SUNSPEC ALLIANCE

LF ENERGY EVerest

WEBINAR:

OPEN STANDARDS FOR EV CHARGING INFTRASTRUCTURE

Wednesday, March 25th

9:00am PST/12pm EST

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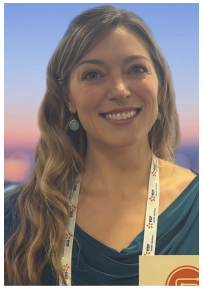
LF ENERGY

Your webinar hosts today

Dr. Marco Möller
TSC Char @ EVerest
Board Member @ LFE
Co-Founder/CEO @ Pionix

Rolf Riemenschneider
Head of Sector IoT
@ European Commission

Piet Gömpel
Sen. Architect @ Pionix



Erin Mahan
VP of Membership and Regulatory Affairs @ SunSpec Alliance

Agenda

- Welcome & Introductions
- **Standards Landscape**
  (Erin Mahan, SunSpec)
- **Defining the space and introduction to EVerest**
  (Dr. Marco Möller, LF Energy)
- **What we can do together & White Paper introduction**
  (Piet Gömpel, Pionix)
- **The importance of Open Source and EU standardization processes**
  (Rolf Riemenschneider, European Commission)
- Call to Action
- Q&A Session

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Standards Landscape

Two Layers of Grid Control: Market vs. Device

From Market Signal to Device Action

- **OpenADR = Market & orchestration layer**
  - Single purpose: it controls real power. It can ask for more or curtail.
  - Enables the market: ends signals such as curtailment requests, pricing, and event-based commands
  - Optimized for **aggregation, scheduling, and grid programs**
- **Secure SunSpec Modbus = Device control layer**
  - Direct communication with inverters and DER hardware
  - Executes **precise electrical commands**
  - Controls:
    - Real power (curtail / increase)
    - Reactive power (VAR control)
    - Voltage regulation
    - Frequency-watt behavior

OpenADR decides *what should happen*.

Secure SunSpec Modbus executes *how it happens physically*.

Working Together in Practice

Grid Operator → OpenADR → Aggregator / Controller → SunSpec Modbus → EVSE / DER

- OpenADR requires encryption.
  Secure SunSpec Modbus covers this need.

  Prepare your product for
  Cyber Resilience Act compliance.
  Download the specification here!

- In a **bidirectional charging** scenario: OpenADR can't modulate voltage, if the grid operator needs to do this, IEEE 2030.5 is the only choice.

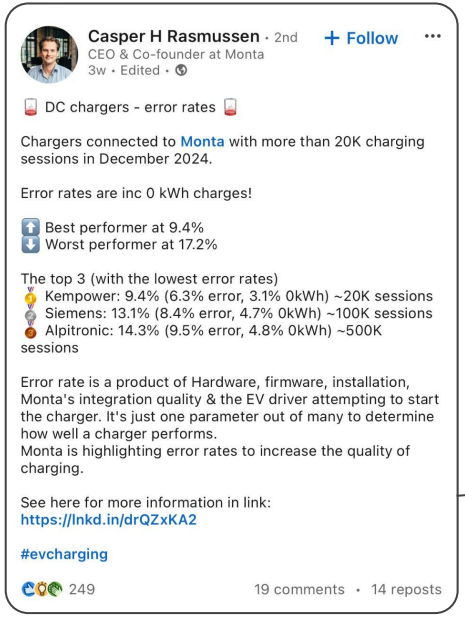
- **SAE J3068 (medium- and heavy-duty charging)** specifies **IEEE 2030.5**
  - Simple curtailment may suffice for small systems, but high-power charging requires precise, multi-variable control.
  - Long-haul trucking is electrifying!

EVerest:

the Base Layer for EV Charging

Why 10-25 % of Charging Sessions Fail

And so far no one is able to fix it!



Casper H Rasmussen · 2nd
CEO & Co-founder at Monta
3w • Edited • + Follow

DC chargers - error rates

Chargers connected to Monta with more than 20K charging sessions in December 2024.

Error rates are inc 0 kWh charges!

⬆️ Best performer at 9.4%
⬇️ Worst performer at 17.2%

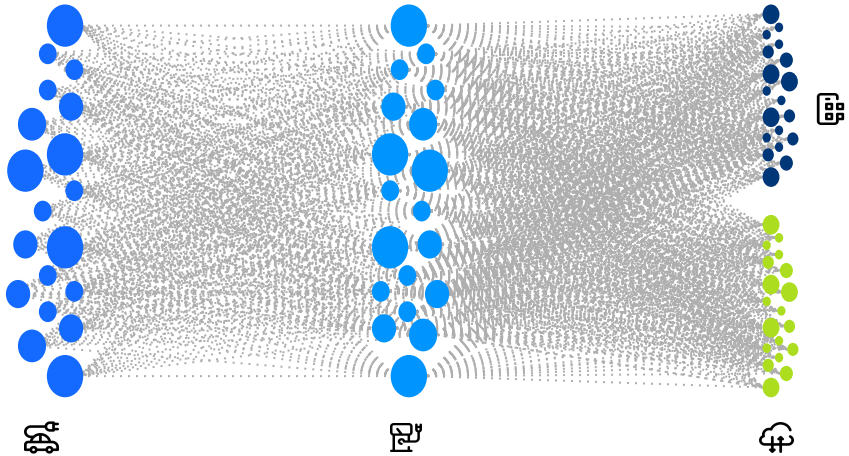
The top 3 (with the lowest error rates)
🥇 Kempower: 9.4% (6.3% error, 3.1% 0kWh) ~20K sessions
🥈 Siemens: 13.1% (8.4% error, 4.7% 0kWh) ~100K sessions
🥉 Alpitronic: 14.3% (9.5% error, 4.8% 0kWh) ~500K sessions

Error rate is a product of Hardware, firmware, installation, Monta's integration quality & the EV driver attempting to start the charger. It's just one parameter out of many to determine how well a charger performs.
Monta is highlighting error rates to increase the quality of charging.

See here for more information in link:
https://lnkd.in/drQZxKA2

#evcharging

249 19 comments • 14 reposts



+2.5 billion electric vehicles*

Various types: Cars, trucks, buses, motorcycles, boats, …

Various operating systems and firmwares

Various brands, models, configurations

Billions of EV chargers*

Various use cases: home, workplace, fleet, public

Various tech: AC/DC, V2G, PnC

Various brands, models, versions

Software quality
Even best teams can't keep up with the changing ecosystem.

