PIONIX

EVerest

A Game-Changer in EV Charger Compatibility

me

Robert de Leeuw
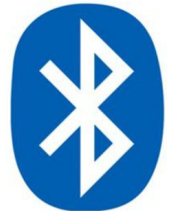
Technology EVangelist

EV Charging Protocol Specialist
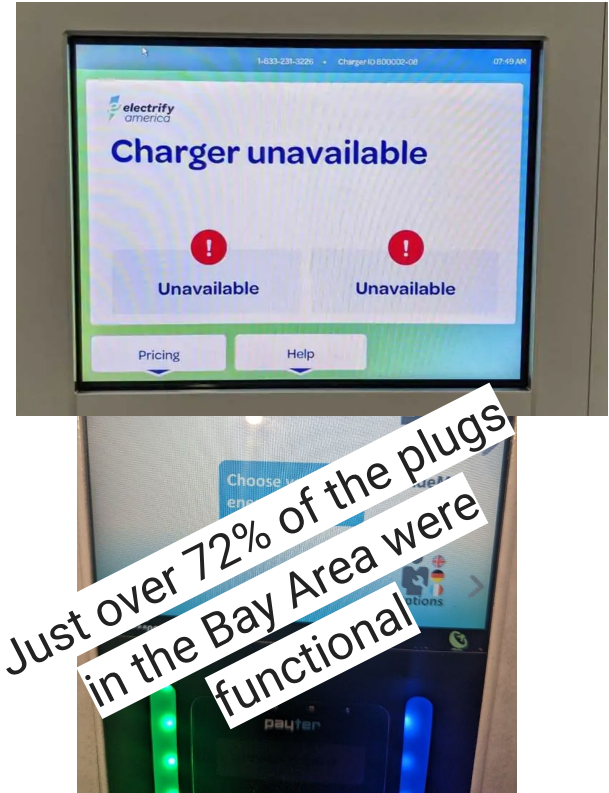
Working @ PIONIX since jan-2023

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Charging a car is easy RIGHT?

ONE DOES NOT SIMPLY

PLUG IT IN AND IT CHARGES

imgflip.com

electrify
america

Charger unavailable

! Unavailable

! Unavailable

Pricing   Help

Just over 72% of the plugs in the Bay Area were functional

https://insideevs.com/news/388501/electrify-america-discusses-network-problems/

EV Charging Party: lots of parties, lots of protocols

Standards and protocols:
Status quo ...and future

Roaming

AR-E 2829-6 (EEBUS)
AR-E 2122-1000
IEC 63380

HEMS

AR-E 2829-6 (EEBUS)

