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Having fun with a solar panel, camera and raspberry doing IoT

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COMMUNITY
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CODE

Agenda

- Introduction.
- How it started...
- Next the zero + big panel in Neuchatel
- Looking for cheaper solution and solving problems
- Results the raspberry on the balcony
- Adding more RPI
- Making it objects other fun stuff
- Q & A

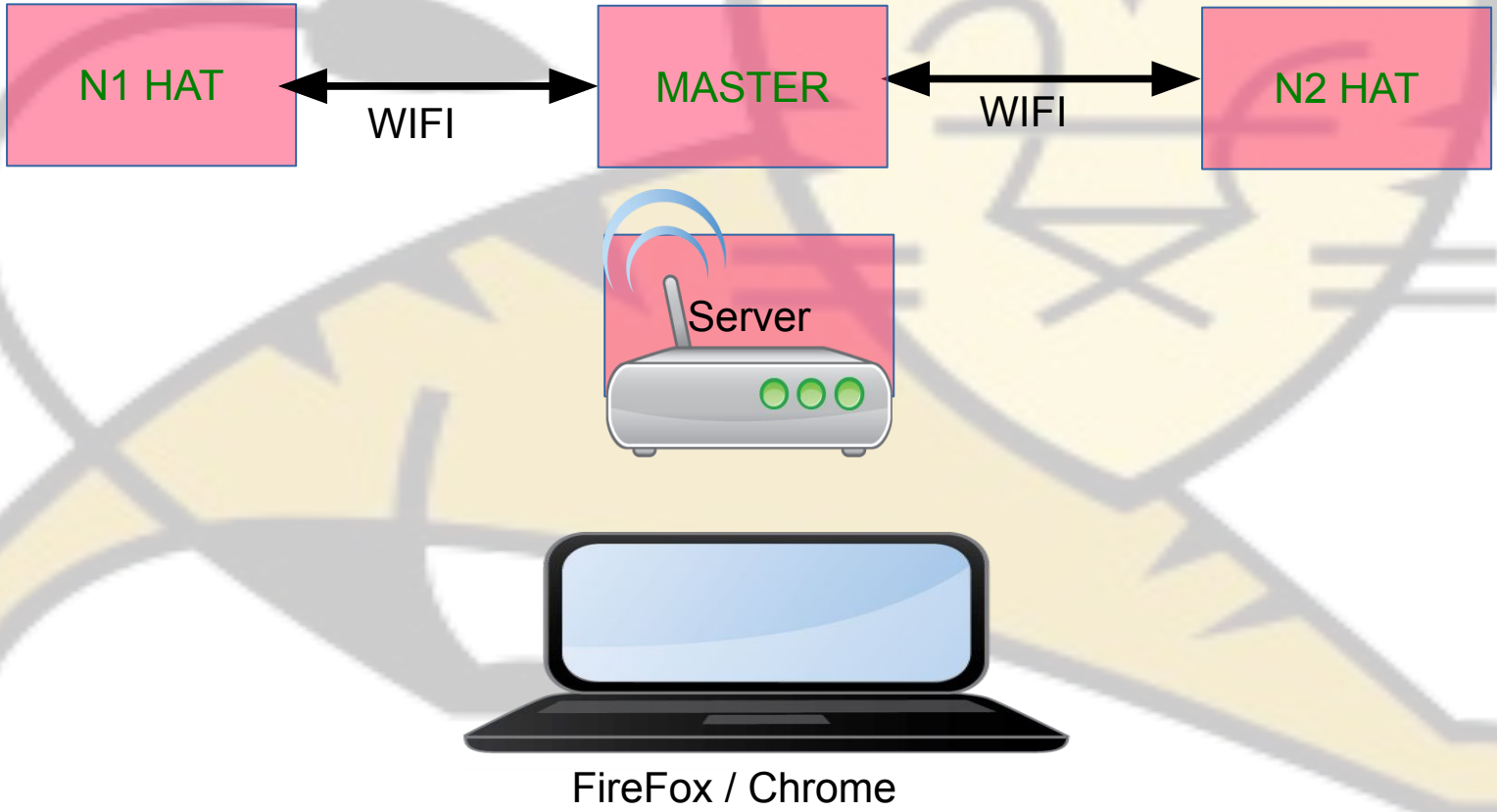
Who I am

- Red Hat employee
  - www.redhat.com
- Tomcat / httpd committer
  - Tomcat.apache.org /httpd.apache.org
- In Neuchatel Office

How does it started

- Needs of cheap cluster demos (for TomcatCon)