Stranded assets
Support stop due to insolvencies or new regulations.

Maintenance
Hard to identify issues in the field and repair in time.

Interoperability
Any combination of charger, EV, apps and cloud must work.

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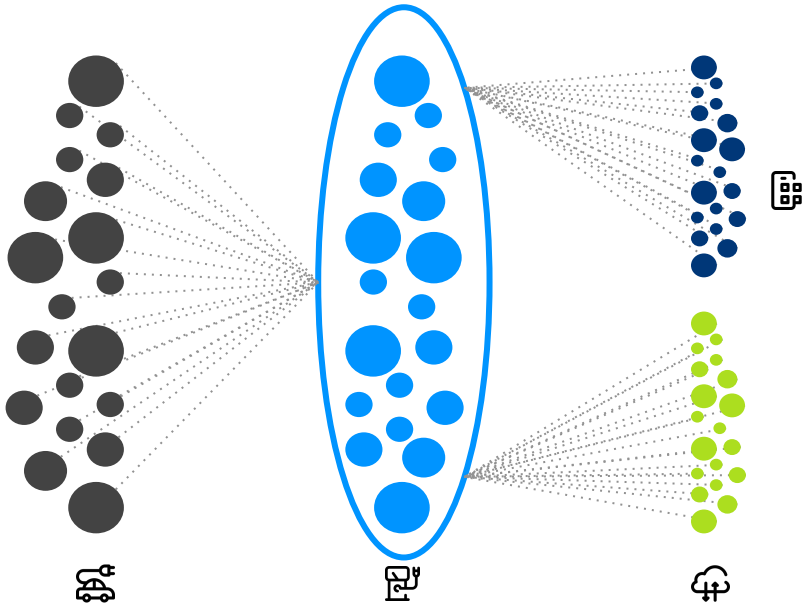
* Estimation for an electric future

The Solution

Unification via **Open Source**

By using the same software framework on all chargers, the complexity of the ecosystem is reduced and becomes manageable.

- One single counterpart to test against for the whole ecosystem.
- Shares investment into non-distinguishing commodity SW



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The only approach to make e-mobility scale fast.

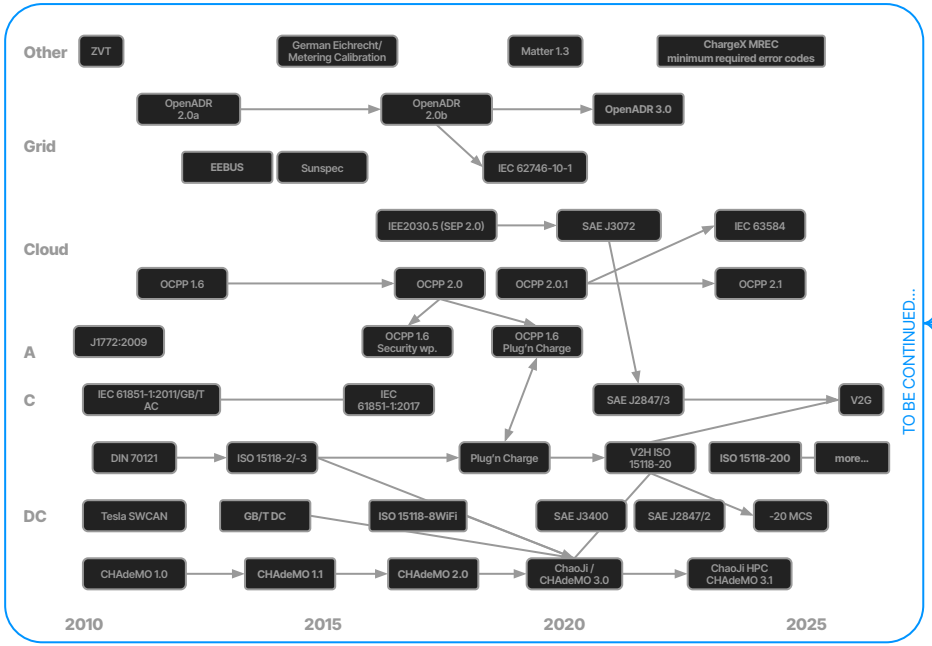
Ever-Growing Complexity of Standardization

Vendors Having Issues to keep up

Niklas Behl

CTO Amperfied / Heidelberg

"For all the topics ... in the pipeline, **we are using more and more open source** components. ... **The customer expects to plug his car in and the charging infrastructure to communicate properly with the car and start a charging process.** And these are issues where we are convinced that it **works best if as many people as possible use the same** thing, because that maximizes compatibility. There is enough left over that we as manufacturers can use to differentiate our devices."
[Moove Podcast]



War on standards
Competing groups create incompatible standards to solve the same issue.

Slow adoption
Implementation into products is often ignored for years.

Waste of resources
Implementation of standards is costly, but doesn't create USPs.

Dialect & deviations
Complex documents lead to interpretation and deviation.