IEC 61851
DIN SPEC 70121
ISO 15118
ISO 15118-2
ISO 15118-20

Electric vehicle

Charging station

OICP
OCPI
eMIP
OCHP
IEC 63119

Grid

IEC 61850

IEC 62746-10-1 Ed 1 (OpenADR)
OSCP
IEC TR 61850-90-8
IEC 63382

OCPP
IEC 63110

CPO
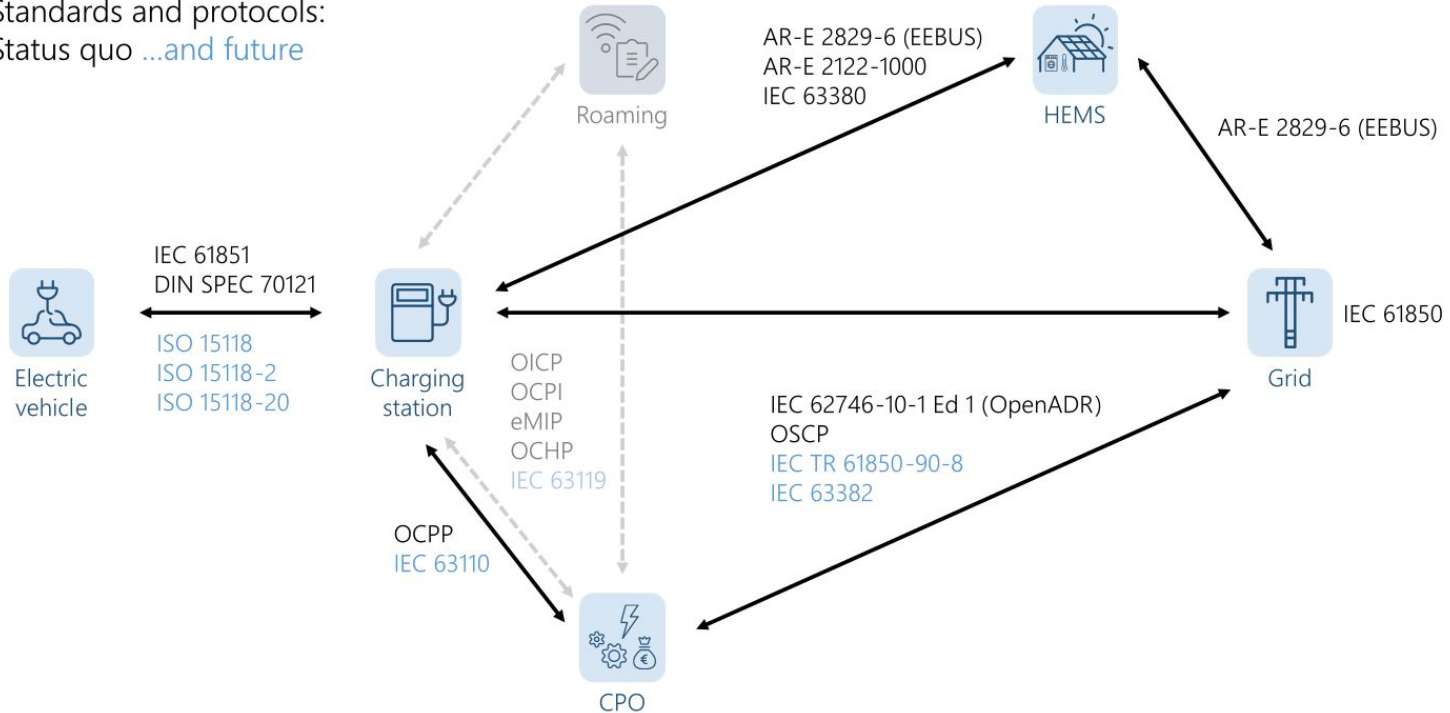
CPO: Charge point operator, HEMS: Home energy management system

https://www.ffe.de/en/publications/normenlandschaft_fuer_die_elektromobilitaet/

(Almost) a wonder DC charging works

IEC61851
- Simple Pulse Width Modulation (PWM) of 1kHz between 0V-12V
- Voltage level manages states
- Duty cycle manages maximum current
- Minimum amount of information exchanged


ISO15118 / DIN-SPEC70121
- Powerline Communication (PLC) modulated on top of PWM
- Enables High Level Communication
- Transport over TCP/IP IPv6
- SLAC for EV and EVSE matching
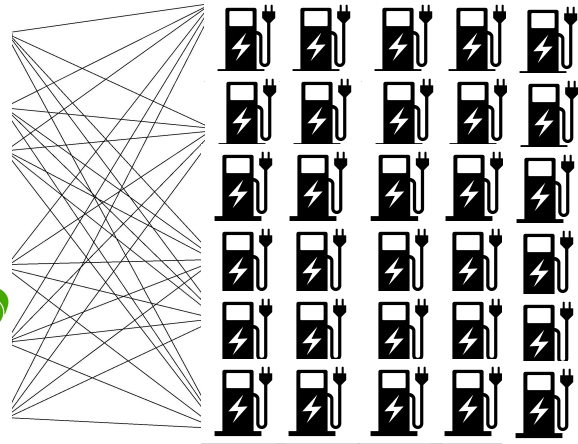- EXI encoding and decoding of ISO15118 messages (binary XML Format)
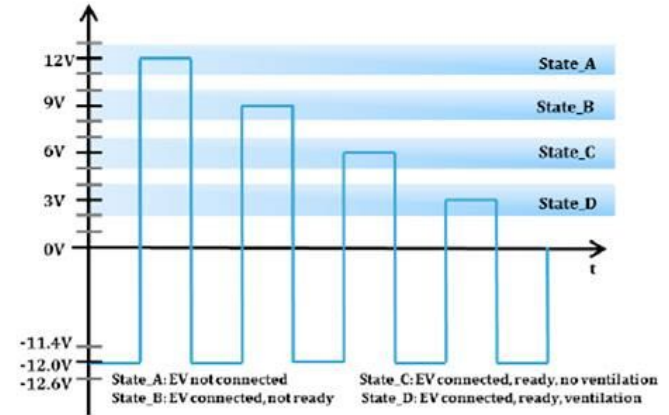
Too many variants: impossible to test

