection via MQ-2 sensor
  - Light intensity monitoring with LDR
  - Motion detection using PIR
  - Automatic fan operation when temperature exceeds 30°C
  - LED control depending on light intensity
  - Gas alarm triggering the buzzer above 0.40V
  - Location tracking using predefined GPS coordinates



The screenshot shows a browser window with four tabs open. The active tab is titled 'project.yaml' and displays a YAML configuration file. The file defines an API endpoint, a local WiFi connection, a fallback hotspot, and two sensors: a temperature sensor and a humidity sensor, all connected to a DHT11 module. The configuration is saved to 'Dashboard - ESPHome'.

```
api: ...
ota:
  - platform: esphome
    password: "73de5addc919b056f51825b32614b0ce"
wifi:
  ssid: !secret wifi_ssid
  password: !secret wifi_password
  # Enable fallback hotspot (captive portal) in case wifi connection fails
  ap:
    ssid: "Project Fallback Hotspot"
    password: "RwightrvgB1kd"
captive_portal:
sensor:
  # ~ DHT11
  - platform: dht
    pin: D10
    model: DHT11
    temperature:
      name: "Living Room Temperature"
      id: temp_living
      accuracy_decimals: 1
      latitude: 19.9057
      longitude: 99.8355
    humidity:
      name: "Living Room Humidity"
      id: hum_living
      accuracy_decimals: 1
      latitude: 19.9057
      longitude: 99.8355
      update_interval: 10s
```

## Step 2 — Adding GPS Coordinates for Each Sensor

- Each sensor and binary sensor includes latitude and longitude values.

Example:

Yaml:

```
temperature:  
  name: "Living Room Temperature"  
  id: temp_living  
  latitude: 19.9057  
  longitude: 99.8355
```

- Repeat this for all sensors (DHT11, MQ-2, LDR, PIR) to allow Home Assistant to plot them on a map.

## Step 3 — Upload to ESP32

- Open ESPHome inside Home Assistant.
- Click INSTALL → WIRELESS (or via USB).
- Wait for build and upload to complete.
- When successful, ESPHome will show:



Successfully compiled program.



INFO Uploading /config/.esphome/build/project/firmware.bin

- The device should appear Online on the ESPHome dashboard.

#### Step 4 — Add Map View in Home Assistant

- Add the following card in your **Lovelace Dashboard** (edit → Add card → YAML):

Yaml:

```
- type: map

  title: "📍 Smart Room Sensor Locations"
  default_zoom: 15

  entities:
    - entity: sensor.project_living_room_temperature
      name: "Temperature"

    - entity: sensor.project_mq_2_gas_level
      name: "Gas Sensor"

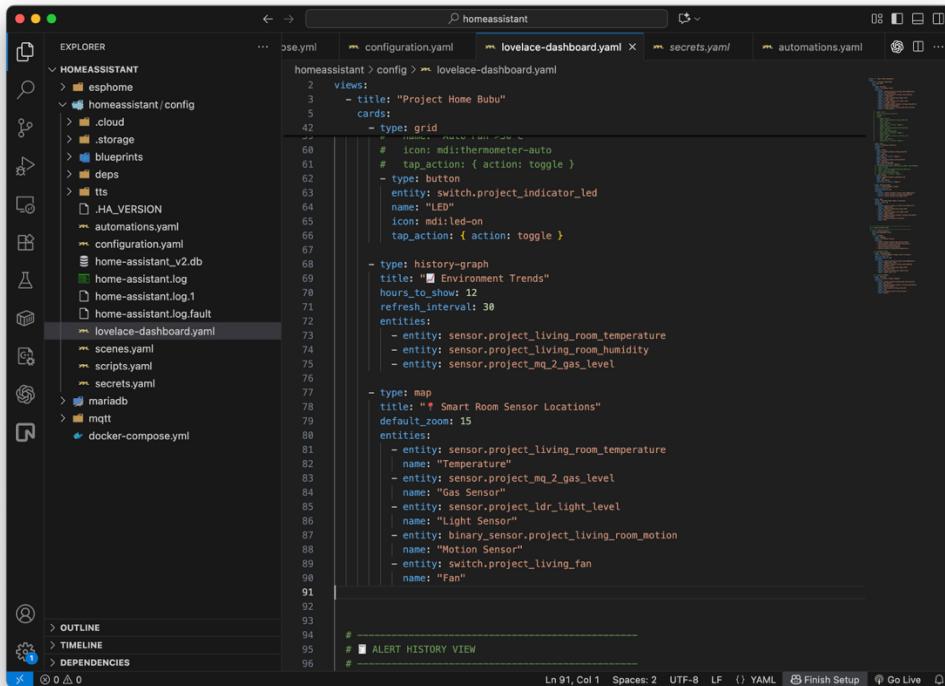
    - entity: sensor.project_ldr_light_level
      name: "Light Sensor"

    - entity: binary_sensor.project_living_room_motion
      name: "Motion Sensor"
```

```
- entity: switch.project_living_fan
```

```
  name: "Fan"
```

This displays pins on the Home Assistant map corresponding to each sensor's coordinates.



