An Open Source OS For Charging Infrastructure: Why One Stack Should Charge Them All

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PIONIX

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State of EV charging
Many different charging station manufacturers

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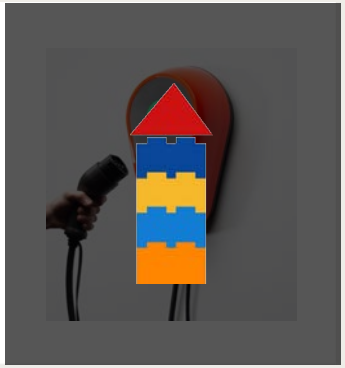
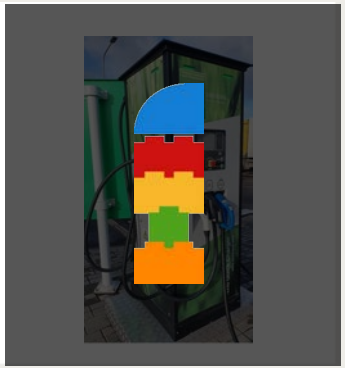
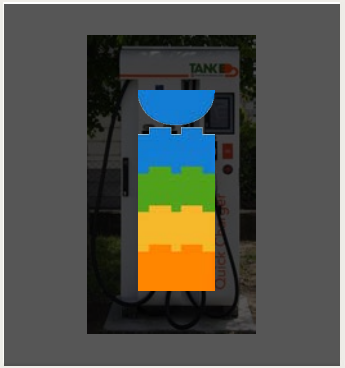
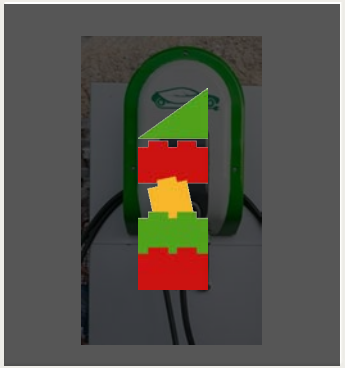
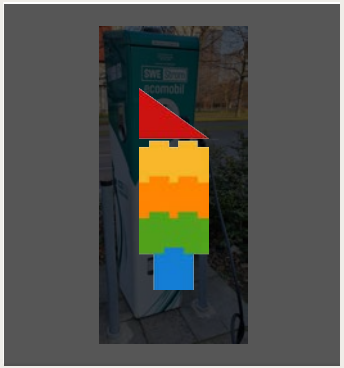
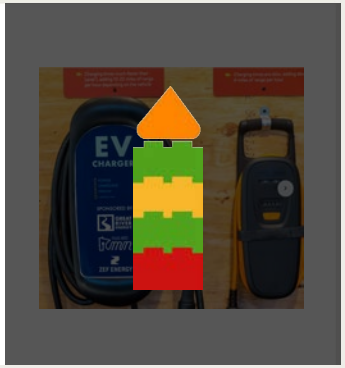
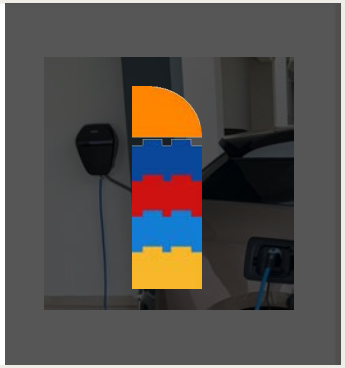
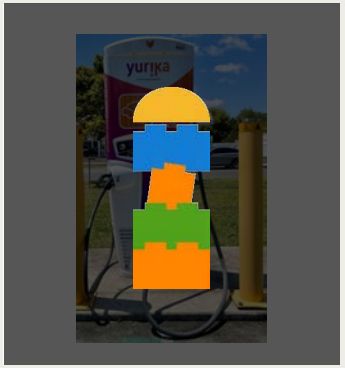
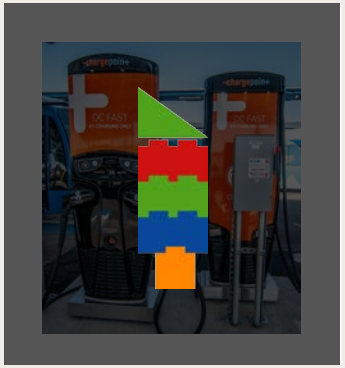
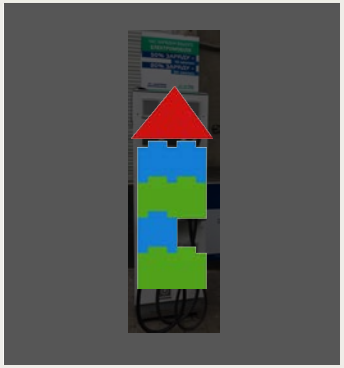
All chargers work differently

