ROOMTRACR

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WHAT IS ROOMTRACR?

- A sensor to calculate room occupancy rate

- Gathers environmental data

- Use the data to calculate % of usage per day

- Why? Health. ⤵

  Health: The more data to know what particles in the air, pressure, oxidization etc., easier to monitor living conditions.

WHAT WAS NEEDED

How do we gather data → what devices give us what we need?

Where do we store the data?

How do we visualize the data and calculate the room occupancy rate?

HOW IT WAS ACHIEVED: ESP32 + MOTION SENSOR

- Connect ESP32 with the motion sensor (in this case, grove to jumper cable) → connect via USB

- Set up Arduino IDE
  - Make Arduino code to set up motion sensor

- Set up a database, enter a table with relevant columns

- Then either:
  1. Connect Arduino to a Raspberry Pi for easier connection and data sending
  2. Connect the Arduino to WiFi (if applicable), proceed to send data via HTTP POSTs every 5-10 seconds
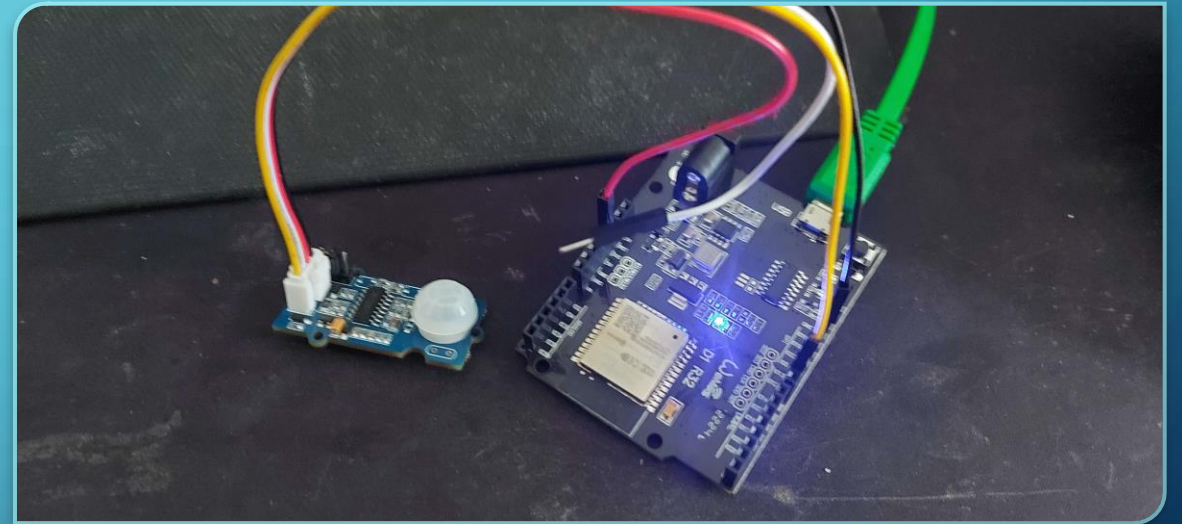
HOW IT WAS ACHIEVED 2: RASPBERRY PI + ENVIRO

- Used components:
  - Raspberry Pi Zero W
  - Pimoroni Enviro+
  - PIR motion sensor

- Set up → Connect to WiFi → Install Enviro+ library → connect PIR motion sensor

- Create a table on the database with relevant columns

- Use of a python script to read sensors and send the sensor-data to database in 10 sec. intervals
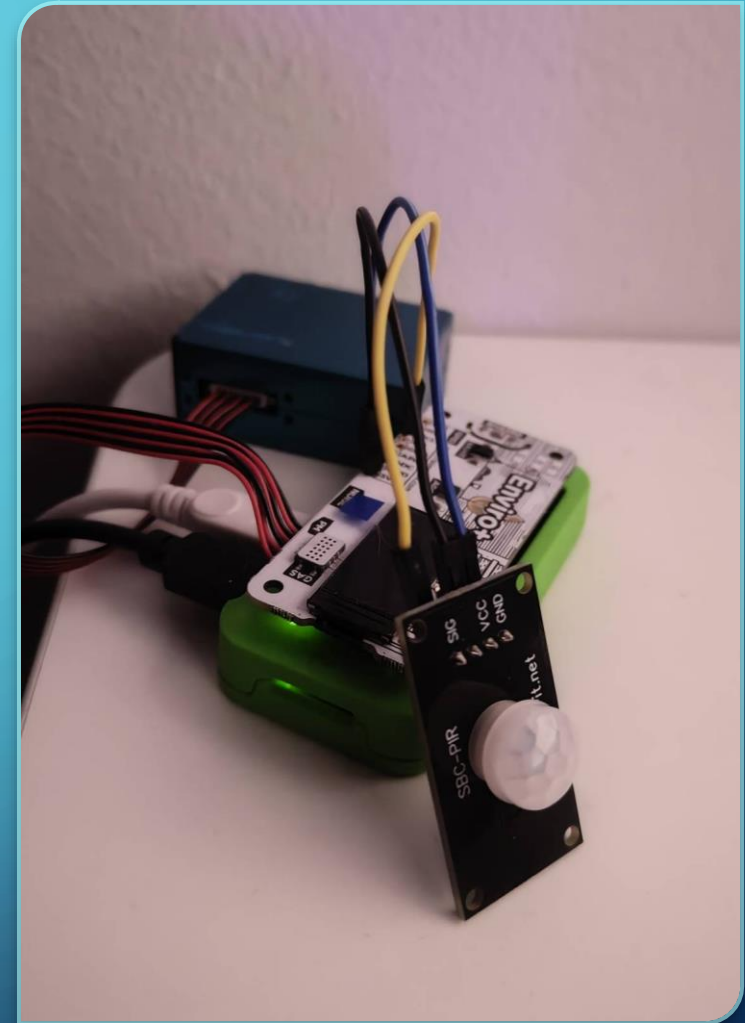
HOW IT WAS ACHIEVED 3: DATABASE