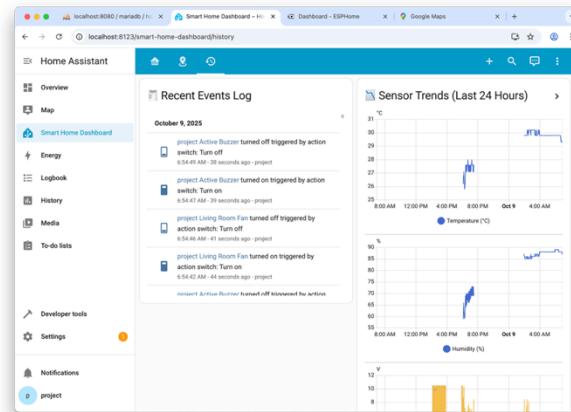
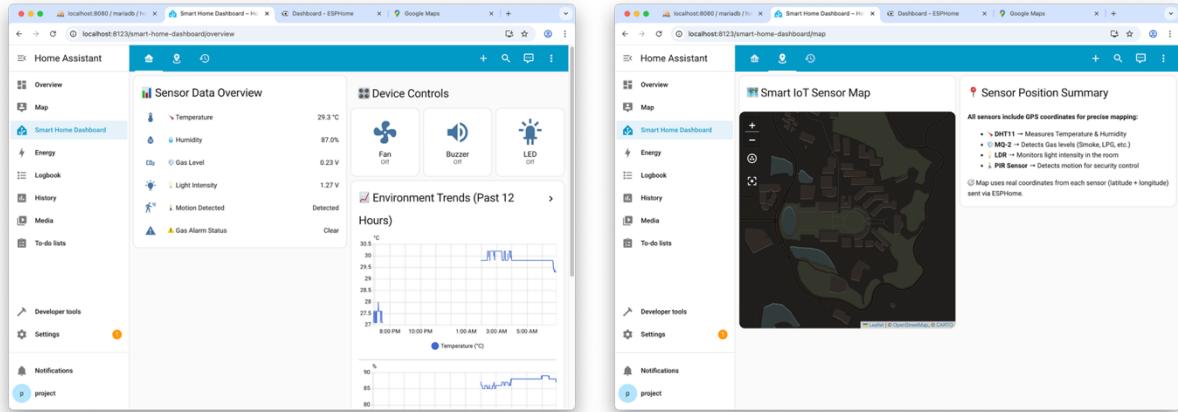
```
views:
  - title: "Project Home Bubu"
    cards:
      - type: grid
        # icon: mdi:thermometer-auto
        # tap_action: { action: toggle }
        - type: button
          entity: switch.project_indicator_led
          name: "LED"
          icon: mdi:led-on
          tap_action: { action: toggle }

      - type: history-graph
        title: "Environment Trends"
        hours_to_show: 12
        refresh_interval: 30
        entities:
          - entity: sensor.project_living_room_temperature
          - entity: sensor.project_living_room_humidity
          - entity: sensor.project_mq_2_gas_level

      - type: map
        title: "Smart Room Sensor Locations"
        default_zoom: 15
        entities:
          - entity: sensor.project_living_room_temperature
            name: "Temperature"
          - entity: sensor.project_mq_2_gas_level
            name: "Gas Sensor"
          - entity: sensor.project_ldr_light_level
            name: "Light Sensor"
          - entity: binary_sensor.project_living_room_motion
            name: "Motion Sensor"
          - entity: switch.project_living_fan
            name: "Fan"
```

## Step 5 — Observation

- The map shows all devices' GPS positions.
- Clicking a pin displays live sensor values.
- Automatic control works as follows:
  -  Temperature > 30°C → Fan turns ON
  -  Gas level > 0.40V → Buzzer turns ON
  -  Light < 1.4V → LED turns ON
  -  PIR detects motion → "Motion Detected" status changes to ON



----- Have a good day -----