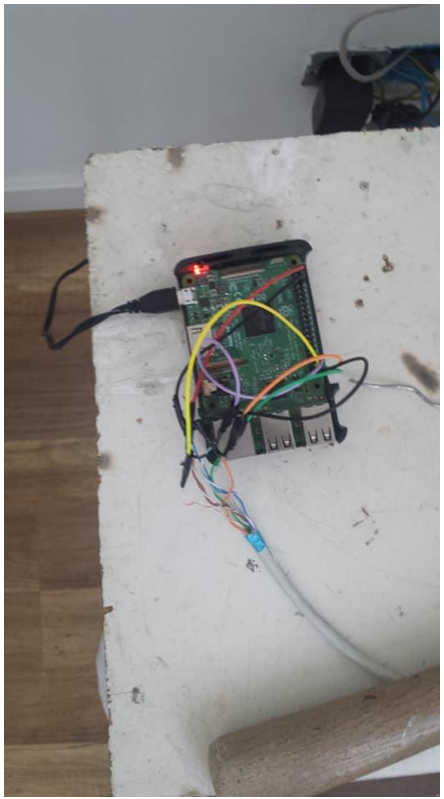
Bare Metal Cloud demo

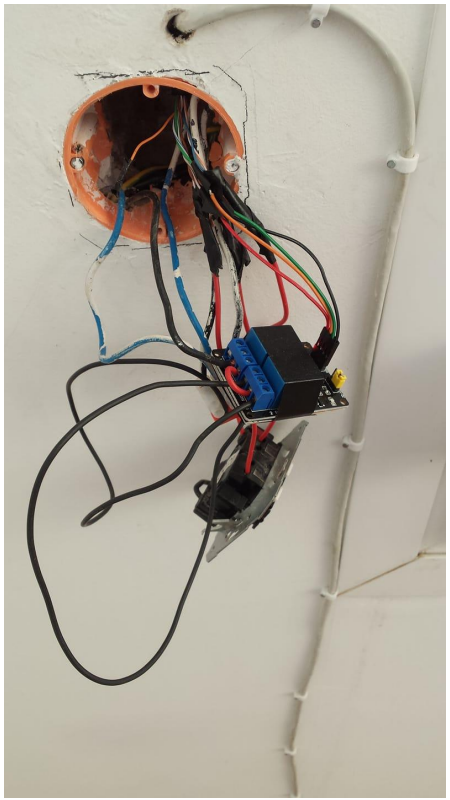


How does it started

- Needs of cheap cluster demos (for TomcatCon)
- New RPI4 = update the cluster.
- What to do with the old ones? :)