We needed a database to store and gather sensor data

Options were to do local or cloud → we chose cloud.

NB: Can be done locally!

We used CSC.fi's free student resources:

- Service: Pukki (DBaaS

- Provides PostgreSQL / MariaDB

- Daily backups (retained for 90 days)

-Built-in firewall management

- Easy setup & connection

Data sent directly to the DB and DB connected to Grafana.

We could then do SQL queries for data visualization

NOTE ABOUT THE DATABASE

- As previously mentioned, we used CSC.fi for the project

- However, the project was marked to end on 09.05.2025 → no access to the service or database after that date (and could not be extended as it was a student project)

- Jasmin set up a new PostgreSQL database on a private Hetzner server
  - Database migrated from a dump of the CSC database
  - Grafana reconfigured to connect to the new database
  - The Raspberry Pi's .env file was updated with the new database connection details (IP address, username, database name, password)
  - Data collection and visualization continued seamlessly

THE DATA VISUALIZED

- We used only the Raspberry Pi's sensor data for visualization → Easier as it gathered everything from one spot

- We used Grafana for visualization

- This was needed for hard evidence of the sensors working

- This was also needed for the calculations for room occupancy rates
  - Several data points were used for the sake of calculation, using motion sensor data as a base to say the room is being occupied

- The Grafana is hosted on Jasmin's Hetzner server(requires user+pw+access)
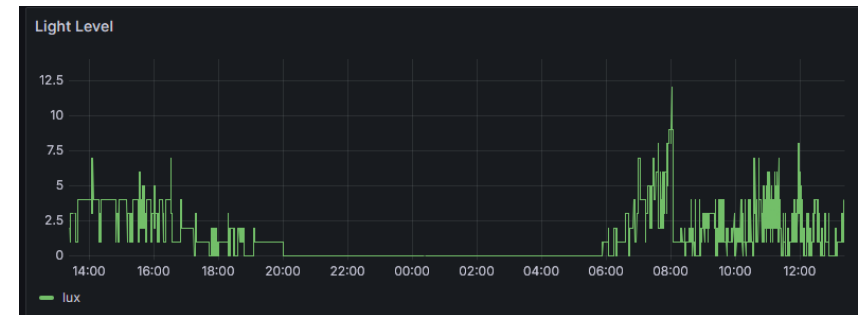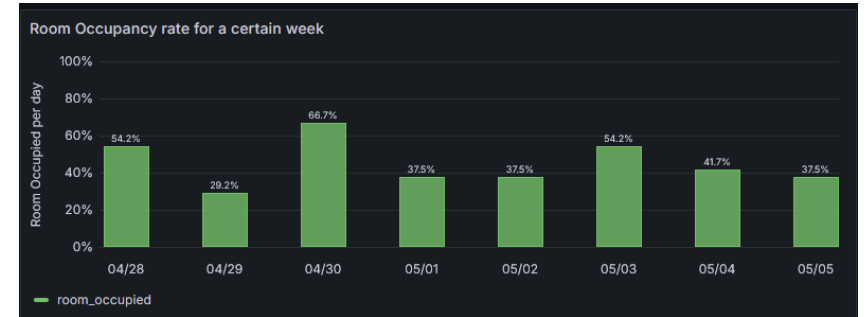
POSSIBLE FURTHER DEVELOPMENT

- The sensor could possibly be built cheaper

- A design of a wall-mounted sensor with LED's and audible alerts for bad air quality

- A possible application to show the data, visualizations and alerts

FULL DOCS - GITHUB

https://github.com/J-Huttunen/RoomTracr

Jasmin's Github page with documentation on the setup, with Jonas' documentation on the ESP32 usage.

NB: It's in finnish.

THANK YOU