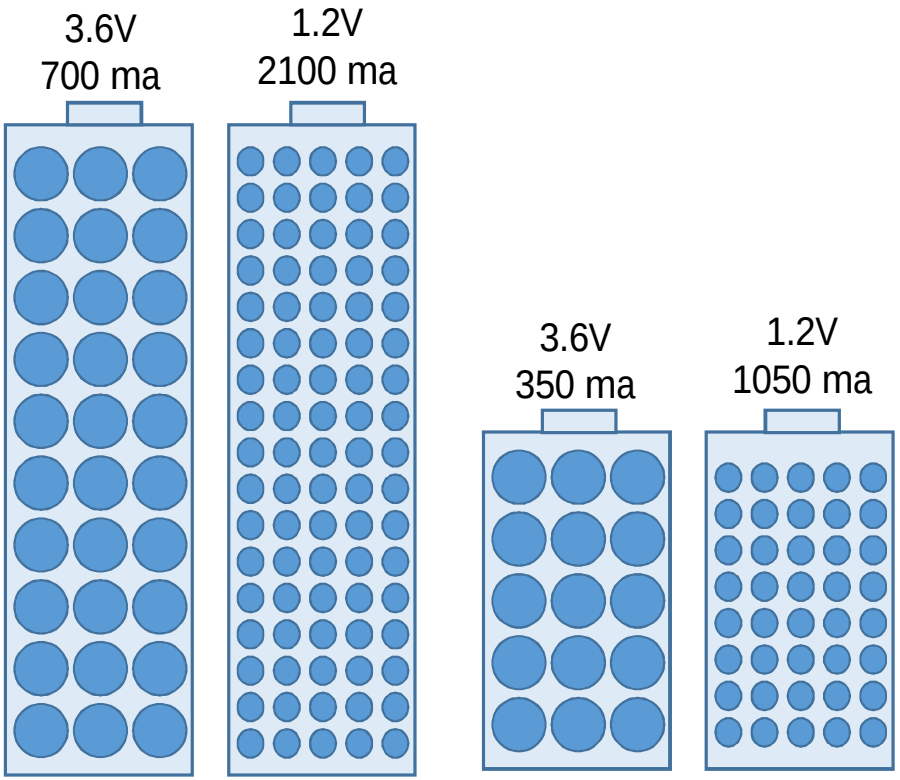
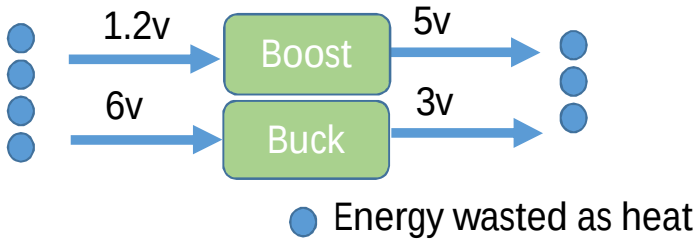
IoT @ FMI

Power Management and Existing Frameworks

04.April.2018

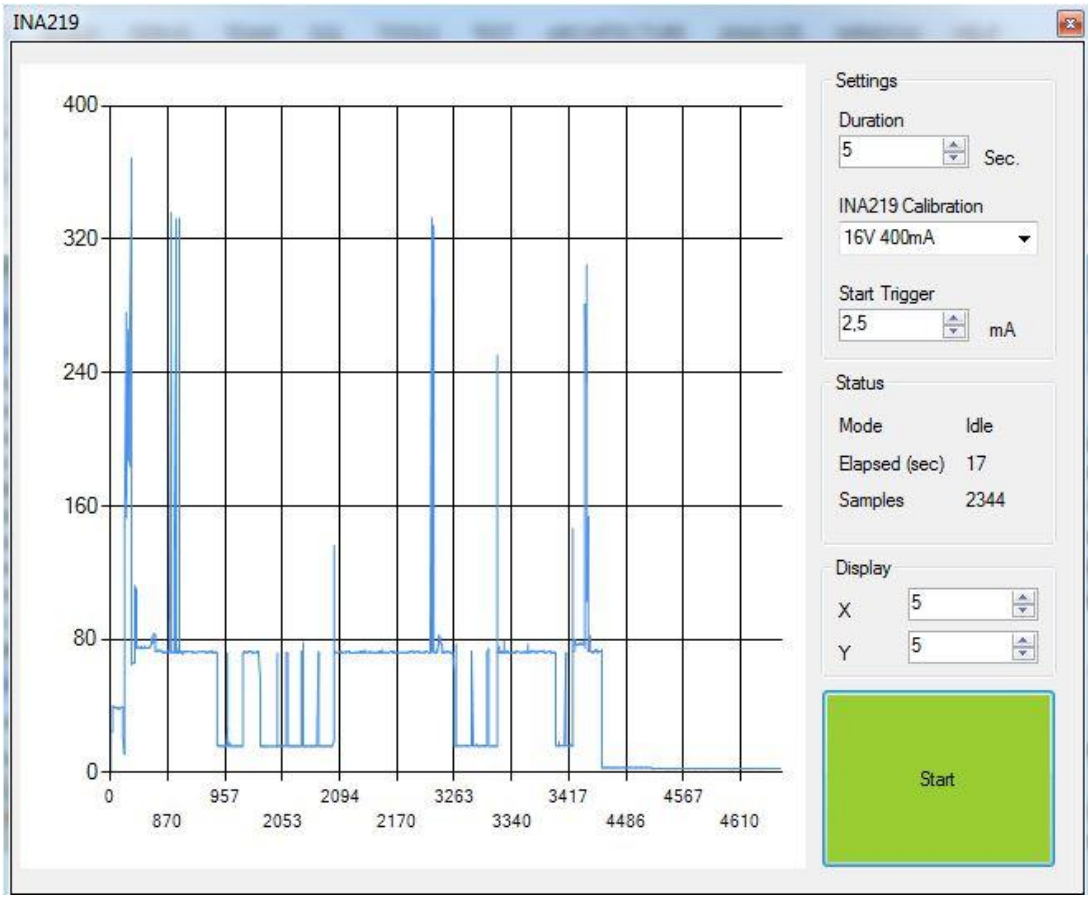
What is Energy?