- Estimated EV Brands: 50
- Estimated EV Charger Manufacturers: 200 – 300
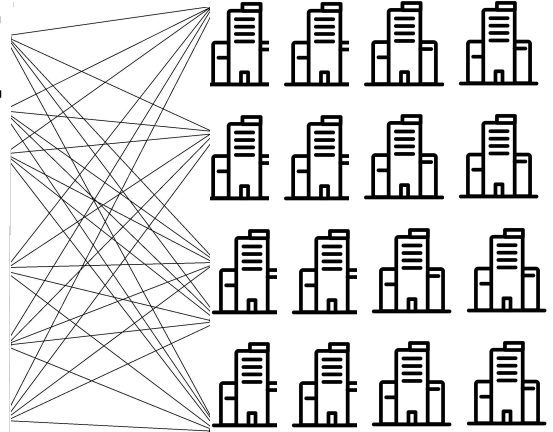- Estimated Charge Point Operators: 1000 in Europe alone
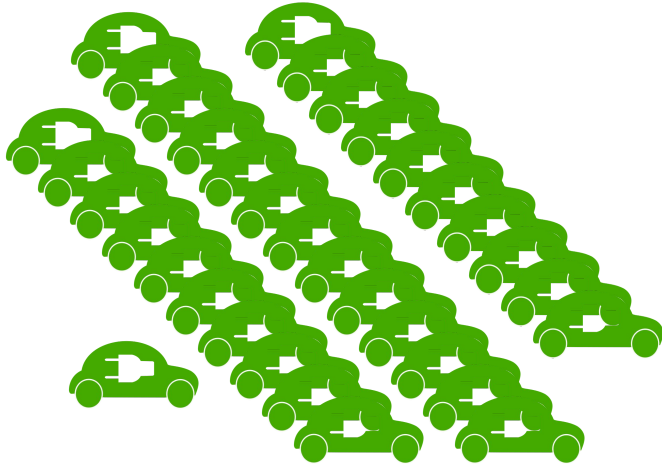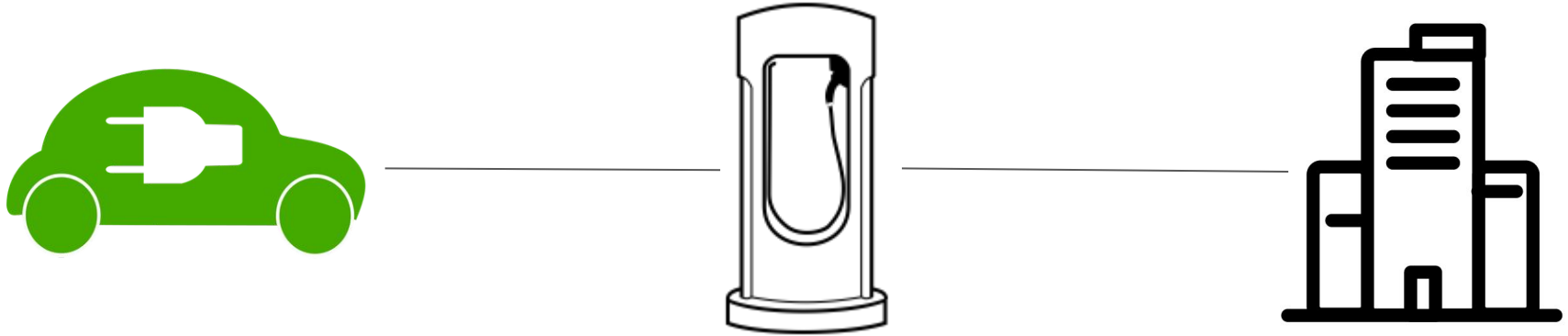
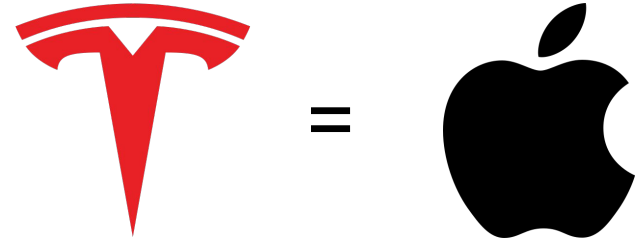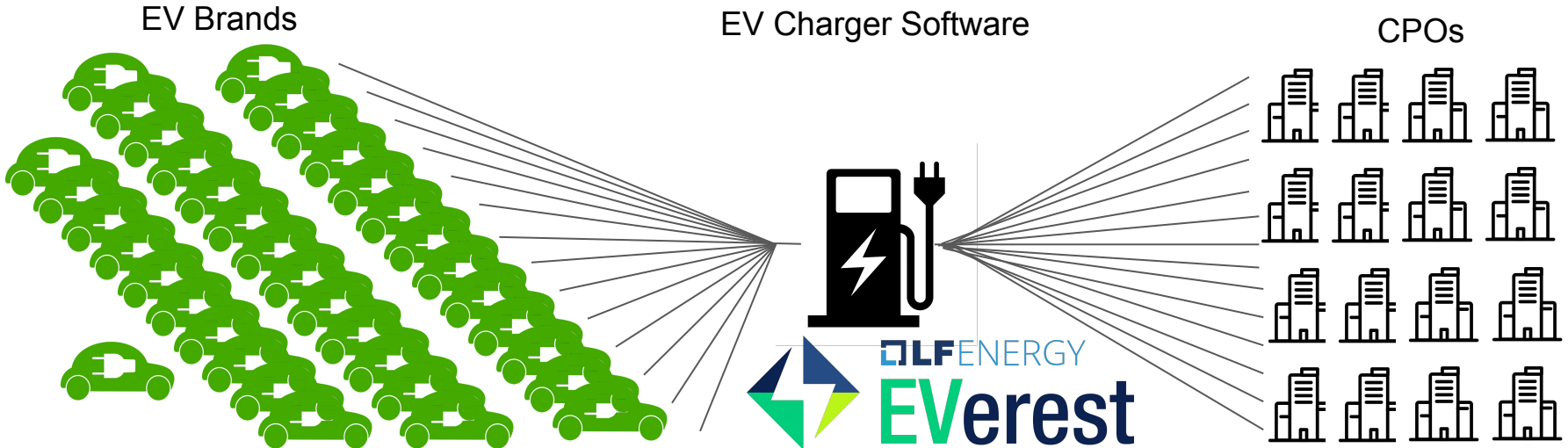EV Brands

