	
Laboratory 9: GPS Integration (ESPHome To Home Assistant Map)	School of Applied Digital Technology	
Name:	ID:	Section:
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Date:	Due date:	

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: 1

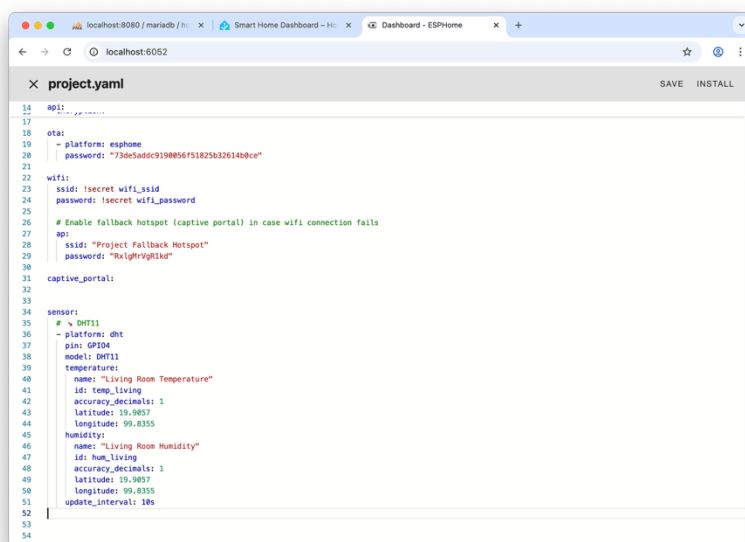
latitude: 19.9057

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



```
14 api:
15   # ...
16
17
18 ota:
19   - platform: esp8266
20     password: "73de5addc9190856f51825b32614b0ce"
21
22
23 wifi:
24   ssid: !secret wifi_ssid
25   password: !secret wifi_password
26
27   # Enable fallback hotspot (captive portal) in case wifi connection fails
28   ap:
29     ssid: "Project Fallback Hotspot"
30     password: "WzlgHrygtlku"
31
32   captive_portal:
33
34
35 sensors:
36   # - DHT11
37   - platform: dht
38     pin: GP104
39     model: DHT11
40     temperatures:
41       name: "Living Room Temperature"
42       id: temp_living
43       accuracy_decimals: 1
44       latitude: 19.9057
45       longitude: 99.8355
46     humidity:
47       name: "Living Room Humidity"
48       id: hum_living
49       accuracy_decimals: 1
50       latitude: 19.9057
51       longitude: 99.8355
52       update_interval: 10s
53
54
```

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"
```

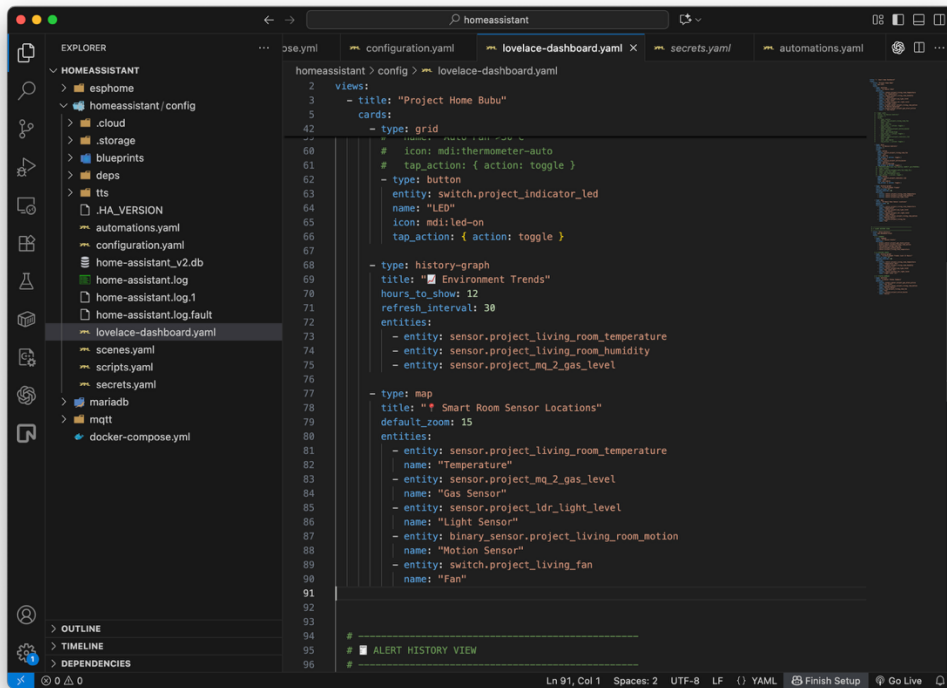
```
    - entity: binary_sensor.project_living_room_motion
```

```
      name: "Motion Sensor"
```

- entity: switch.project_living_fan

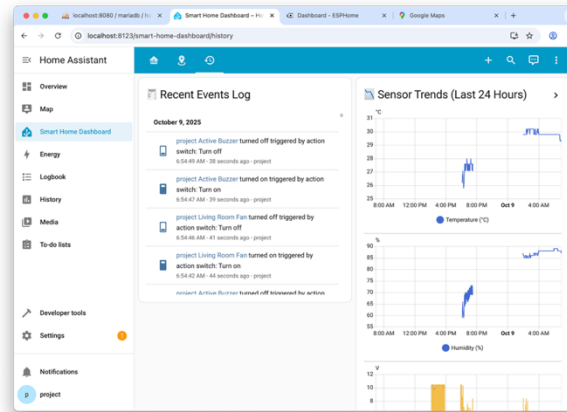
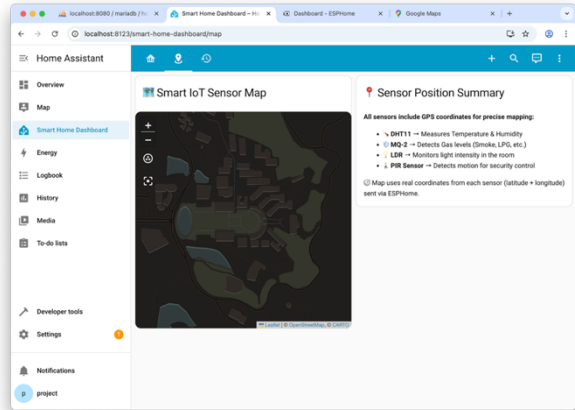
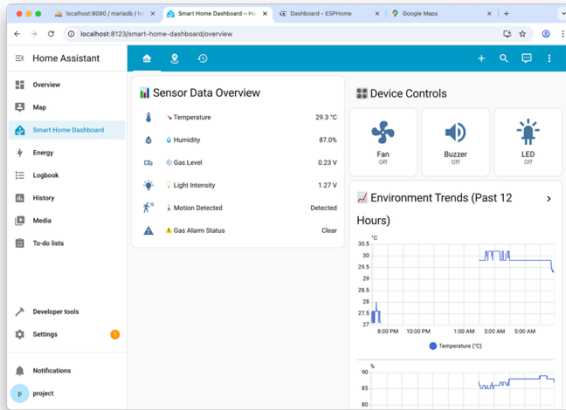
name: "Fan"

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



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 -----