Power Consumption

- ESP8266 (2.9-4.2v)
  - Active: 30-300 ma
  - Sleep: 0.1 – 10 ma
- Arduino (Atmega328p)
  - Active: 4-20 ma
  - Sleep: 0.001 – 0.01 ma
- Raspberry PI
  - Active: 80-240 ma
- BLE/Zigbee modules
  - 0.02ma (BLE), 0.05ma (Zigbee)

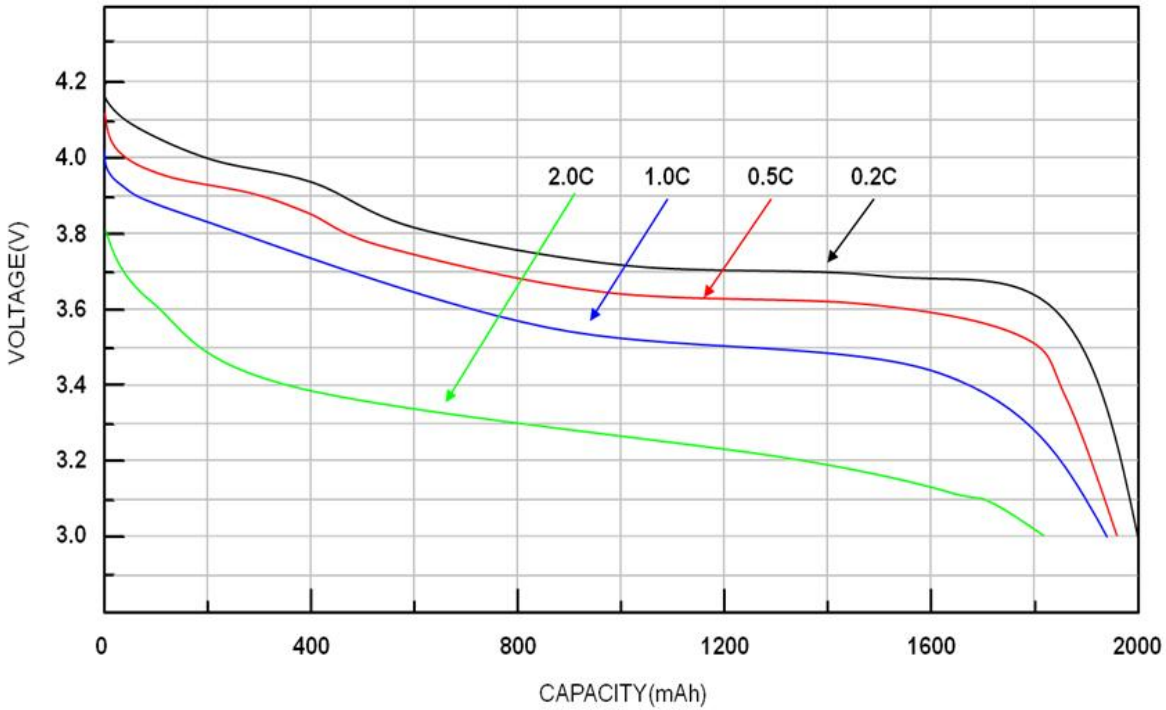


Types of Batteries

Type	Voltage (V)	Capacity (mAh)	Resistance	Self Discharge
Coin Cell 2032	3.00	200	High	Low
AAA/AA/C/D (Alkaline)	1.2 – 1.5	1000/2000/5000/10000	Medium	Low
AAA/AA/C/D (NiMh)	0.2 – 1.3	same	Medium	Med/Low
AAA/AA/C/D (Ni-Zn)	1.3 – 1.6	Same	>	?
LiPo (Generic)	3.3 – 4.2 (3.7)	10 – 5000	Low	Low
LiPo - 16850	Same	1000 – 5000		
LiPo – 14500	Same	500 – 1000	Low	Low