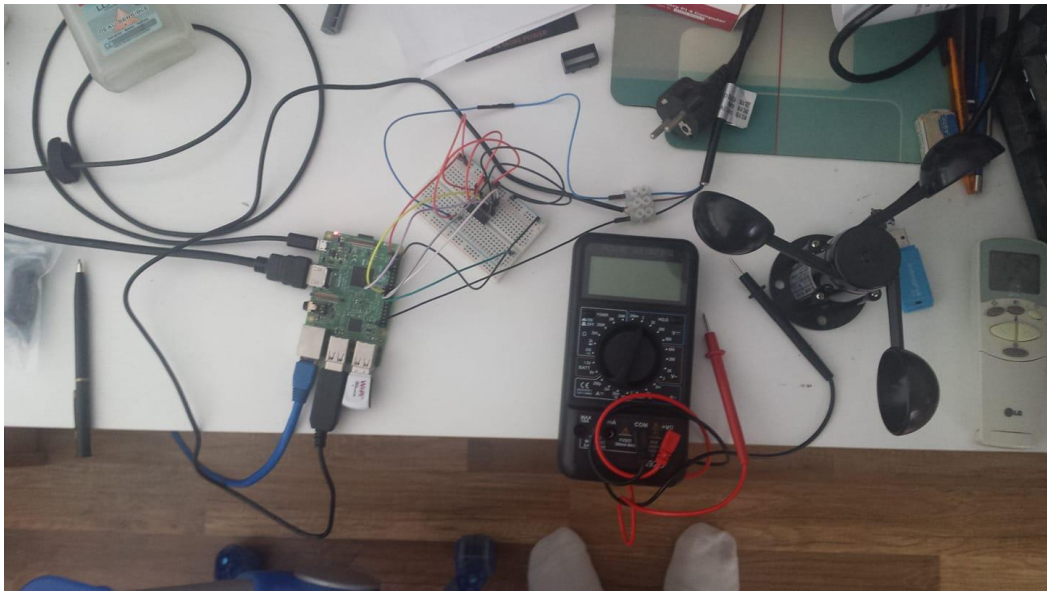
What happens to the old ones…





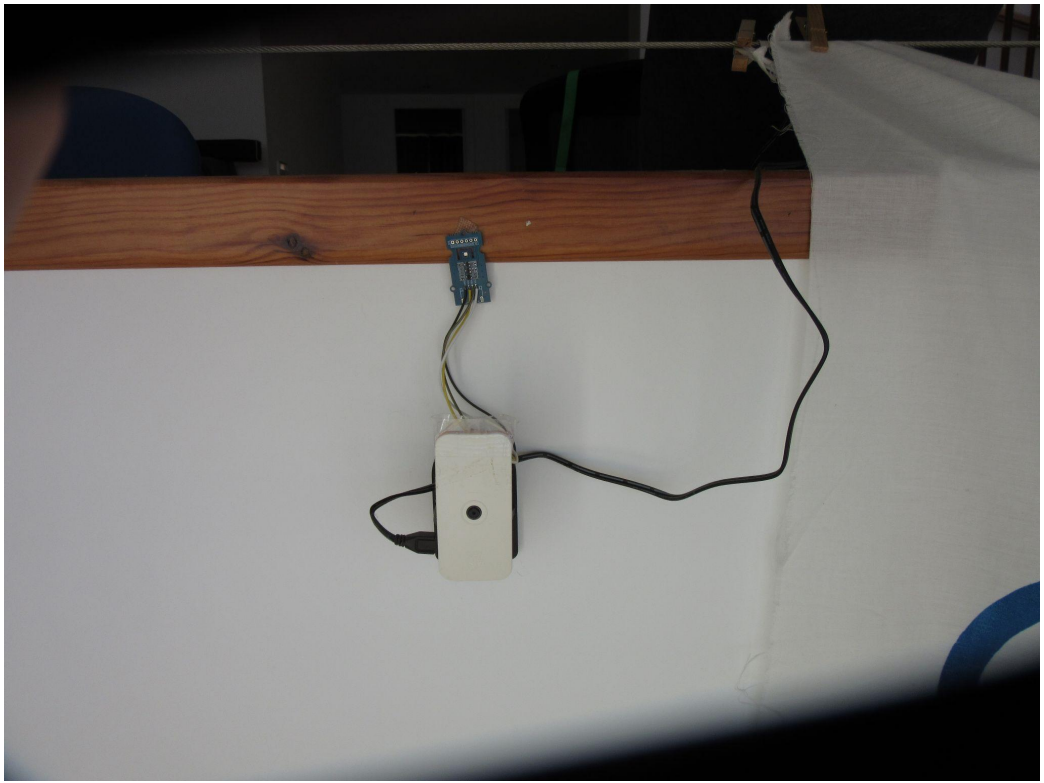
RPI3
connected to relay board (hyperion)
connected the switch (manual comment)
connected wifi and internet (remote control)
Using GPIO
Apache HTTPD and cgi python
https://github.com/jfclere/door

What happens to the old ones…



RPI3
windsensor 9V power with USB
mcp3008 to convert the voltage
using SPI
Python script to read SPI and Wifi to the other RPI3
https://github.com/jfclere/door/blob/master/mcp3008.py

What happens to the old ones…



RPI3 (well I changed it to a RPIzero W)
Controlled by a server ssh
Use raspberry pi v2 camera
Use BME280 I2C temp/pressure/humidity
https://github.com/jfclere/pisolar/blob/main/bme280.py

What happens to the old ones = avoid this!!

Going solar Try 1

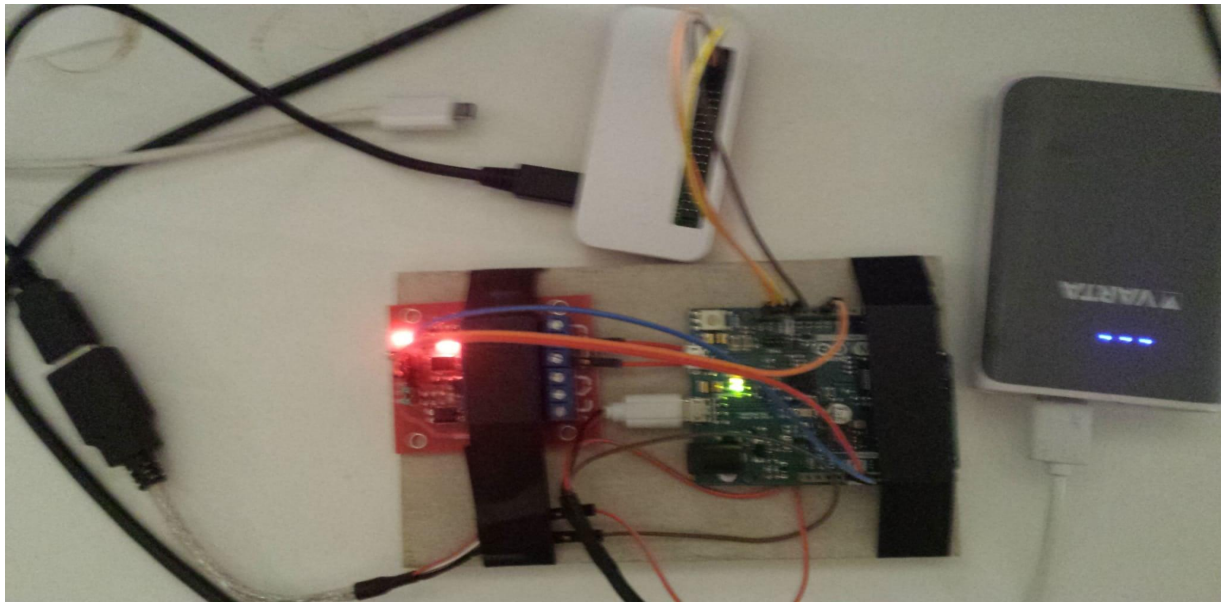
- Pi Zero W 260mA/400mA / Camera
- 9W panel
- Li-Po Rider PRO (charge and USB power)
- UPS Plco - LiPO Battery 8000mAh

problems…

- Dead after the first rainy days.
- Not really a few dollar project:
  - Solar panel : ~ 100 USD
  - Li-Po Rider PRO ~ 20 USD
  - LiPO Battery ~ 50 USD
  - Camera ~ 20 USD