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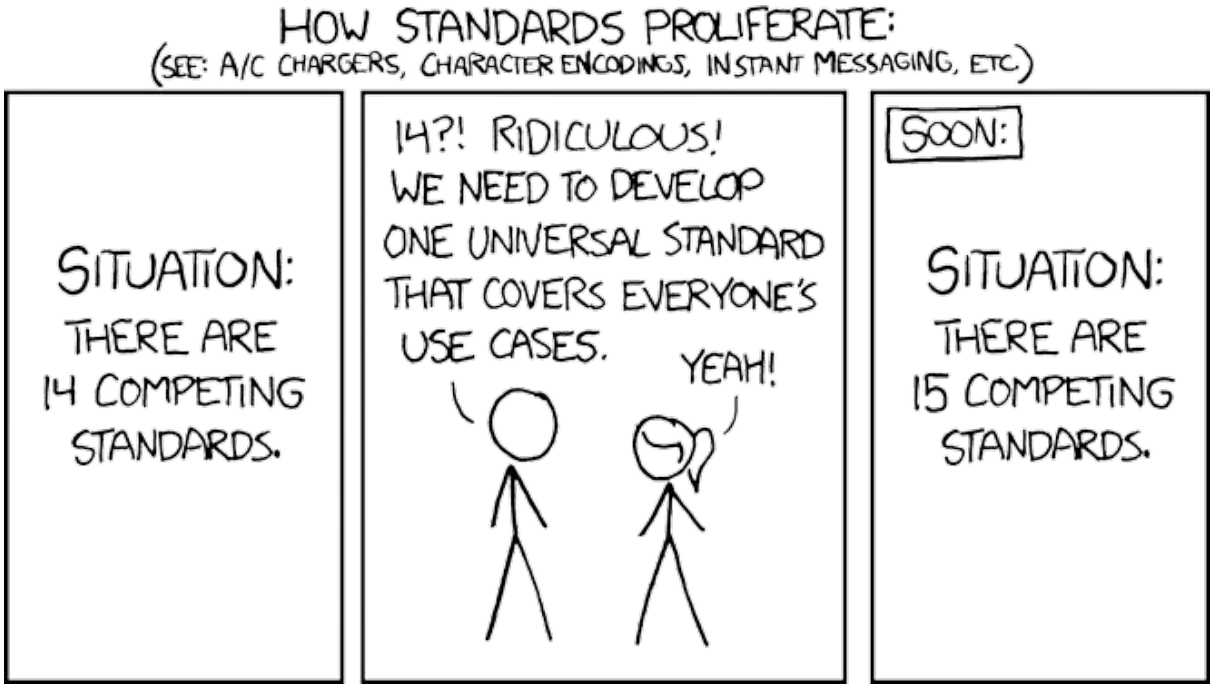
New Standards are Not the Solution!

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EVerest
ONE
STACK TO
CHARGE
THEM ALL!

EVerest Ecosystem & Community

Users

EVerest CPO Forum in launch Phase

amazon · DHL · techem · powerflex (EDF Renewables) · Lynkwell

EVAILABLE · ELECTROMIN · EnBW · gaia charge · SLK ENERGY · Powerfill

POWERLINES (AN EQUANS COMPANY) · ChargeMate · quello · HUBJECT

System Makers

EVONITY (ELEGANT POWER) · MAHLE · enteligent · voltpost · TONOMIA · quello · s.charge · HEIDELBERG (AMPERFIED)

Nidec · chargeBIG (powered by MAHLE) · SIEMENS · ENPHASE · KATHREIN · COMPLEO · ...and many more silently

Component Makers

DOLD · Acrel · Wireline Technology · LEM · Eastron · CARLO GAVAZZI · HUAWEI

KLEFR · FEIG · BENDER · Iskra · AST INTERNATIONAL · ISABELLENHÜTTE · SCU · TonHe · INFY POWER (Innovation for Your Power)

Controller Vendors

Powered by Raspberry Pi · seeed studio · PHYTEC

PIONIX · ADVANTECH · chargebyte · DFI

Silicon Makers

LUMISSIL MICROSYSTEMS · RENESAS · ANALOG DEVICES · NXP · TEXAS INSTRUMENTS

++ Academia / Research / Governmental ...

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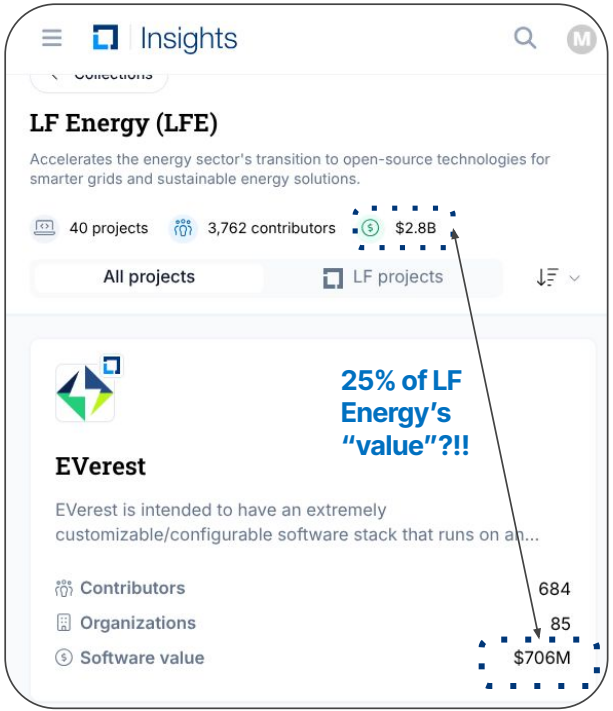
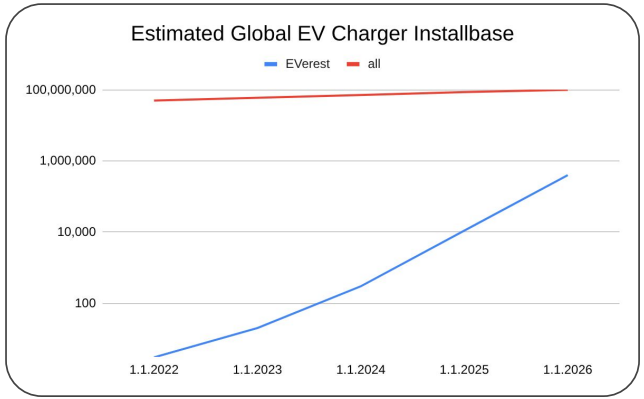
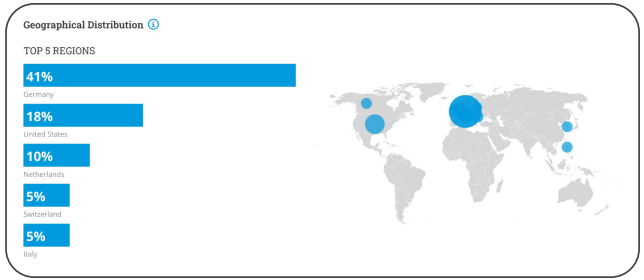
Note: Often ecosystem players vertically and/or horizontally integrate many of those boxes along this slide