Battery Discharge Curve

- Internal Resistance increases with decreased capacity
- 1 om @ 300 ma = 0.3v voltage Drop



ESP8266 – DeepSleep

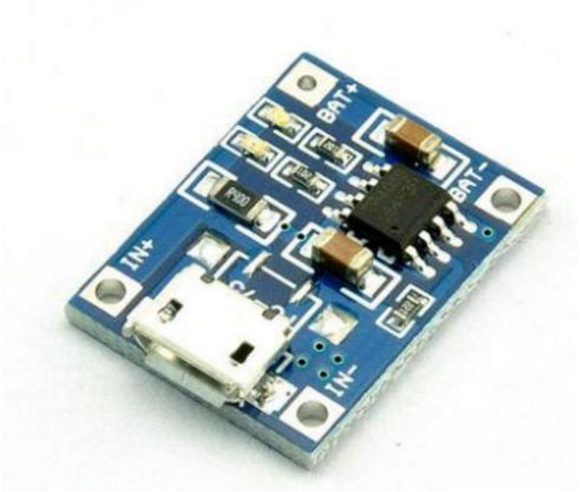
- Sleep current in DeepSleep is 0.08 ma
- Connect D0 and RST with a jumper wire
- Call ESP.deepSleep(time); delay(1000);
- ESP will go to deep sleep and reset after “time”
- Time is in us (1,000,000 us = 1,000 ms = 1 sec)
- RTC Memory can be used to store data between iterations
- After wake up it takes ~300 ms to boot and ~3-10 sec to connect to WiFi
- All GPIOs are set to INPUT during sleep
- http://www.espressif.com/sites/default/files/9b-esp8266-low_power_solutions_en_0.pdf

ESP8266 – LIGHT and MODEM sleep

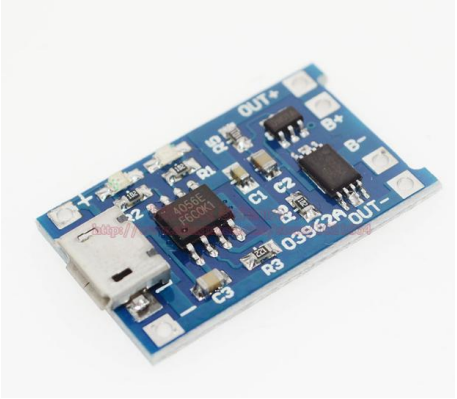
- Modem Sleep: ~15 ma. Just use delay(xxx)
- Light Sleep: ~0.5 ma
  - Details: https://github.com/esp8266/Arduino/issues/1381#issuecomment-279117473

