Enviromental Monitoring

with cheap microcontollers

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Enviromental Monitoring...

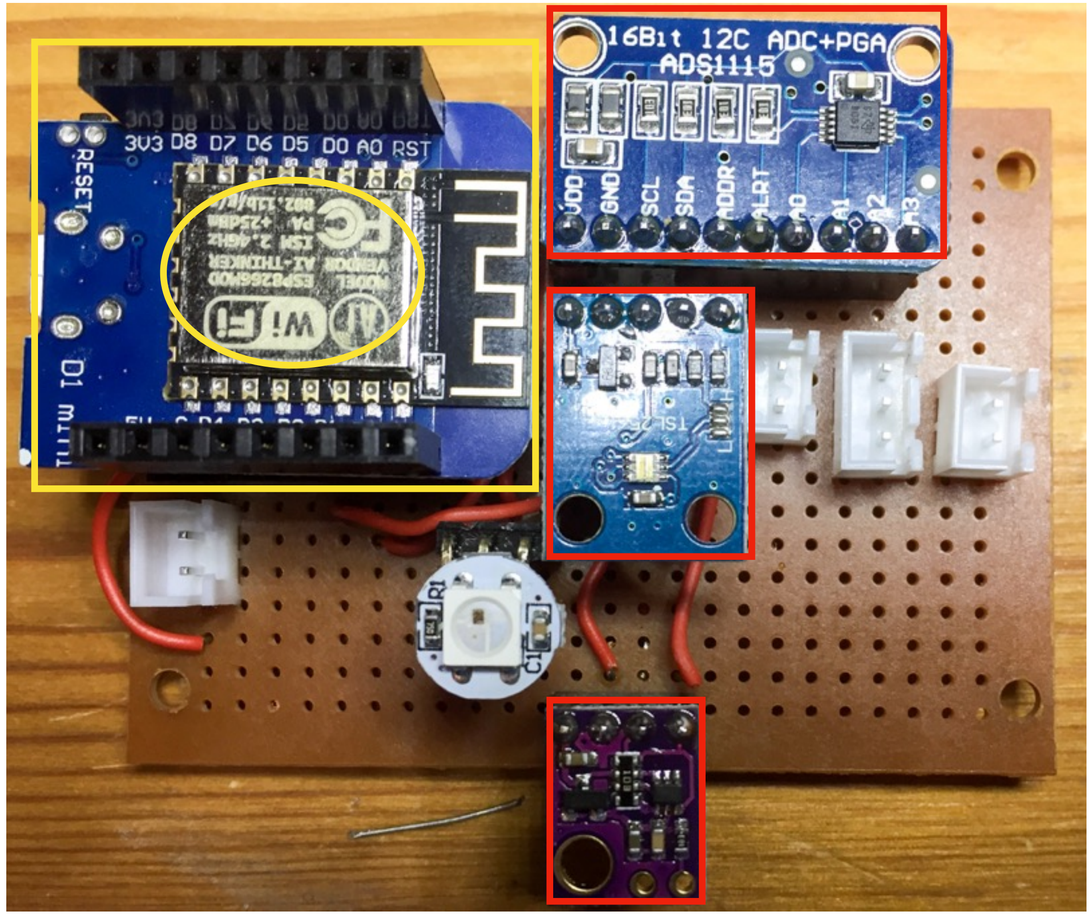
- Temperature
- Humidity
- Air Pressure
- Light Level
- Movement
- Rainfall

...and transmiting it somewhere

- A transport network is needed - WiFi
  - Usually available nearly everywhere
- A transport protocol is needed - MQTT
  - Flexible
  - Lightweight
  - Open Source