EVerest is one of the largest projects in the Linux Foundation Energy







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This is EVerest

Everything you need to control your EV charging station

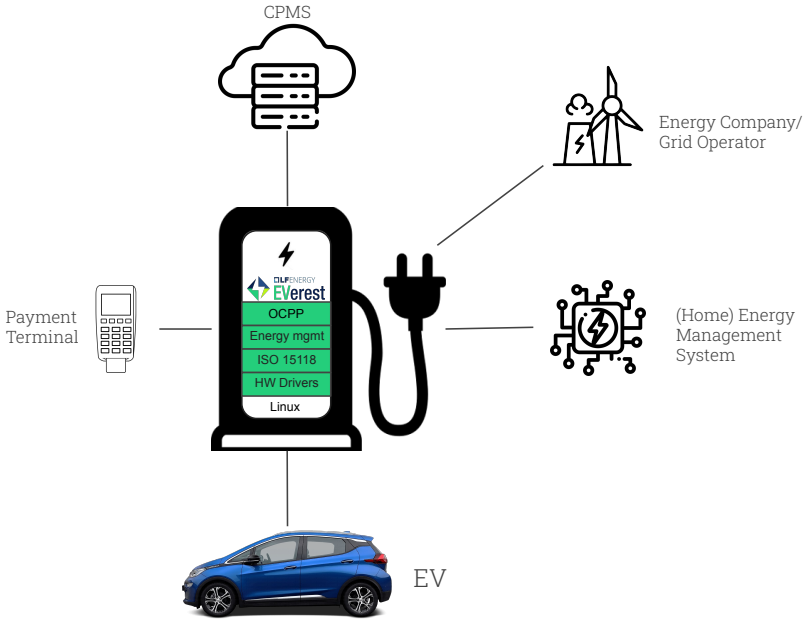
Open source firmware stack for standards-compliant, interoperable, and secure EV charging.

Licence Cost: Free

Hosted by: Linux Foundation Energy
Neutral, non-profit organization where companies (including direct competitors) safely collaborate to build and standardize foundational open-source technologies

Managed by: Cross Org Technical Steering Committee

License type: Apache 2.0
No limitation on commercial code use



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The Open Source Charging Station Firmware Stack

Communication Protocols | OCPP 1.6 / 2.0.1 / 2.1 | ISO 15118-2 / -20 | DIN 70121 etc.
Business Logic | Energy Management | Transaction handling
Hardware Drivers

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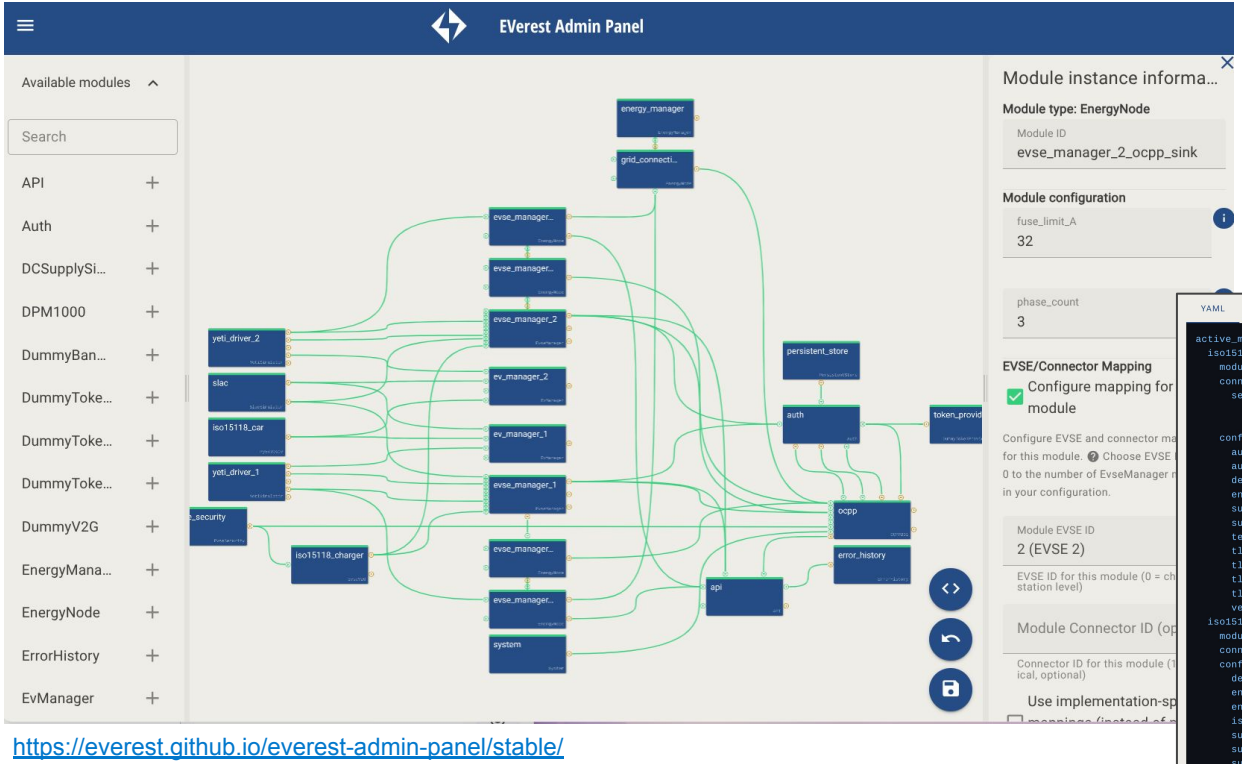
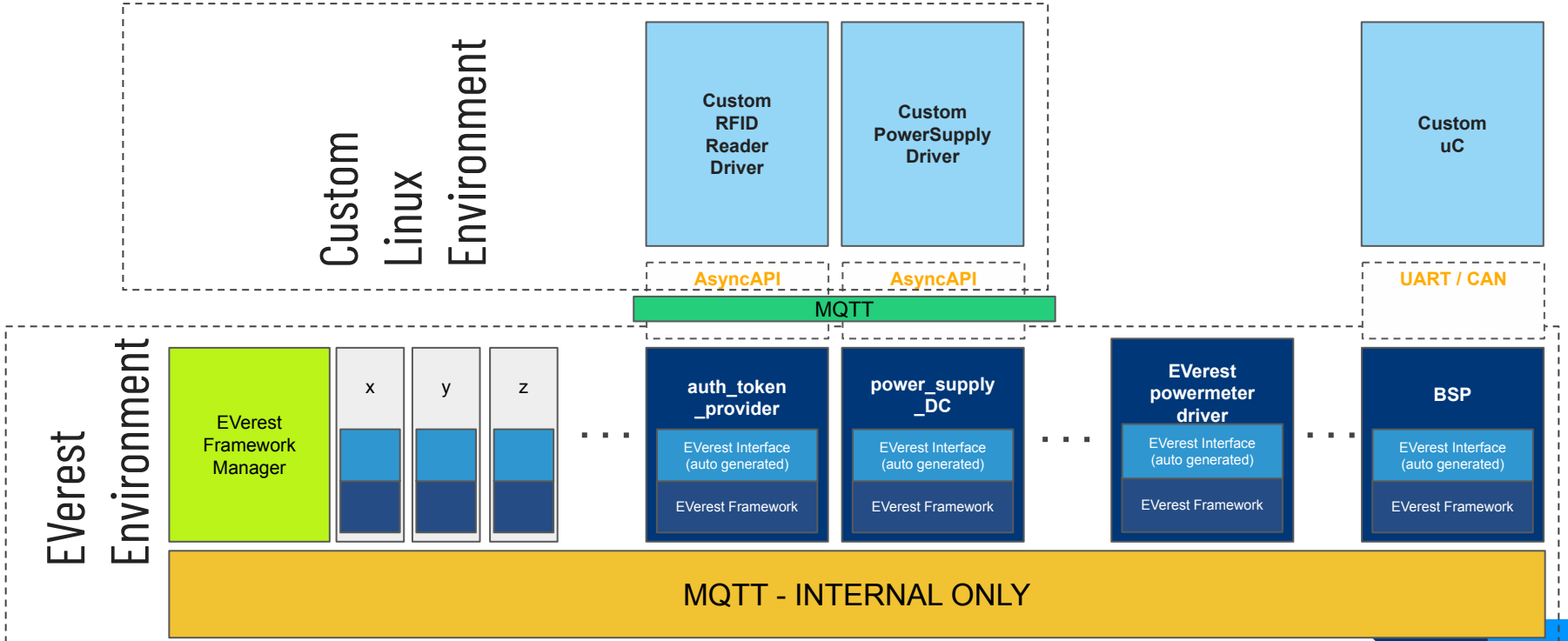
Tailor to EVerything:
From Single Port Home AC .. to .. public HPC parks