LiPo Chargers

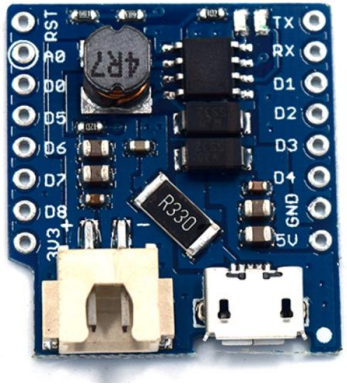
- Only Charge



- + battery protection



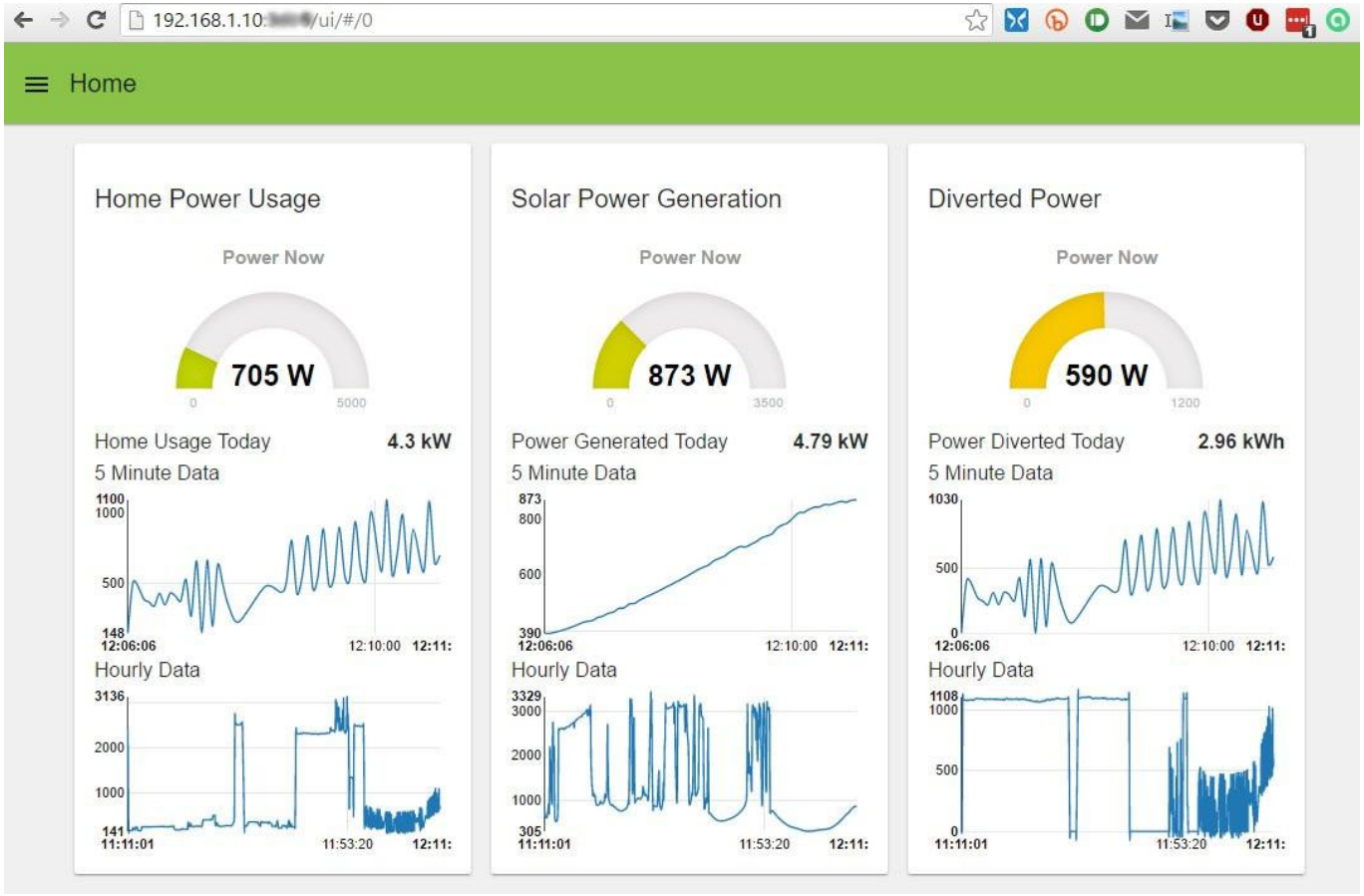
- Wemos Battery Shield
  - + battery protection
  - + 5v Boost