Hardware: D1Mini + I2C Sensors

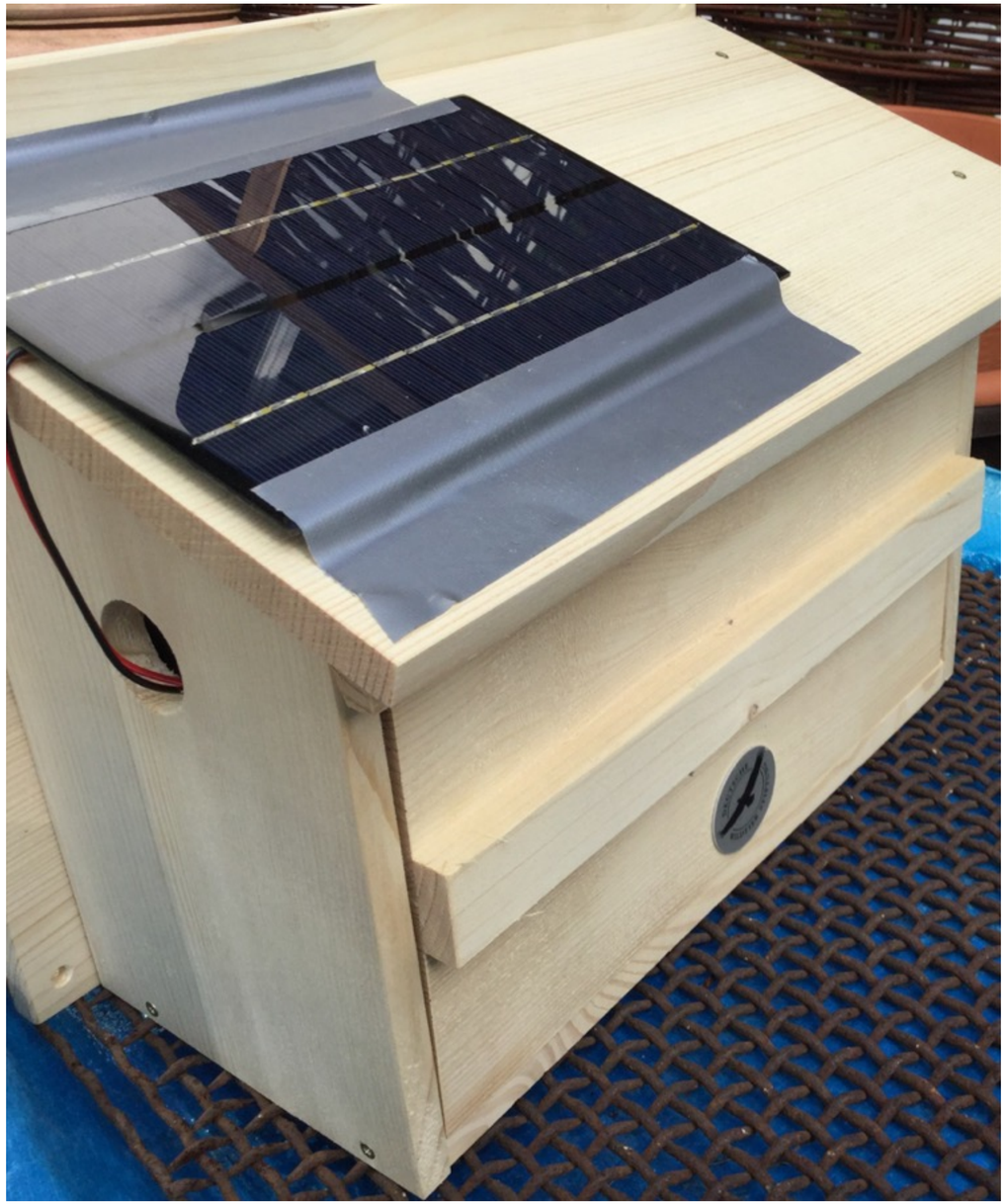
- ESP8266 Microcontrollers are cheap and easy to program
- D1Mini brings a nice package
- I2C-Sensors are also cheap and can be directly attached