https://everest.github.io/everest-admin-panel/stable/

EVerest Architecture with Integration APIs



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Call for Participation:

SunSpec Modbus Server Module for EVerest

Why SunSpec Modbus for EVerest?

- EVerest powers ~400k chargers globally (early 2026), growing 10x year over year
- SunSpec Modbus is the de facto standard in EMS, DER, and inverter ecosystems
- Grid and energy management integration requires standardized interfaces → SunSpec Modbus
- Makes EVerest devices grid-integration ready out of the box
- Enables interoperability with existing SunSpec ecosystems (EMS, SCADA, DER controllers)
- Significantly reduces integration effort for EMS vendors

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SunSpec Modbus Server module for EVerest

EVerest SunSpec Modbus Server

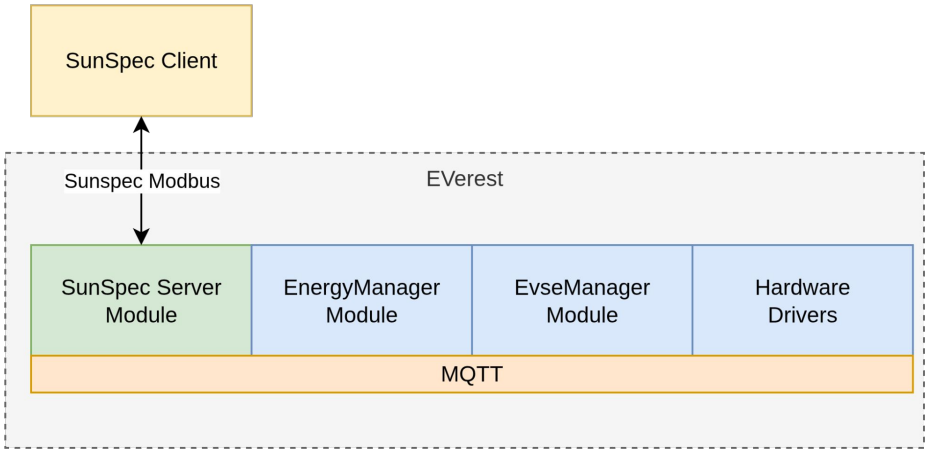
- Based on Modbus TCP
- Implementation of relevant SunSpec models
  - DER AC Measurement (701)
  - DER Capacity (702)
  - DER AC Controls (704)
  - optional: DER DC Measurement (714) - for DC Charging stations
- Read/Write register handling

SunSpec Data & Control Integration

The module maps EVerest data to SunSpec models — enabling external monitoring and control

This includes:

- Metering data
- Charger state & faults
- Power limits & setpoints



SunSpec Modbus Server module for EVerest

Suggested Implementation Approach

Foundation

- Implementation of Modbus TCP server in C++17
- Implementation of required SunSpec Models
- Definition of a static SunSpec register map

Integrate SunSpec and EVerest

- Integration and mapping of EVerest internal data to SunSpec models
- Implementation of monitoring data exposure (meter values, state, faults)
- Implementation of control functionality (setpoints, enable/disable, session handling)
- Validation of data consistency, scaling factors, and write handling

Call for Participation

We invite contributors interested in:

- SunSpec model implementation
- Modbus protocol stack development
- EVerest module integration
- Testing and validation

For example as **hackathon challenge** during the **SF Climate Week**!

ENERGY IOT
DEMOCRATIZE THE MICROGRID

⇒ **Register:** luma.com/6jvum8on

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Get Started with EVerest Today!