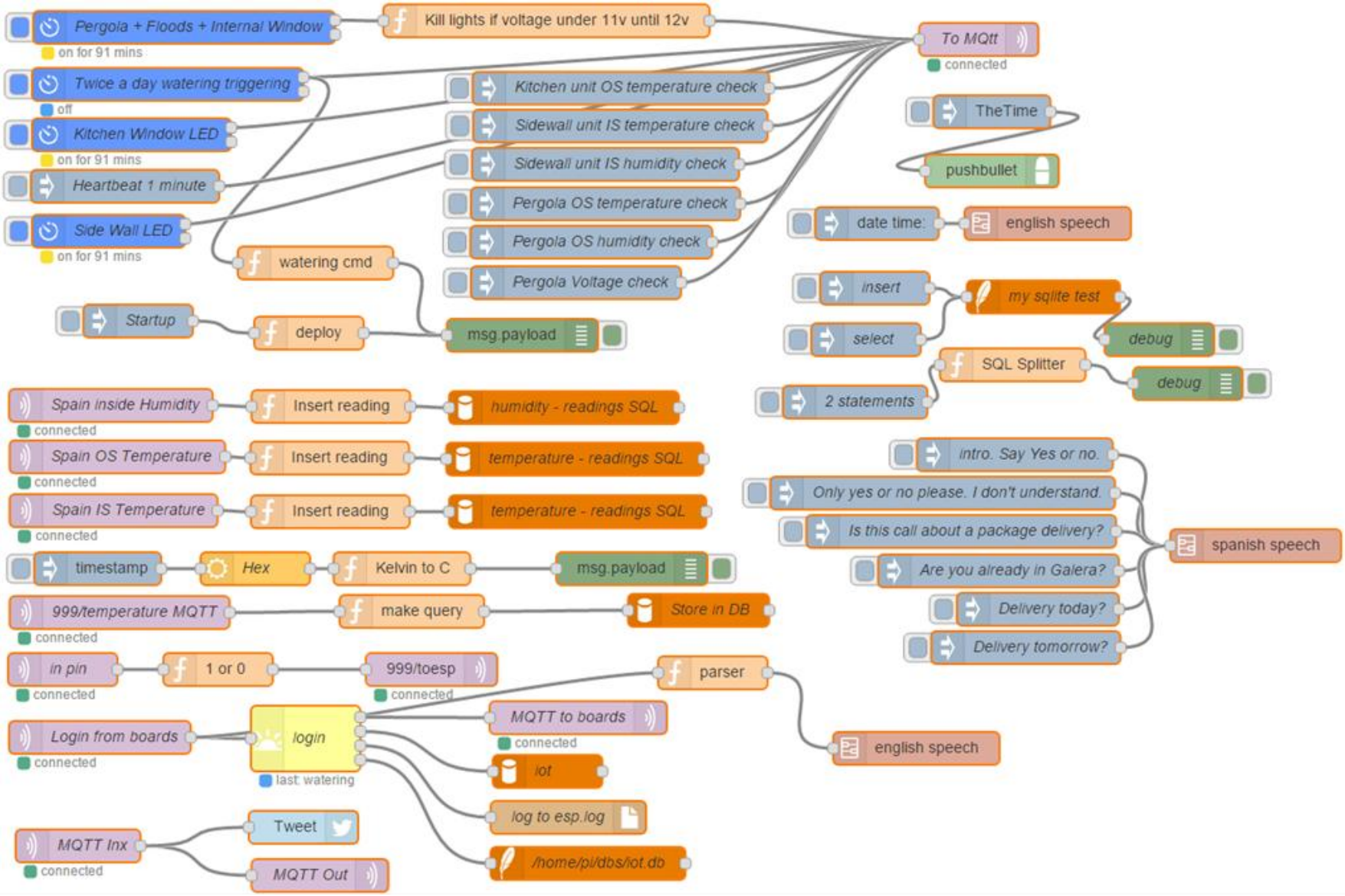


Popular Software

NodeRED

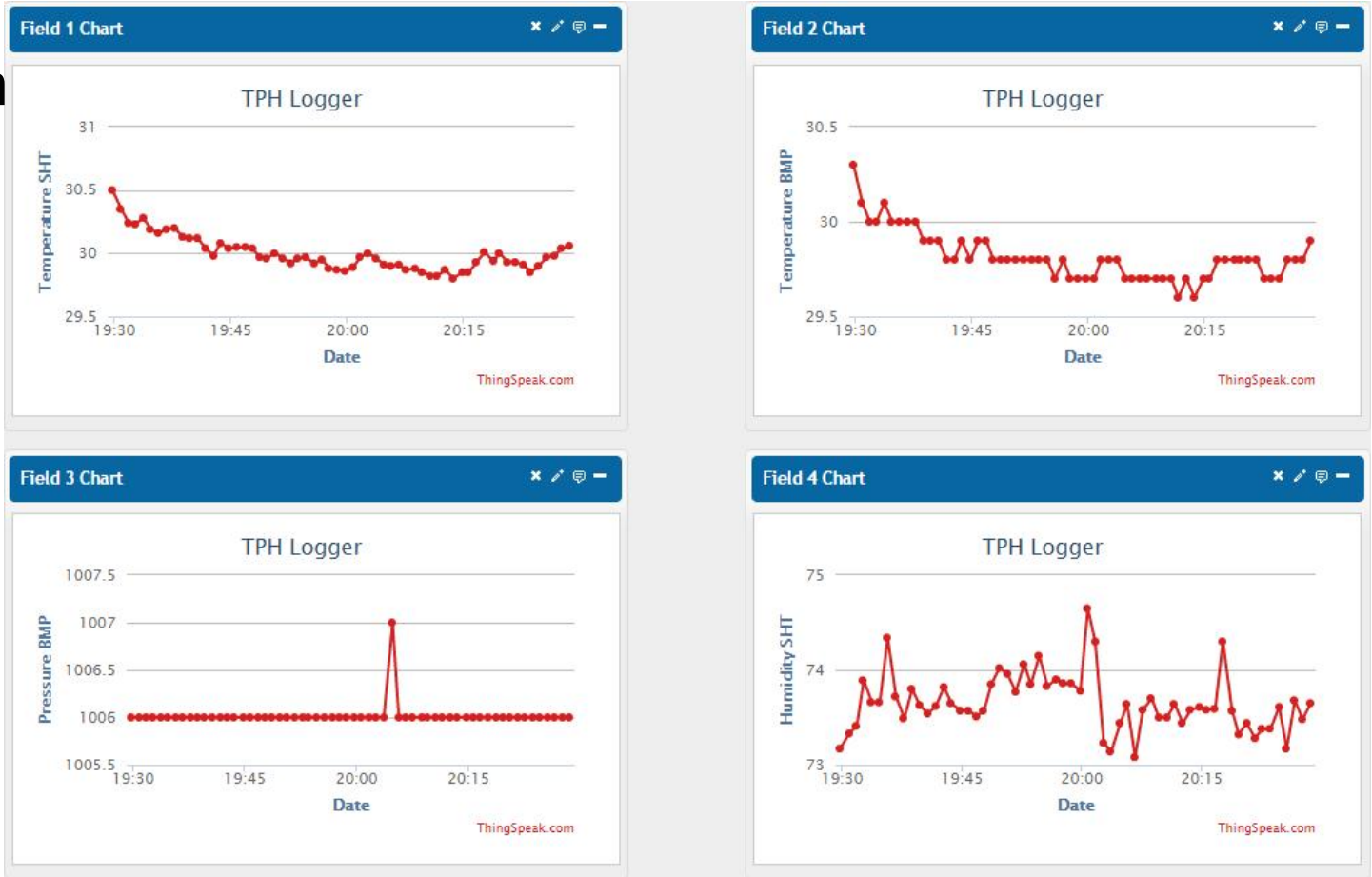
- Design flows
- Java Script
- Dashboards