Solution: Stop the RPI when needed. Try1

- Cut the power (USB converter as off/on)
- Use Arduino and relay for off/on
- Use I2C to control the Arduino.
-



Solution: **Stop the RPI when needed. Try2**

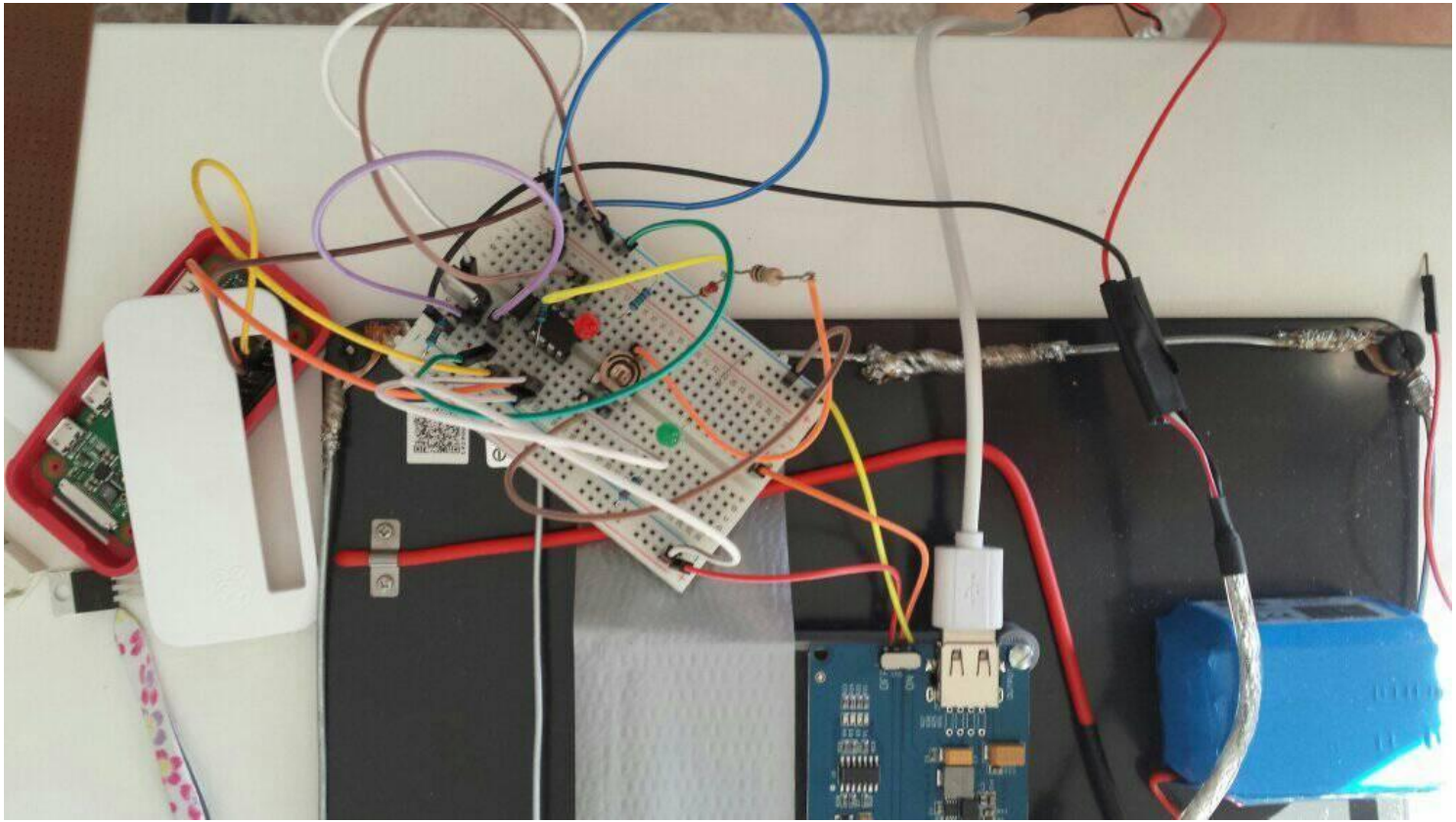
Problems of Try1:

- **Relay uses a too much energy**
- **Arduino doesn’t work with 3.7V**

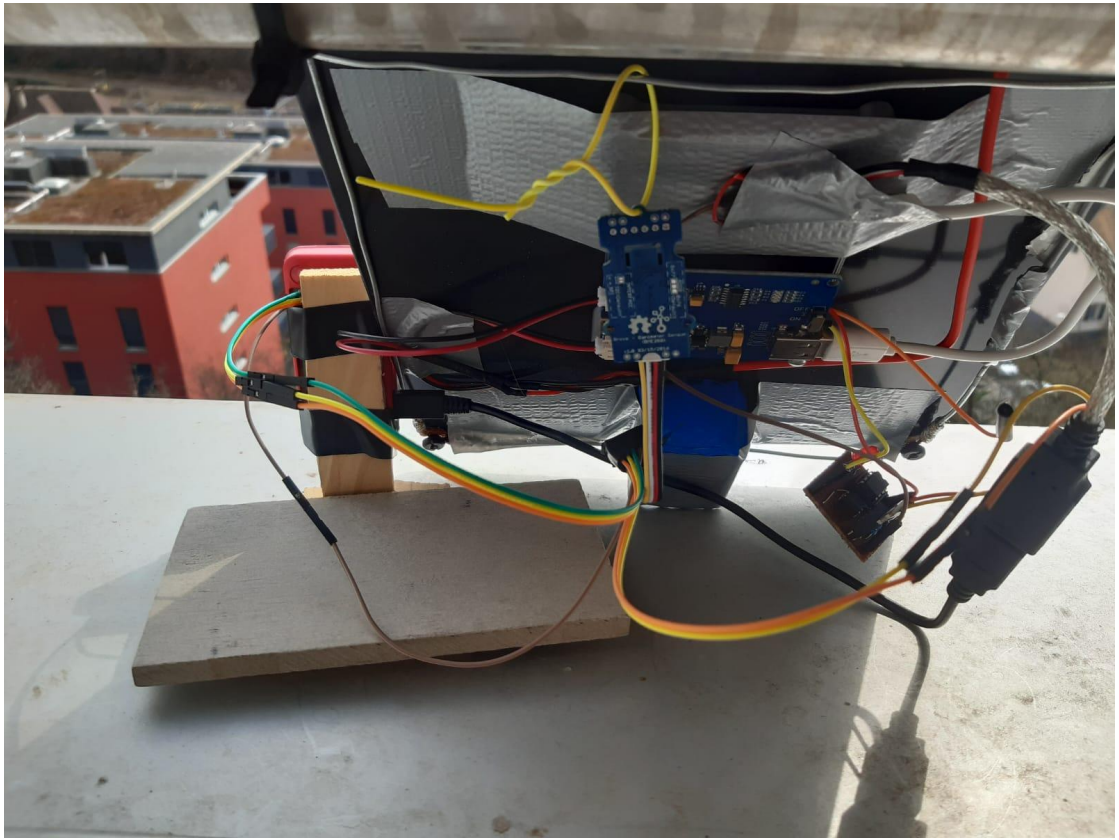
Solution:

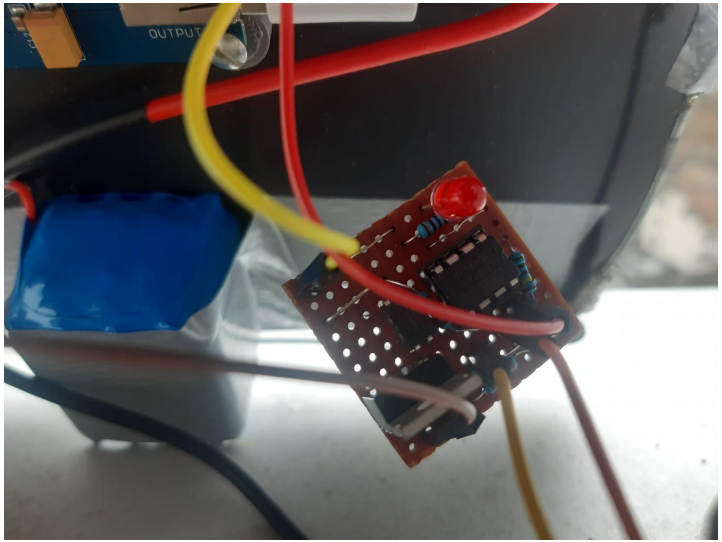
- **Use mosfet (~1 USD)**
- **Use ATTiny45 (1.8-5.5V, low power 300µA, ~1USD)**
- **Software on ATTiny (Use Arduino IDE)**
- **Software on RPI3 python+shell script**
- **Cadaver and webdav to send images to server**