- ➔ Code: github.com/EVerest
- ➔ Chat: lfenergy.zulipchat.com
- ➔ Documentation: everest.github.io
- ➔ Collaborate: Weekly online Working Groups ⇒ calendar
- ➔ Stay Informed: Mailing List (lists.lfenergy.org/g/everest-announce)
  Monthly Technical Steering Committee (Recordings on YouTube)

Piet Gömpel
EVerest tech lead
piet.goempel@pionix.com

Dr. Marco Möller
CEO / Co-Founder @ Pionix
Chair @ EVerest TSC
mm@pionix.com

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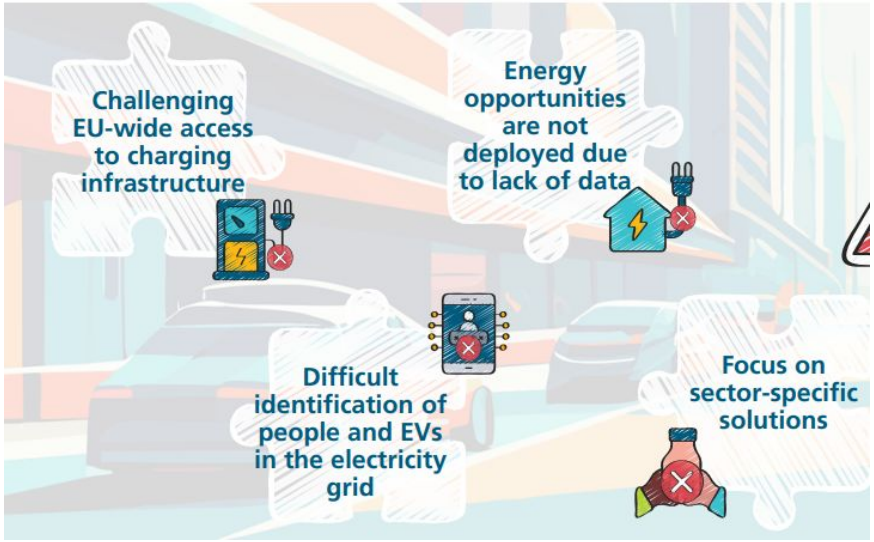
Role of Open Source Platforms for the Energy Transition

"Role of Open Source Platforms for the Energy Transition"

Rolf Riemenschneider, Head of Sector IoT
DG CONNECT/E4
European Commission

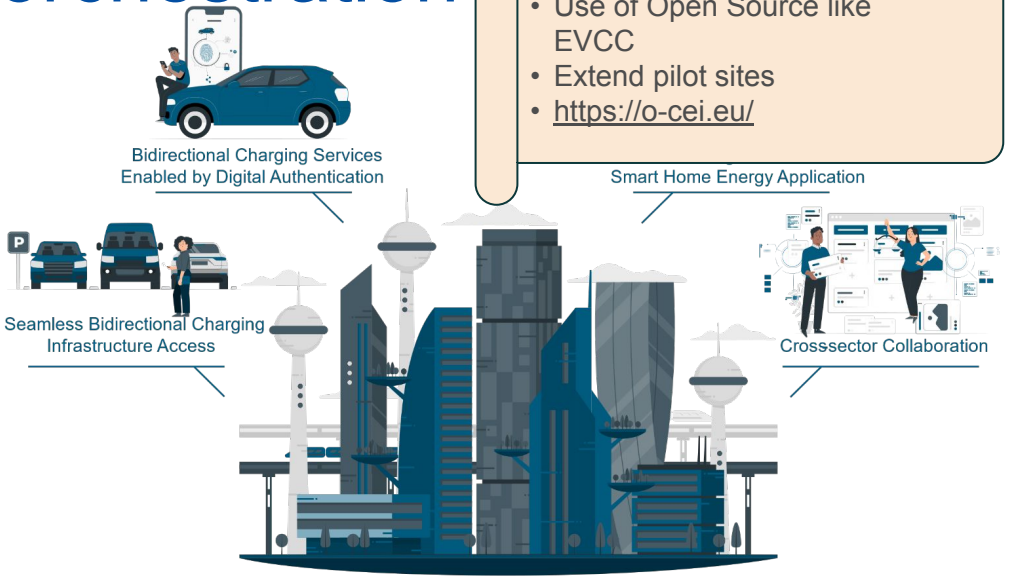
Lack of cross-sector orchestration

Challenges



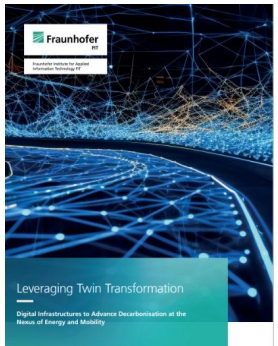
Pilot Project O-CEI

- Use of Open Source like EVCC
- Extend pilot sites
- https://o-cei.eu/



Opportunities

Study Report by Fraunhofer FIT, May 2024 <<*LEVERAGING TWIN TRANSFORMATION DIGITAL INFRASTRUCTURES TO ADVANCE DECARBONISATION AT THE NEXUS OF ENERGY AND MOBILITY* >>



European Commission

Evolving Complex Ecosystem

- EV Charging & Parking
  - Find parking with charging facility
    - Charging is a sub-property of parking
    - Parking is a sub-property of Mobility
  - Authenticate and enable charging
- Extend ecosystems with solar, fleets, chargers and/or parking places / service brokers
- Direct identity-based P2P communication between service providers and end users

Report : AIOTI – EV Charging Use Cases (2021)

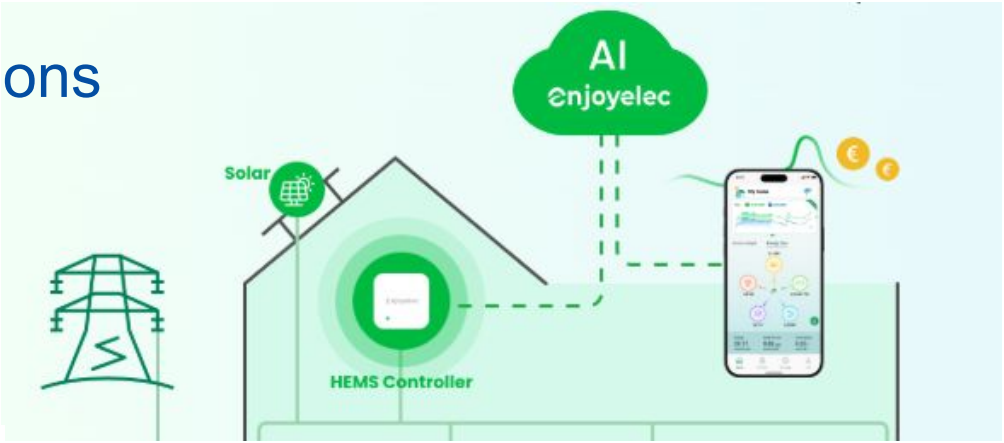
Hybrid Installations on the Rise

- Hybrid power plants with PV, wind and/or battery storage
- Potential of EV flexibility capacity
- Affordable energy to drive electrification in home / Buildings