Different implementations and complex software patchwork hinders interoperability

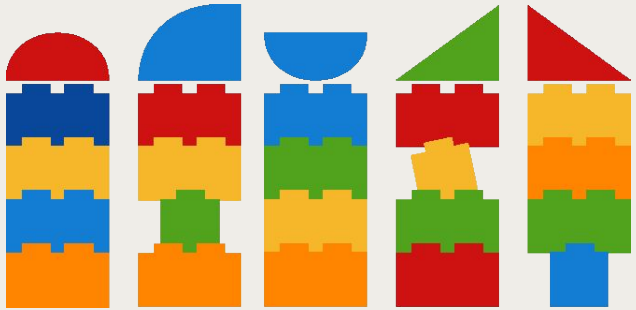




Fixing the ecosystem

- **Compatibility Nightmare**
  Car ⇔ Charger ⇔ Cloud / Grid / Solar
- **Wasting of resources** on commodity software
- **Hard to maintain interoperability**

Individual proprietary solutions
without sharing



Fixing the ecosystem
Building (on) a shared base layer

- ↯ **Compatibility Nightmare**
  Car ⇔ Charger ⇔ Cloud / Grid / Solar
- ↯ **Wasting of resources** on commodity software
- ↯ **Hard to maintain interoperability**

- ➢ Compatibility through **shared codebase**
- ➢ Development focus now on **USPs and innovation**
- ➢ **Easy to maintain**, updates and fixes through community

Individual proprietary solutions
without sharing

Standardized **base layer** with
individual value add

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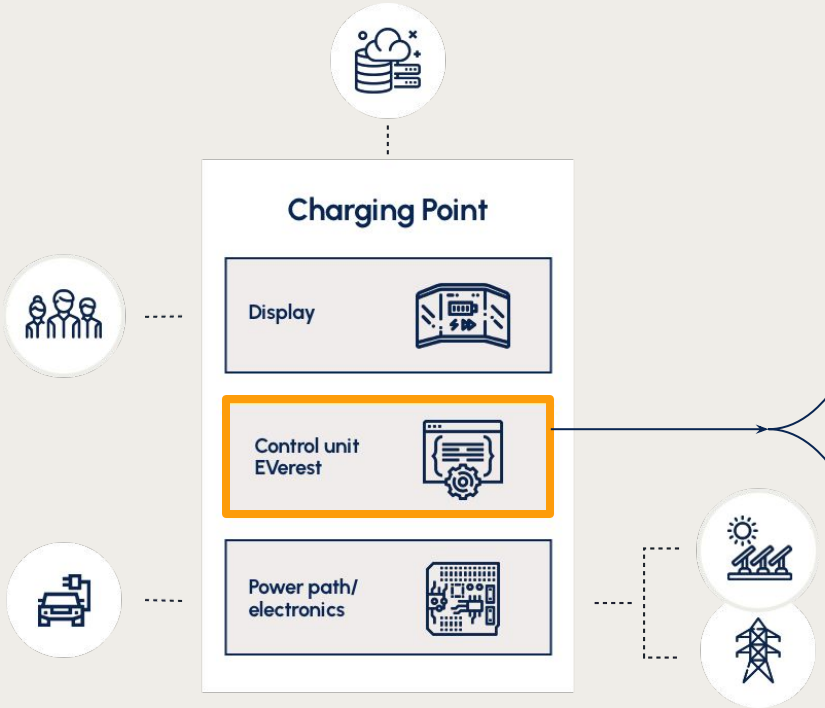
What is EVerest

A versatile software stack for any type of charger

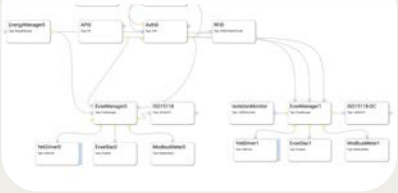


Customizable for **any use cases**
e.g.

Simple AC or DC Charger

SW-in-the-loop testing

AC+DC Hybrid Charger



Site Energy Mgmt

Distributed charging park

more: https://youtu.be/OJ6kjHRPkyY

EVerest - the **complete** seamless software stack
Not just a bunch of single protocols...