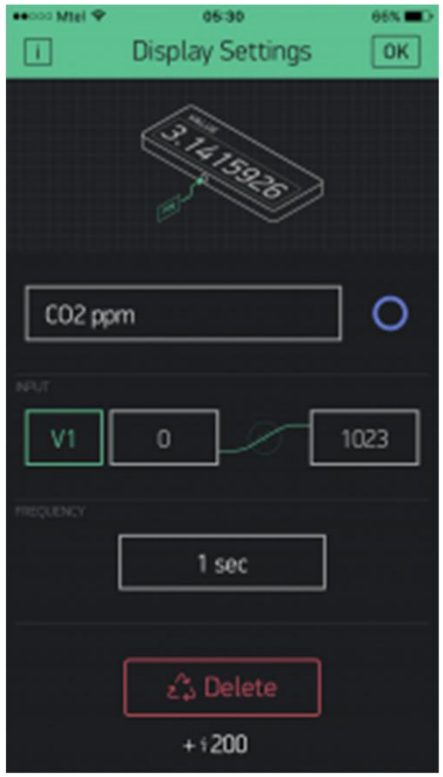

Pergola + Floods + Internal Window
on for 91 mins
Kill lights if voltage under 11v until 12v
To MQtt
connected
Twice a day watering triggering
off
Kitchen unit OS temperature check
TheTime
Kitchen Window LED
on for 91 mins
Sidewall unit IS temperature check
pushbullet
Heartbeat 1 minute
Sidewall unit IS humidity check
Pergola OS temperature check
date time:
english speech
Side Wall LED
on for 91 mins
Pergola OS humidity check
watering cmd
Pergola Voltage check
insert
my sqlite test
Startup
deploy
msg.payload
select
debug
SQL Splitter
debug
2 statements
Spain inside Humidity
connected
Insert reading
humidity - readings SQL
intro. Say Yes or no.
Spain OS Temperature
connected
Insert reading
temperature - readings SQL
Only yes or no please. I don't understand.
Spain IS Temperature
connected
Insert reading
temperature - readings SQL
Is this call about a package delivery?
spanish speech
timestamp
Hex
Kelvin to C
msg.payload
Are you already in Galera?
999/temperature MQTT
connected
make query
Store in DB
Delivery today?
Delivery tomorrow?
in pin
connected
1 or 0
999/toesp
connected
parser
Login from boards
connected
login
last watering
MQTT to boards
connected
english speech
iot
log to esp.log
MQTT Inx
connected
Tweet
MQTT Out
/home/pi/dbs/iot.db

Thingspeak

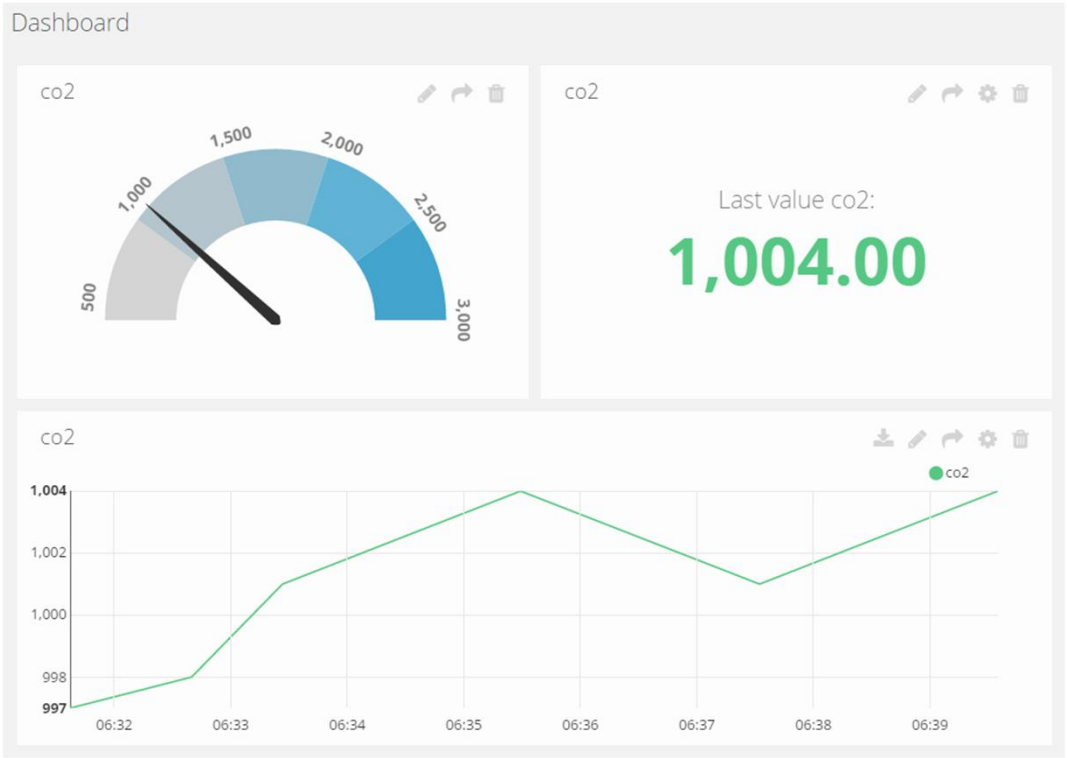
- Easy integration
- Lots of display options