Courtesy: TheSmarterE.de

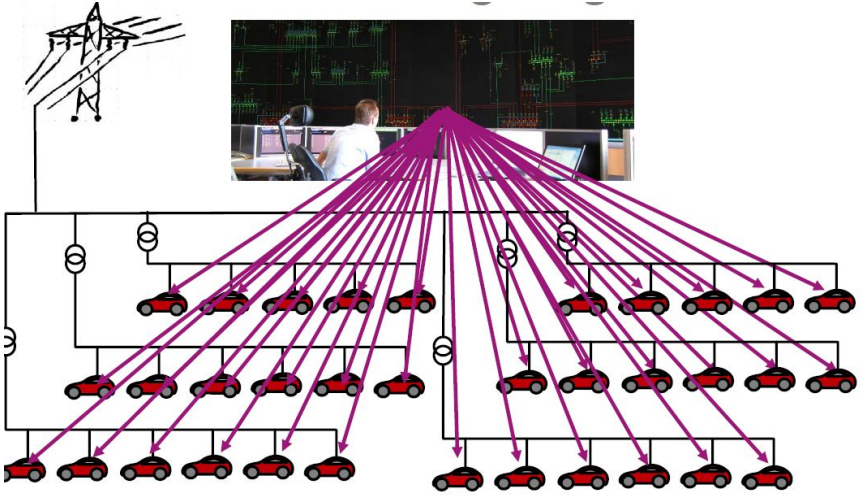
Building Installation Operations

today and tomorrow



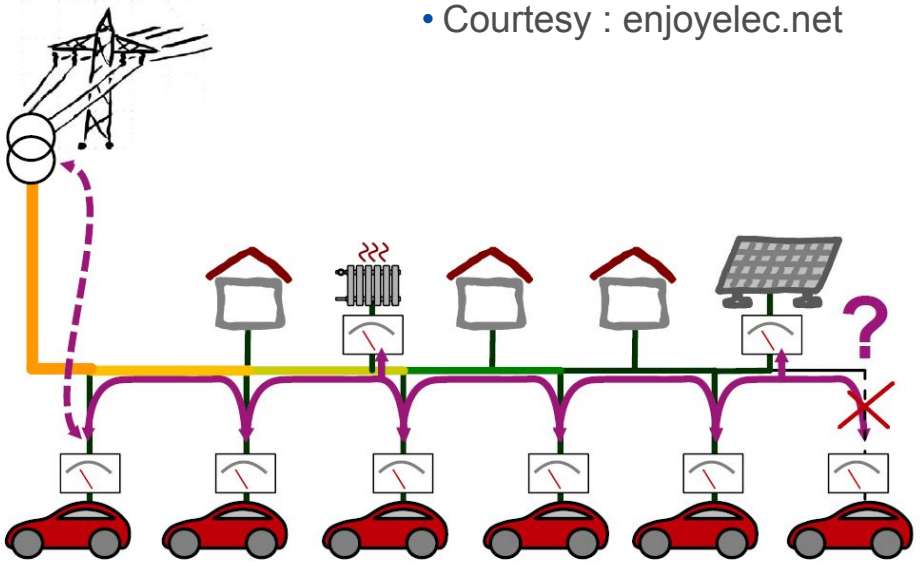
- Courtesy : enjoyelec.net

- *today*

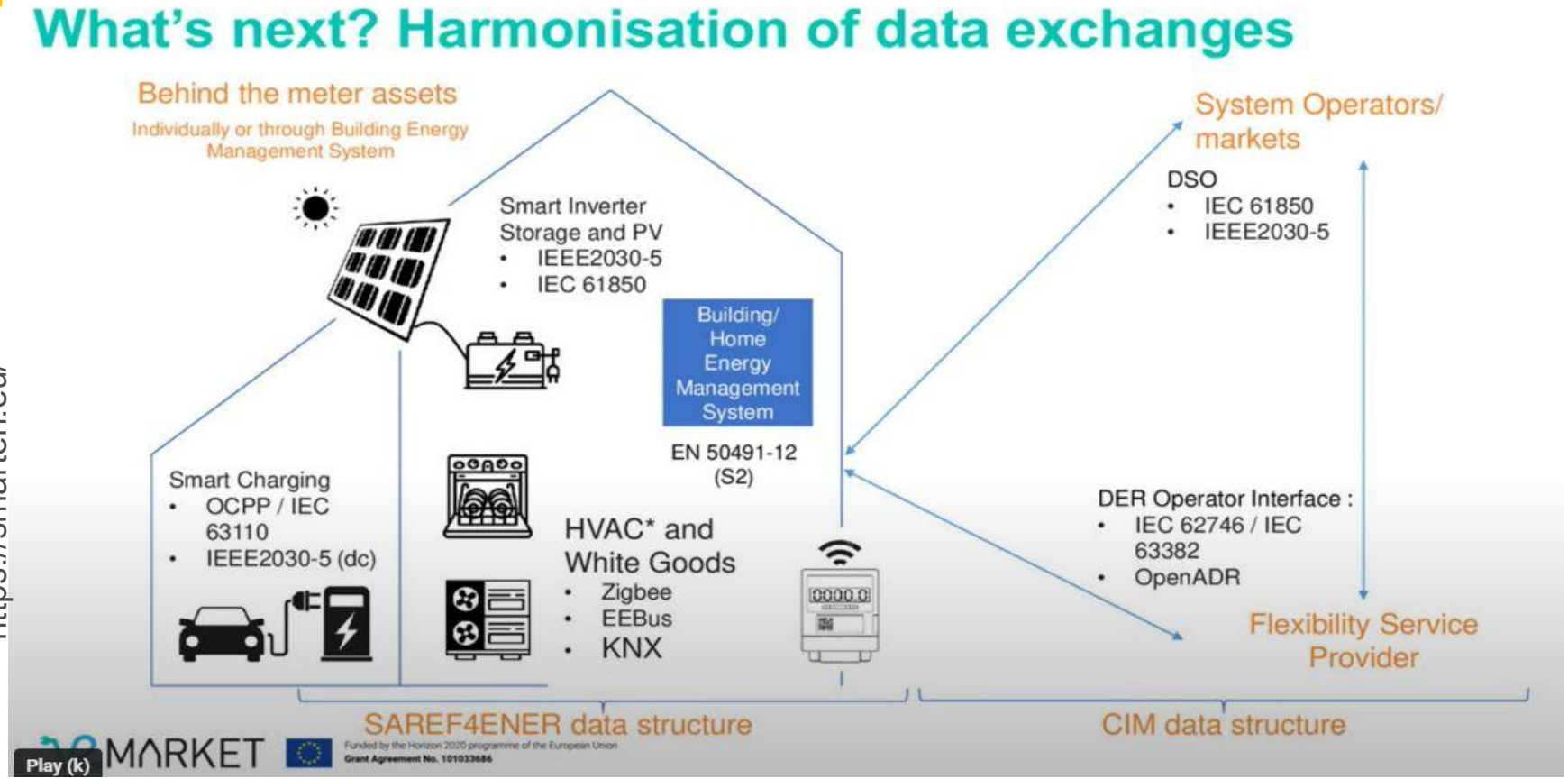


- Courtesy : E. Waffenschmitt

- *tomorrow*

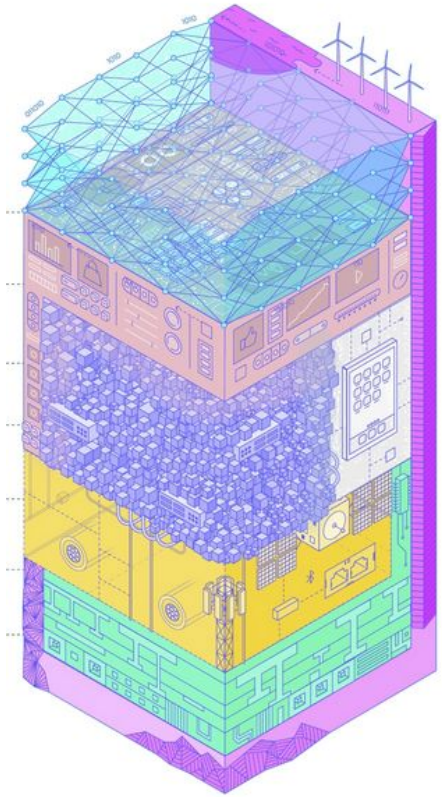


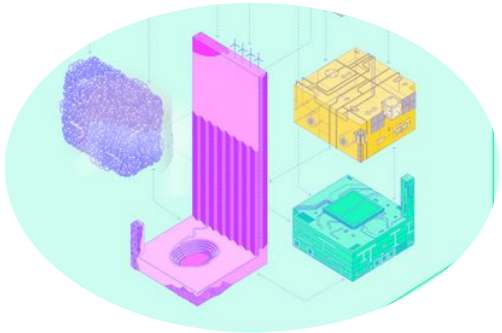
Smarten Architecture



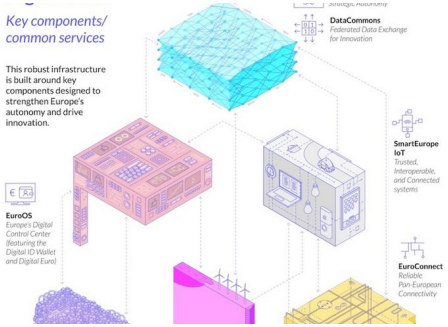
Courtesy: https://smarten.eu/