Going solar try2



Going solar try2



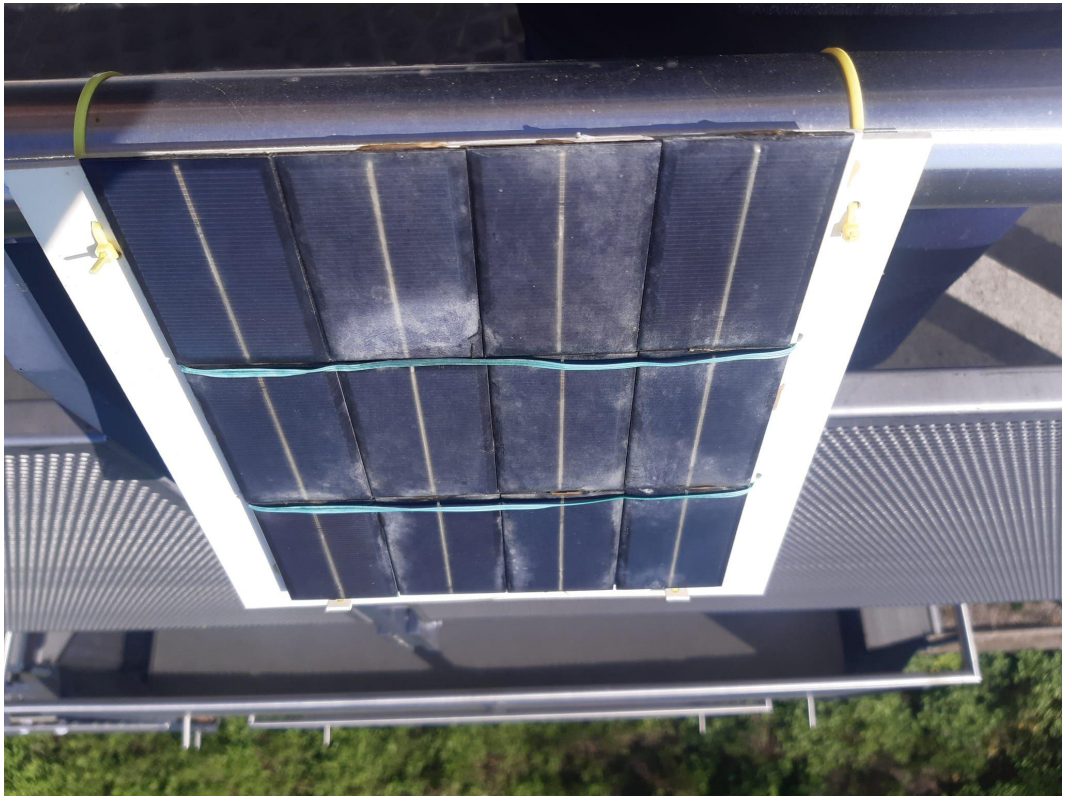


With BME280 I2C sensor

Going for next tries

- Cheaper panels ~20USD
- Small batteries (and cheaper) ~ 10USD
- Self made boxes (~1USD)
- Cheaper USB converter
  - PowerBoost 500 Basic 1.8V to USB (~10USD)