EVerest can be easily customized and extended. **Already available:**

Charging standards & protocols

- IEC61851/SAE J1772 Basic PWM Charging
- ISO15118-2 AC and DC
- BiDi: SAE J2847/2
- DIN SPEC 70121 DC
- SLAC
- DC: Isolation monitoring support
- AC/DC: Powermeters
- Type 1 J1772, Type 2, CCS Combo Type 1, CCS Combo Type 2, NACS/Tesla

OCPP & External Backends

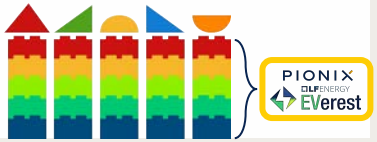
- OCPP 1.6J with all optional profiles
- OCPP 1.6 Plug and Charge (AC+DC)
- OCPP 2.0.1 / 2.1 basic functionality
- Autocharge
- Authentication management with multiple providers/validators
- System management (reboot, upgrade, ...) e.g. via OCPP

External devices

- External API / UI interface
- Sunspec + Modbus

Tools & Features

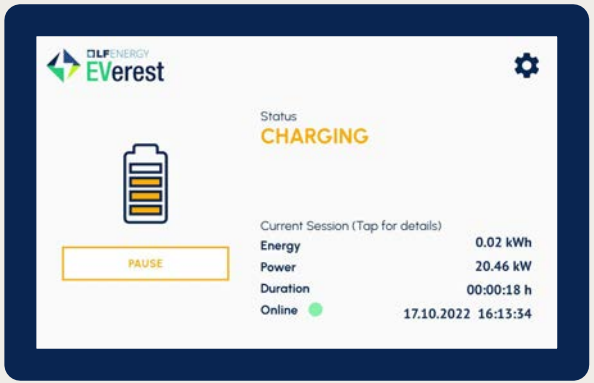
- Basic Energy Management
- Display app based on Flutter / Node Red
- Software in the Loop simulations of HW and Cars



2024 Roadmap -

Priorities depending on Community priorities:

- All further OCPP 2.0.1 / 2.1 profiles and options
- ISO15118-20
- Dynamic (and remote) connections / dependencies
- Advanced Energy Management
- IEEE 2030.5
- ADR
- EEBus



Open Source Governance

EVerest was selected as an official Linux Foundation Energy project

LF ENERGY by THE LINUX FOUNDATION

PIONIX is part of the **Linux Foundation** to promote **EVerest** within LF Energy's collaborative community of open source enthusiasts.

The **Linux Foundation** is the largest open source non-profit organization worldwide, a forum to align interests, quality assurance, networking, marketing, politics, etc.

LF ENERGY EVerest

Linux Foundation Energy governs EVerest
As a subgroup and part of the Linux Foundation, **LF Energy** is focused on the **power systems** sector.
LFE's goal is to build the shared digital investments that will **transform the world's relationship to energy**.

In this context EVerest was selected to be the go-to solution in the cluster of **EV charging**.

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PIONIX initiated EVerest and donated it to the open source community.

PIONIX is still bootstrapping and **coordinating** the project, steering the roadmap, filling gaps, **supporting commercial vendors** with added services.

Linux Foundation benefits

Experienced and well-established: More than 1000 industrial members collaborating on SW