EV Charger Manufacturers

CPOs

But Tesla makes it look so easy?

- 1 EV Manufacturers: Tesla
- 1 EV Charger Manufacturers: Tesla
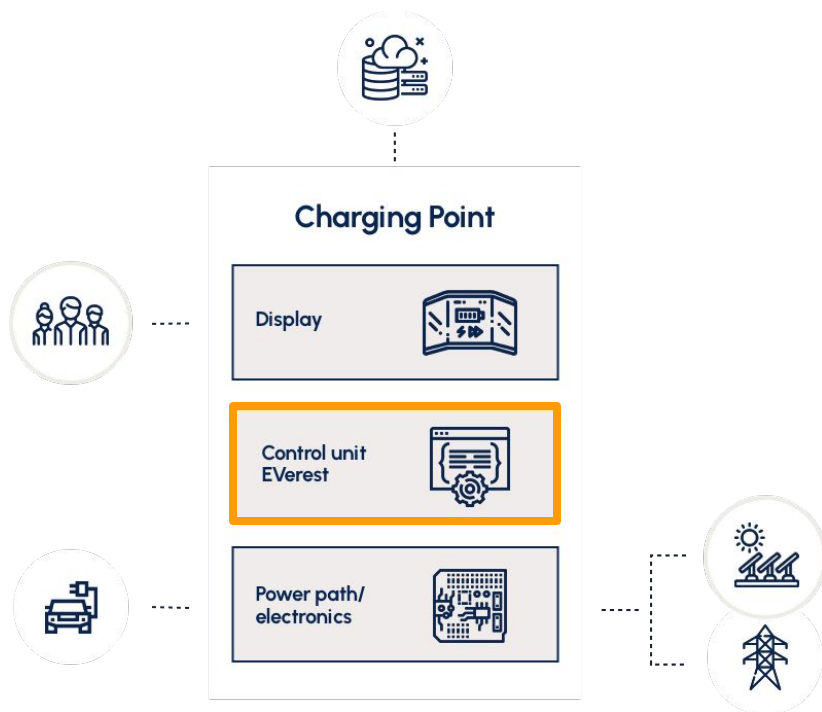- 1 Charge Point Operators: Tesla

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How to solve this: limit the variants

- Estimated EV Brands: 50
- EV Charger Software Stacks: 1
- Estimated Charge Point Operators: 1000 in Europe alone

EV Brands

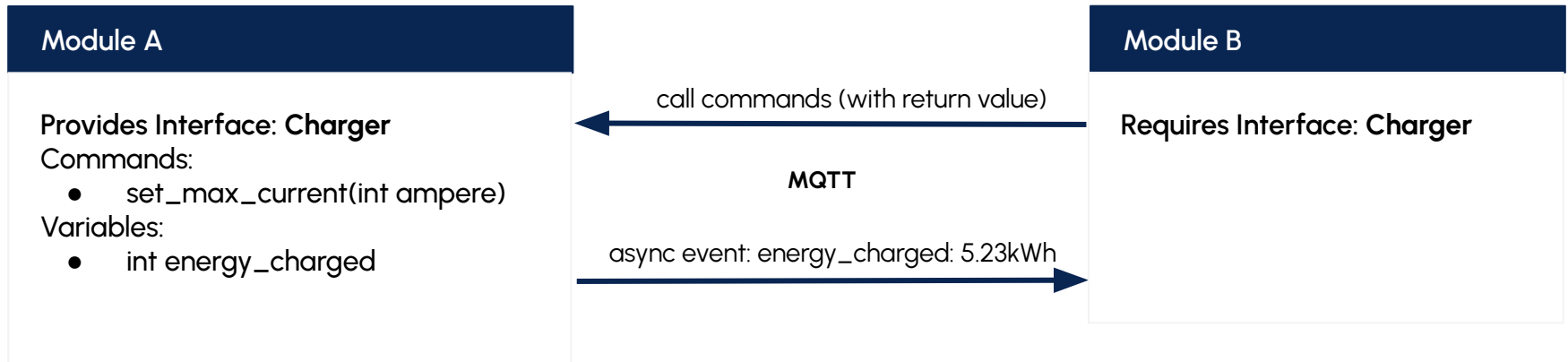EV Charger Software

CPOs

LF ENERGY

EVerest

What is EVerest?