Blynk – Arduino to Mobile - https://blynk.io



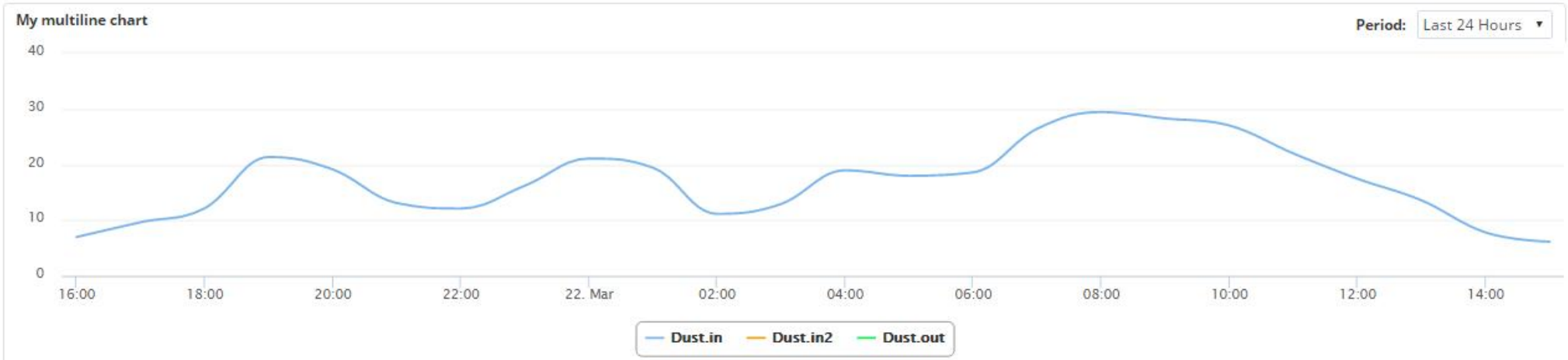
Ubidots – IoT Dashboards

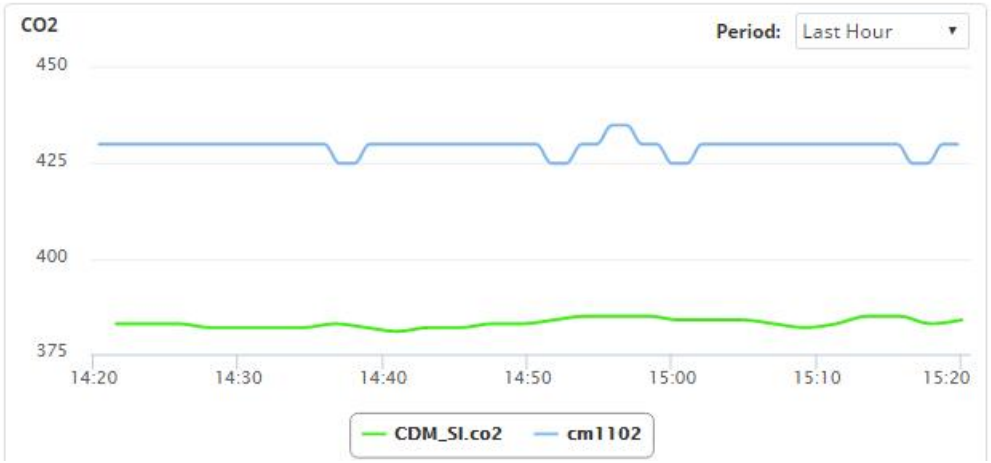


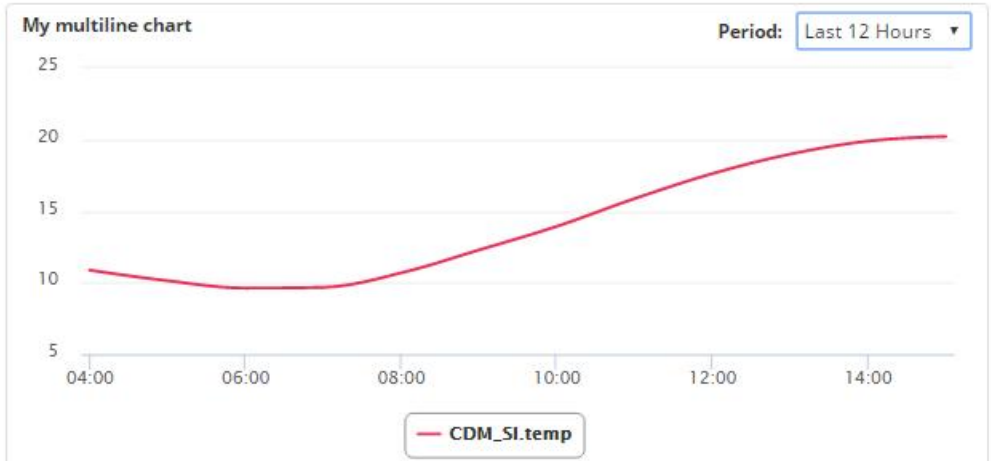
Dust Monitors

vlast3k Public *Created: January 20th 2017* Views: 783

BeeBotte







Popular Hardware

Sonoff

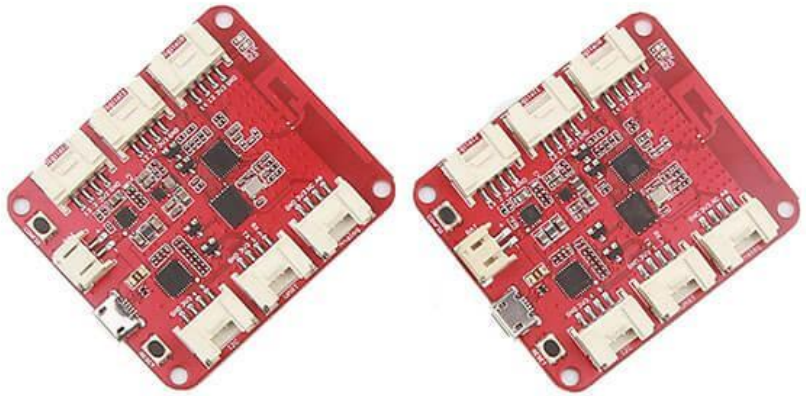
- https://www.itead.cc/search/result/?cat=&q=sonoff