Outdoor Version

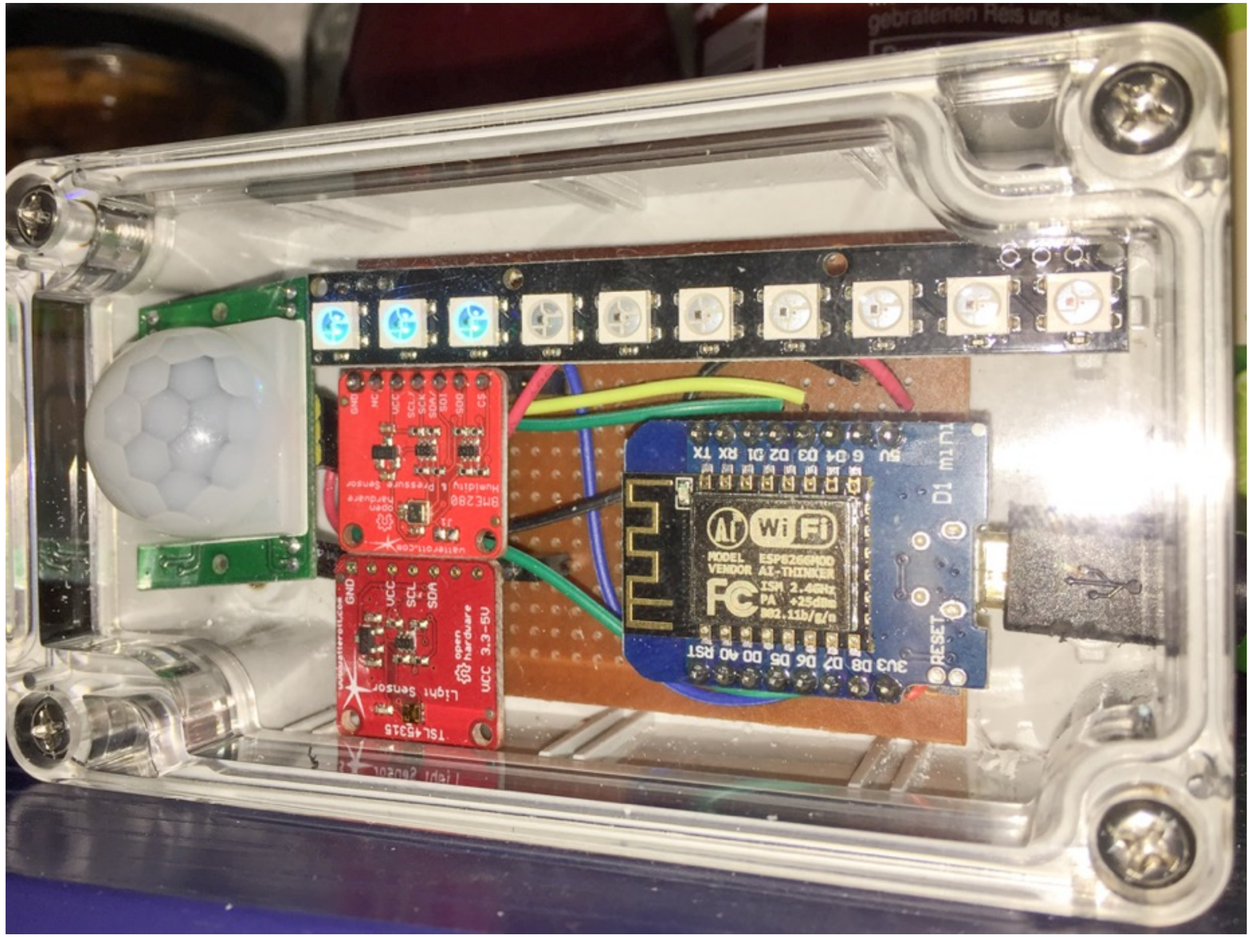
with solar panel and Eneloop buffering

- **On sunny days collects enough energy for 24h**
- **On cloudy days a few hours are missing when power runs out**