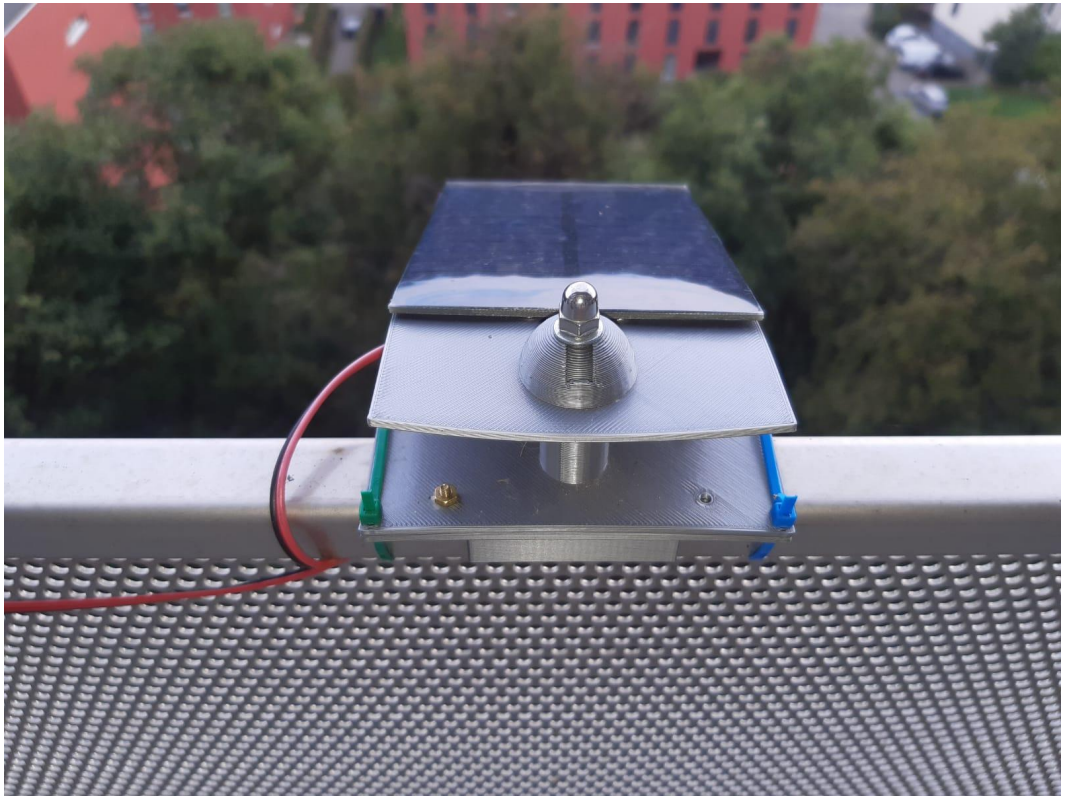
Failures panel

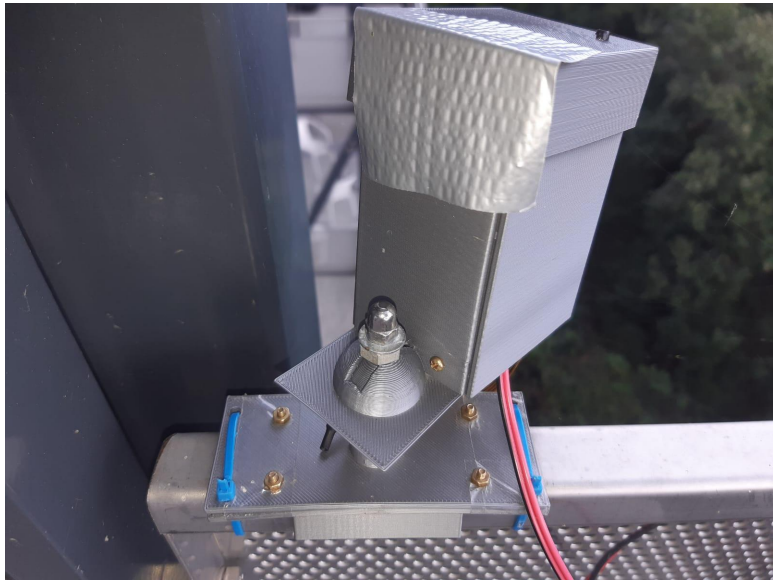


Failures printing box

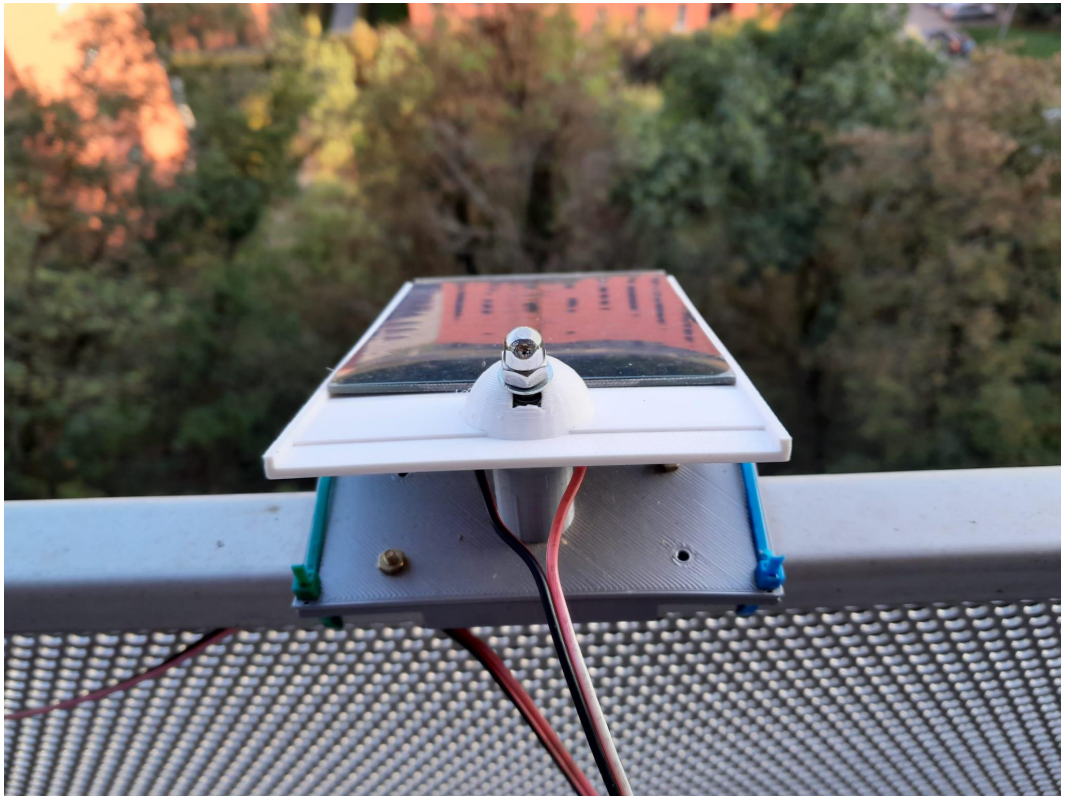
Failures humidity

2021 year running version





Current running version



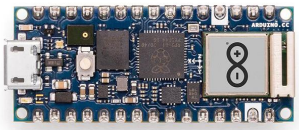
Going Objects

Price: about 95 USD
Small enough
Easy install (Shell script for RPI, Arduino IDE + writer for the ATTiny45)
Use Wifi (wpa_supplicant.conf)
Configuration in the server via uniqueid (/etc/machineid).