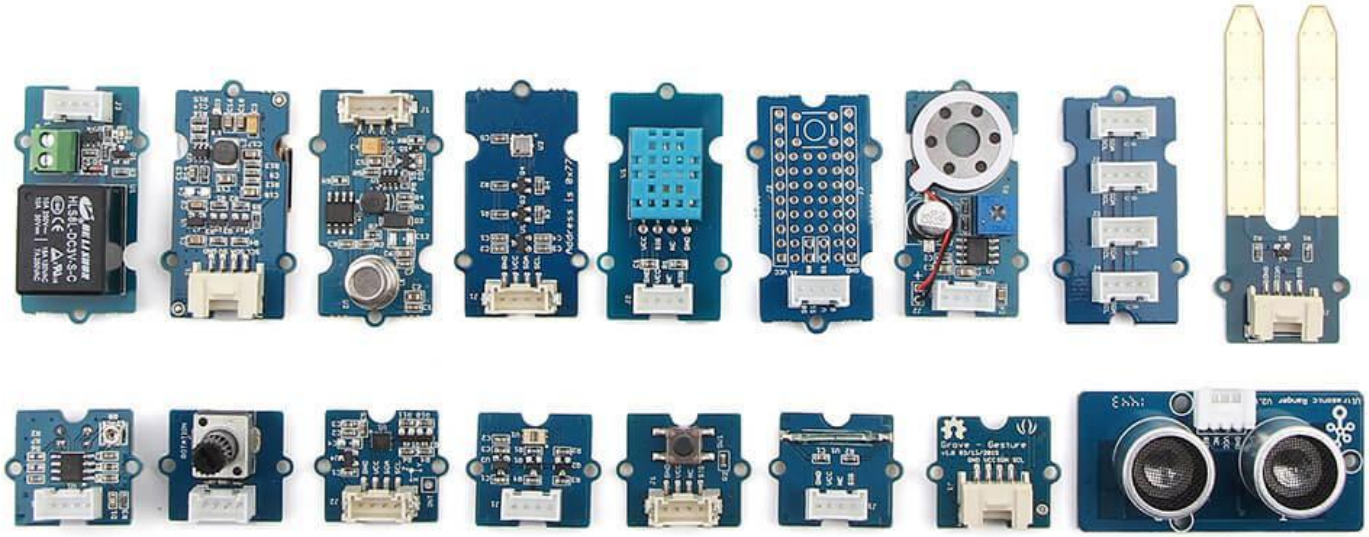
Broadlink

Touch the future
TC2 Fire-new updating
Smartphone/Panel Control & One-button Configuration
TC2 makes light controlling easier and more user-friendly.

Contros
Wi-Fi Smart Plug/Timer
Smarter, but smaller!
Contros is a Wi-Fi timer that enables you to set timer and turn on/off your home appliances by iOS/Android phone anytime from anywhere
Lamp
ON

Grove / Wio Link





Xiaomi