Charging Point

Display

Control unit EVerest

Power path/ electronics

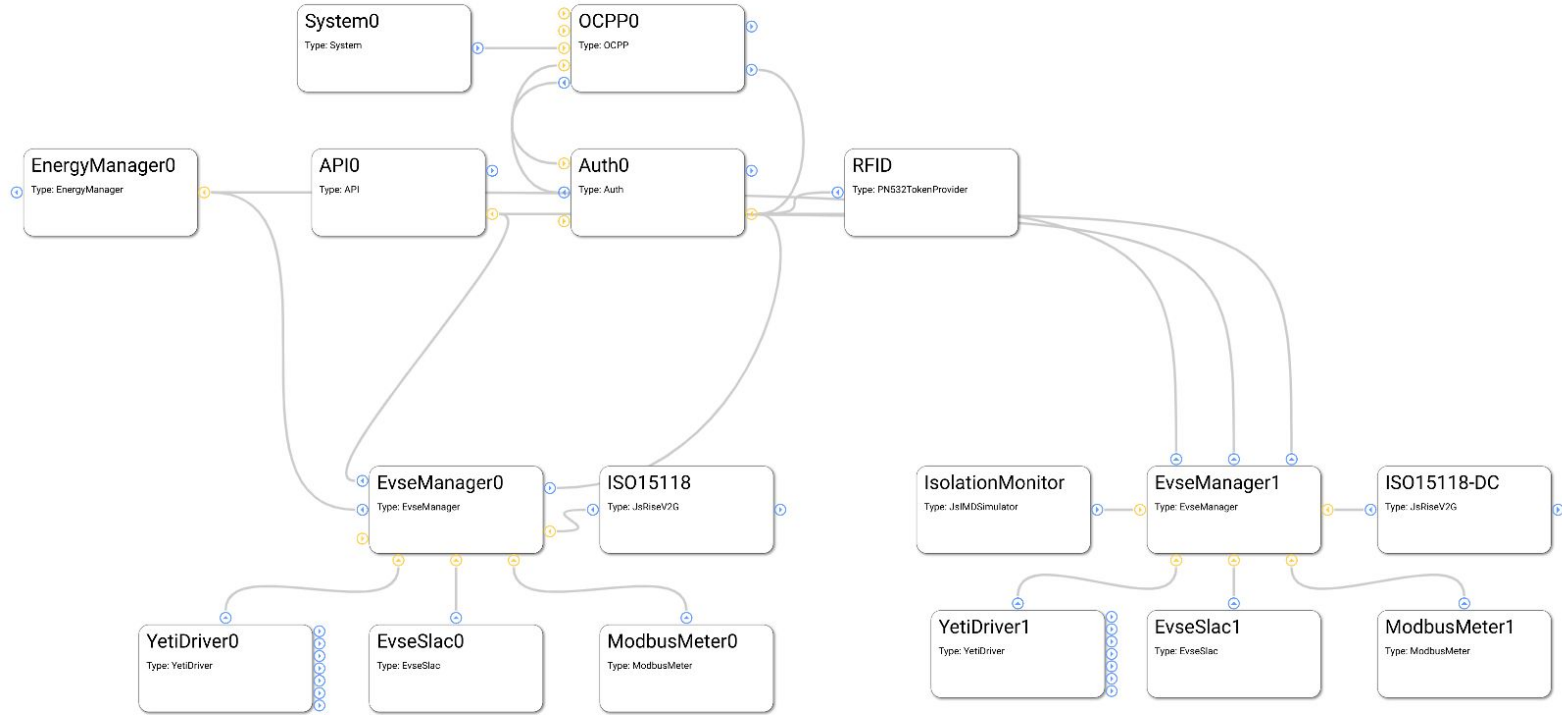**EVerest** is a **complete Operating system** for EV Chargers.

- Implements all standards running on a charger
- Runs on tiny embedded linux
- Aims to support as many different HW platforms as possible
- Provides all functionality needed from smart home chargers to commercial fast chargers
- Commercial friendly open source (Apache 2.0 licensed)
- Modular
- Don't reinvent the wheel