pi4neuchatel	Directory where send information
10	Time to wait before next cycle
440	Low battery voltage value (here 2.62 V)
0fd108a	Github commit id

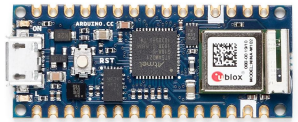
Other fun objects

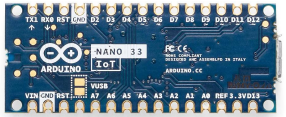
RP2040 based there are many



Micropython version for each

Smaller objects arduino nano





Use arduino IDE (ino and cpp)

No CSI so no camera but 3.3V powerable and analogue inputs and of course GPIO, I2C , SPI and UART.

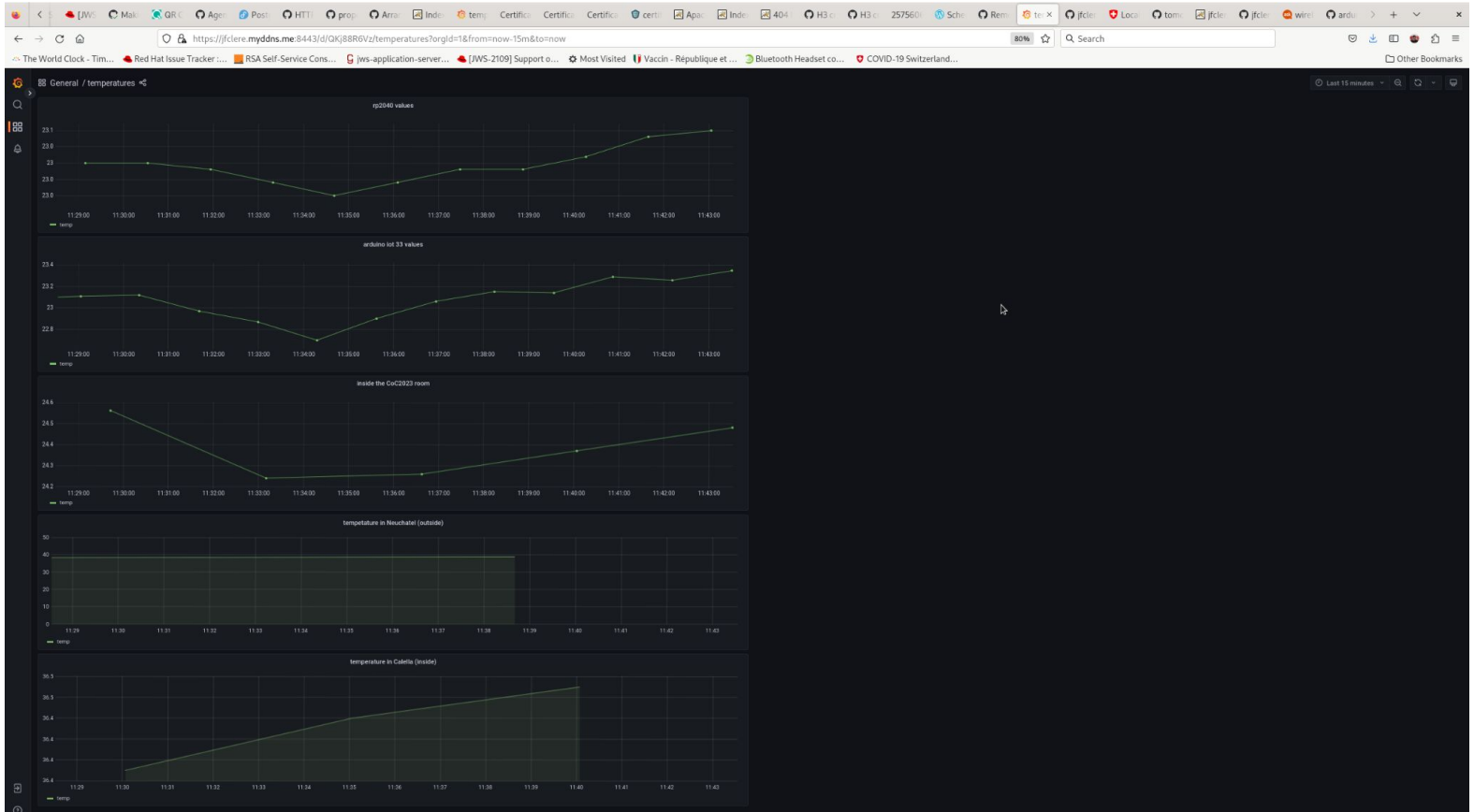
Reporting and visualisation

The devices PUT data on the server (Apache HTTPD / mod_dav)

Service on server put the information in **PostgreSQL** database

Grafana for visualisation

Grafana screen



Try it yourself

Everything at:

https://github.com/jfclere/pisolar

https://github.com/jfclere/picow (for the RP2040 stuff).

Ask me:

jfclere@gmail.com

QUESTIONS

THANK YOU!