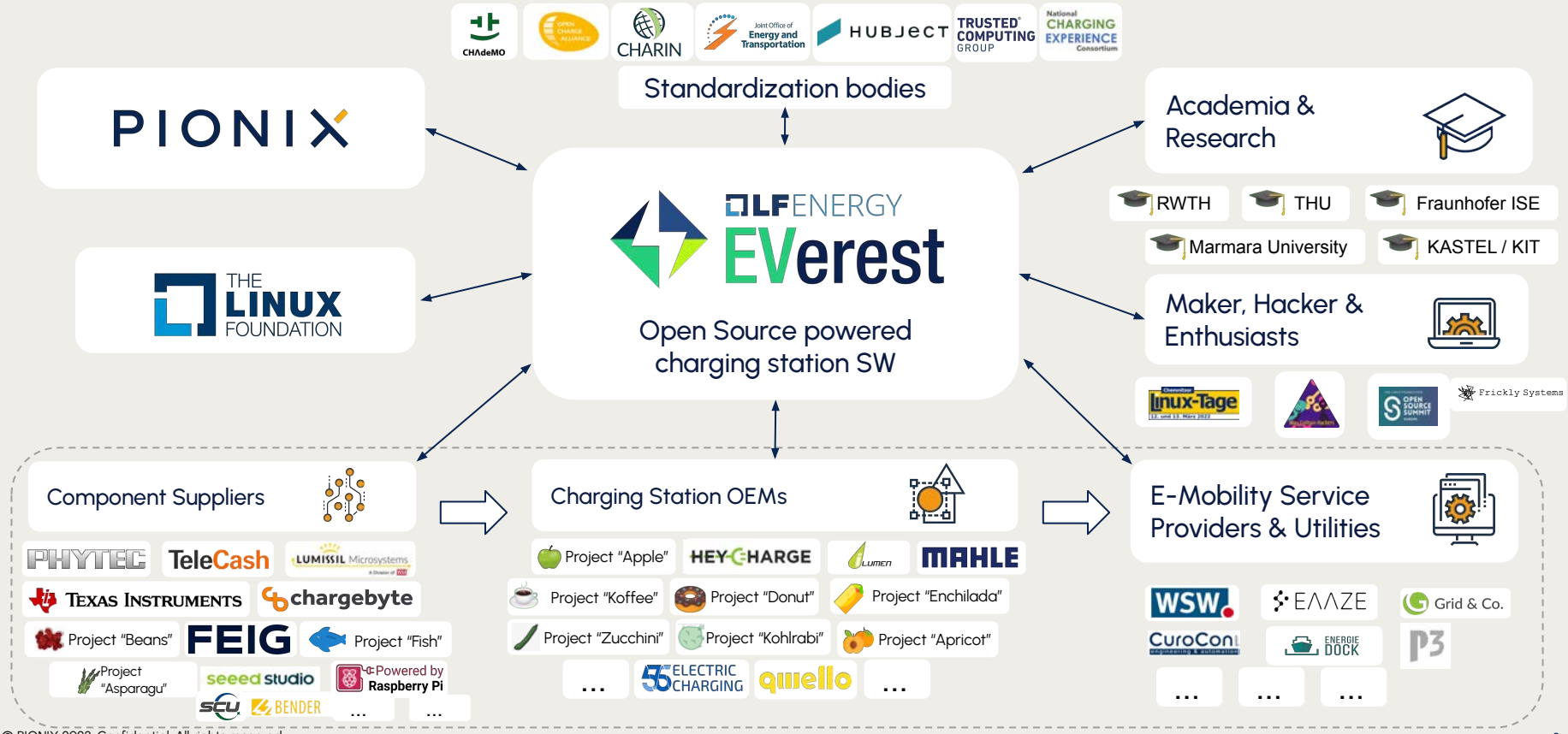
Linux Foundation Values:

- **Neutral**: SW project governance by neutral non-profit organization
- **Fair**: Non-discriminating access to steering committees
- **Non-competitive**: Safe antitrust laws compatible processes
- **Accessible**: Ensuring a safe and harassment-free environment for minorities

Linux Foundation Neutral Management:

- Provide legal backoffice
- **Automatic code scans** for licence violations
- IP contribution process to **prevent patenting issues**
- Provide **home for IP** assets
- Define a **governance** structure for **decisions**
- Separate **business** decisions from **technical**
- Curate **sense of identity** superseding individuals or firms
- **Maintain** IT infrastructure

EVerest by PIONIX is an open source charger SW
for a broad community of active partners and customers



What advantages does EVerest have for CPOs?

Interoperability:

- If all chargers use EVerest
    - All chargers will have an uniform implementation of standards like: OCPP, ISO 15118, IEC 61851, DIN-Spec.
    - More standardized OCPP 2.0.1 device management

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Less variants means better interoperability
Imagine a world where all chargers run EVerest

OEMs only need to test against EVerest

With so many variants in protocol implementation it is almost a wonder that charging works at all.

When the majority of chargers use EVerest, OEMs only need to test their vehicle software/systems with EVerest.

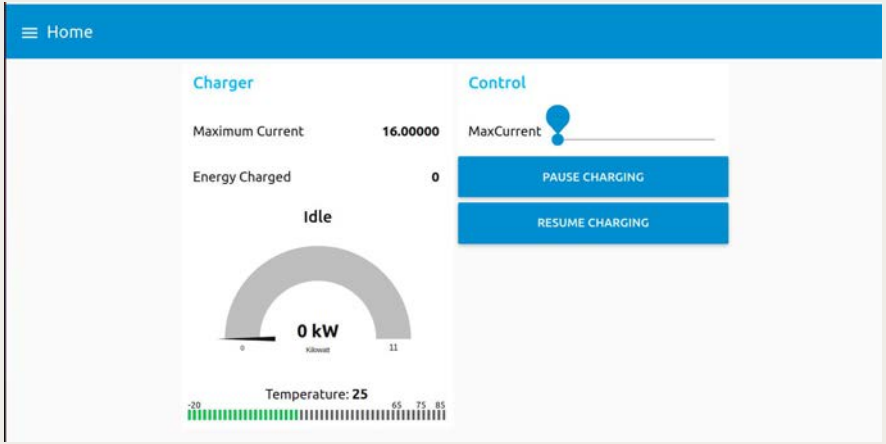
Need to push innovation to broad public infrastructure?