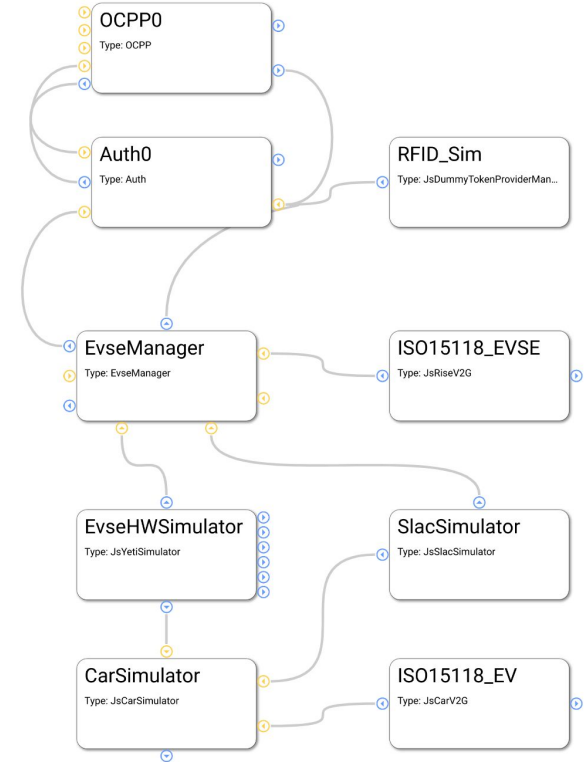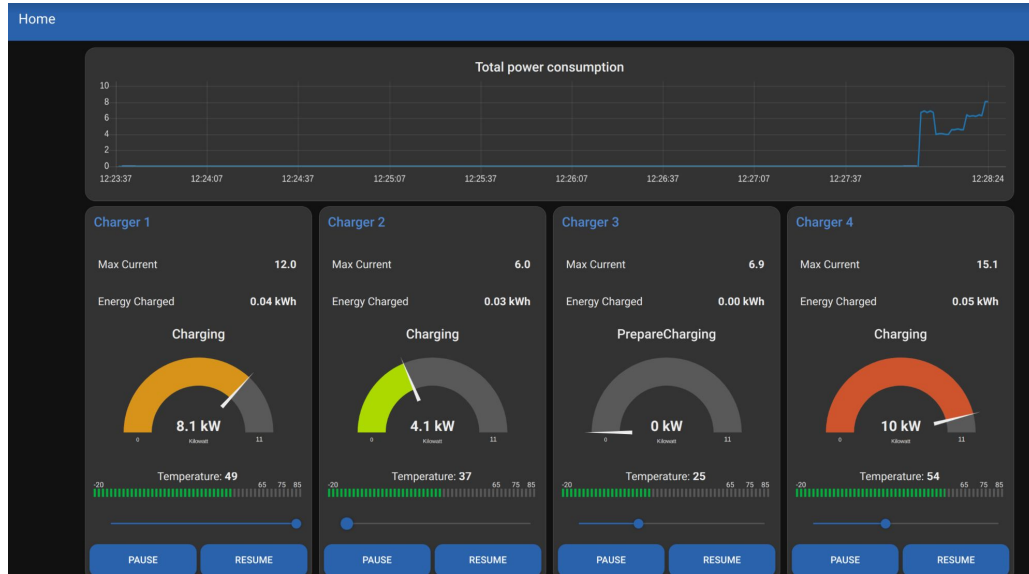# The EVerest framework: *a flexible microservice architecture*

- Modules are individual Linux processes
- Modules expose (multiple) interfaces over MQTT
- Config file to connect module requirements/interfaces
- Framework starts/stops/restarts modules

- Communication via MQTT broker, transparent to modules
- Loose coupling: A does not know B, B does not know A
- Framework manages synchronous RPC, argument type safety, dependency checking

Module A

Provides Interface: Charger
Commands:
- set_max_current(int ampere)

Variables:
- int energy_charged

call commands (with return value)

MQTT

async event: energy_charged: 5.23kWh

Module B

Requires Interface: Charger

The EVerest visual config builder

Running EVerest as a simulator

How to get involved

Check out the code: https://github.com/EVerest
Hardware designs and microcontroller firmware: https://github.com/orgs/PionixPublic/repositories

EVerest Mailing list: https://lists.lfenergy.org/g/everest
EVerest project page on Linux Foundation Energy: https://www.lfenergy.org/projects/everest

Quick start guide: https://everest.github.io/general/quick_start_guide.html

Technical Steering Committee (TSC): Follow the evolution of EVerest, get involved, open to all!
    Every 4th thursday of the month, announced via mailing list
    Recordings available on YouTube: https://www.youtube.com/@lfe_everest

Weekly Tech Sync – Join the developers and start contributing
    Every Tuesday 10am -11am CET, meeting link via mailing list