Indoor Version

with LED-Strip
and
motion sensor



Protocol: MQTT

- MQTT-Messages have two components:
  - Topic
  - Message
- Example: `/Chattenweg5/Wohnzimmer/temperature 24.32`
- Topic contains Site, Location, Measurement-Type

Protocol: MQTT

- MQTT = MQ Telemetry Transport
- Invented in 1999
- Uses TCP as transport, port 1883
- SSL possible, port 8883
- User/Password security possible
- See mqtt.org for more

Software: Microcontroller

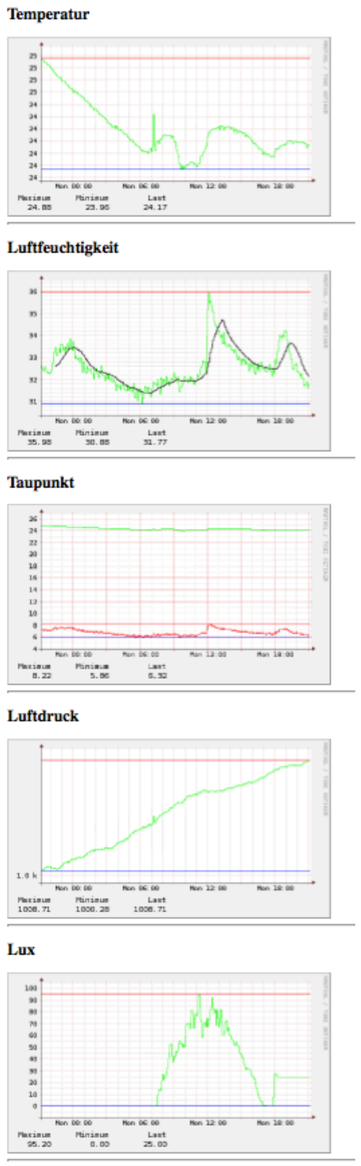
- Initialize
- Check voltage: If too low, deepsleep
- Connect to Wifi
- Connect to MQTT-Server
- Read sensors
- Transmit measurements
- If outdoor, deepsleep to conserve energy, reboot and restart
- If indoor, wait and loop back to read sensors

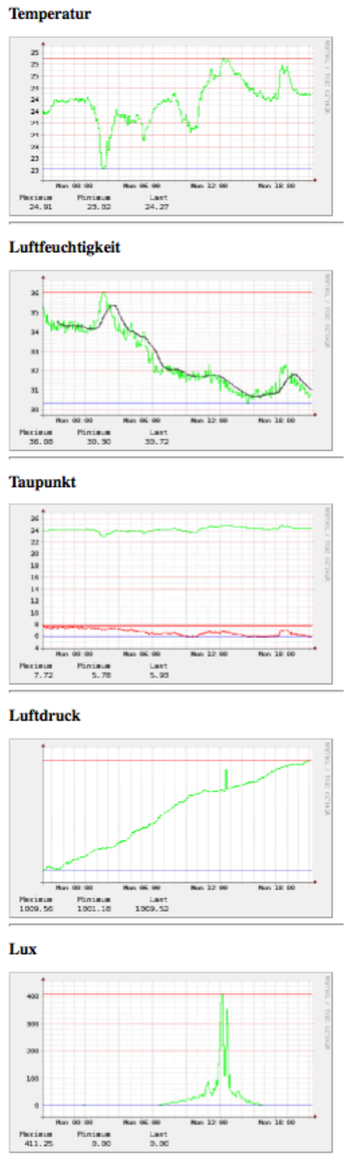
Software: mqttgraphd

- Runs on linux, needs:
  - mosquittod
  - RRD-Tools
- Connects to mosquittod as a reader
- Waits for messages from sensor-controllers
- Reads message, parse topic
- Create RRD-File if not exist
- Write value in RRD-File

Software: Display

- PHP-Scripts to display RRD-Files





Future enhancements

- Connect event handlers to MQTT
  - like react to starting rain by closing windows
- Relay weather data to APRS
- Keep everything modular!

Any Questions?

Thank you!