OEMs can add support for corner use cases, that are not supported by commercial protocol stacks.

What advantages does EVerest have for Research and Academia?

Simulation:

- EVerest can be run as simulator:
  - A lot of CPOs/CPMS developers have built their own rudimentary charger simulator
    - Needs to be kept updated.
    - Never behaves as a real charger.
  - EVerest is kept up to date by the community.
- Simulate any type of charger:
  - 1 socket or multiple sockets
  - AC or DC
  - ISO 15118
- Has a rudimentary EV simulator
- Is open source: can be improved/extended



https://everest.github.io/nightly/tutorials/run_sil/index.html

Dev kits for Rapid Development & Testing

PIONIX BelayBox

The PIONIX BelayBox is a complete 11/22kW AC charging station designed for Developers. It comes with EVerest pre-loaded and gets you started within minutes:

All in a wall-mountable IP44 case with metal cable holder.
Full spec sheet available here

100% open source: Hardware, Firmware and EVerest stack!

PIONIX uMWC *(in development)*

The PIONIX microMegaWattCharger is a portable, battery power DC Charging protocol tester. Runs EVerest with a testing application. Test vehicle interoperability with EVerest. Supports ISO 15118 & DIN SPEC 70121. Capable of generating up to 1000V.

Cannot not deliver power.

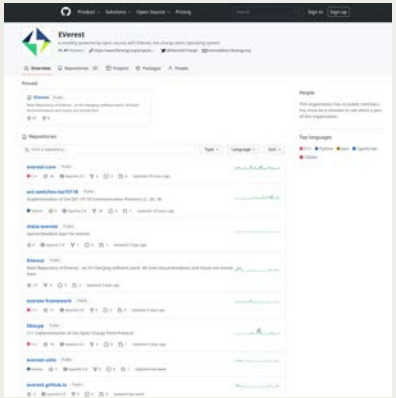
Get in touch
and start with EVerest

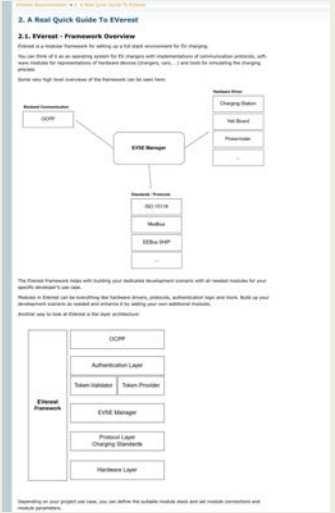
EVerest resources

- **GitHub** - Check out the code and other helpful things like our documentation
  https://github.com/EVerest
- **Webinar #1 EV Charging Pioneers - How the EVerest ecosystem will simplify charging use cases**
  https://www.youtube.com/watch?v=OJ6kjHRPkyY
  More webinars upcoming - if you would like to learn more about specific topics, let us know!
- EVerest **Mailing list**: Get updates about upcoming events and news and join the discussion about EVerest
  https://lists.lfenergy.org/g/everest
- EVerest **project page** on Linux Foundation Energy: Overview with links to most ressources
  https://www.lfenergy.org/projects/everest/
- **Quick start guide**: Everything to get EVerest up and running:
  https://everest.github.io/general/quick_start_guide.html
- Technical Steering Committee (**TSC**): Follow the evolution of EVerest closely, get involved, open to all!
  Every 3rd thursday of the month, next instance & meeting link announced via mailing list
- Weekly Tech Sync - Join the developers circle and start contributing
  Every Tuesday 16am -17am CET, meeting link via mailing list
- ***OpenHW*** *available from PIONIX*
  https://github.com/PionixPublic/reference-hardware

  Follow us on LinkedIn to get all updates around EVerest and industry news:
  linkedin.com/company/pionix-gmbh

  https://pionix.com





CHARGED
VIRTUAL CONFERENCE

EV INFRASTRUCTURE

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