Open Source Stack for European Sovereignty





Modular
building blocks



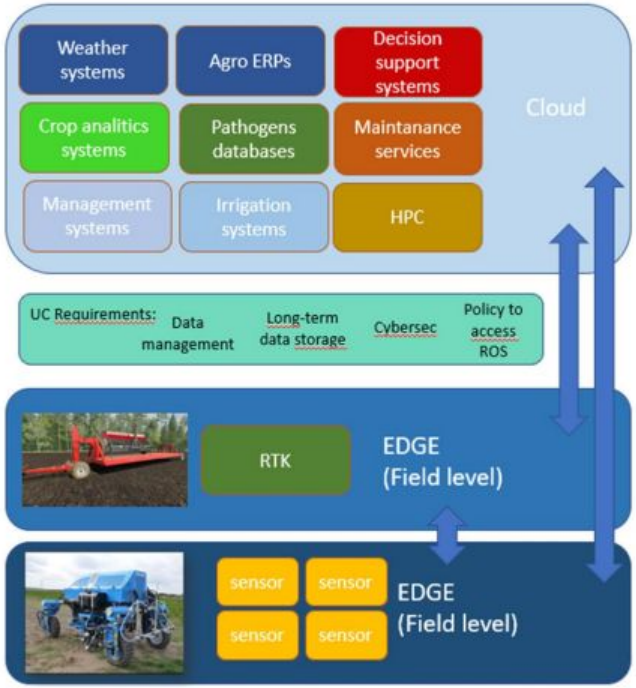
IoT connecting
Systems

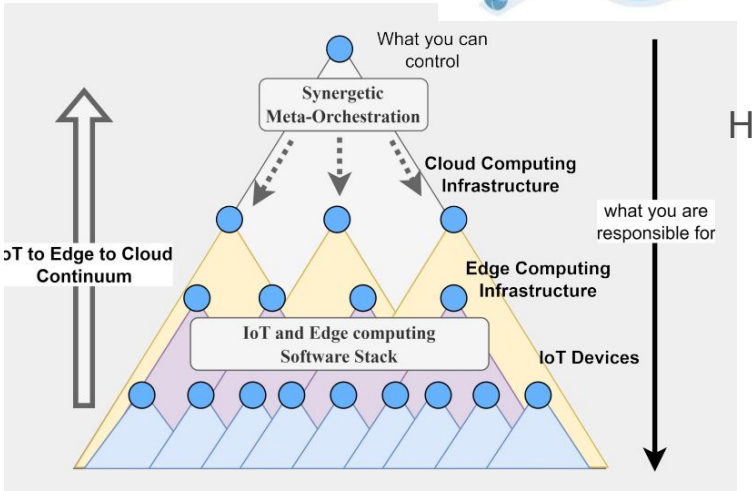
SW-driven
Systems

EuroStack key to European Sovereignty

European Commission

Cloud-Edge Platform





HE Project: NEPHELE

European Commission

A digital platform model necessary beyond interoperability

Standardise

Open APIs

OSS Building blocks

Use cases

Aggregate Data

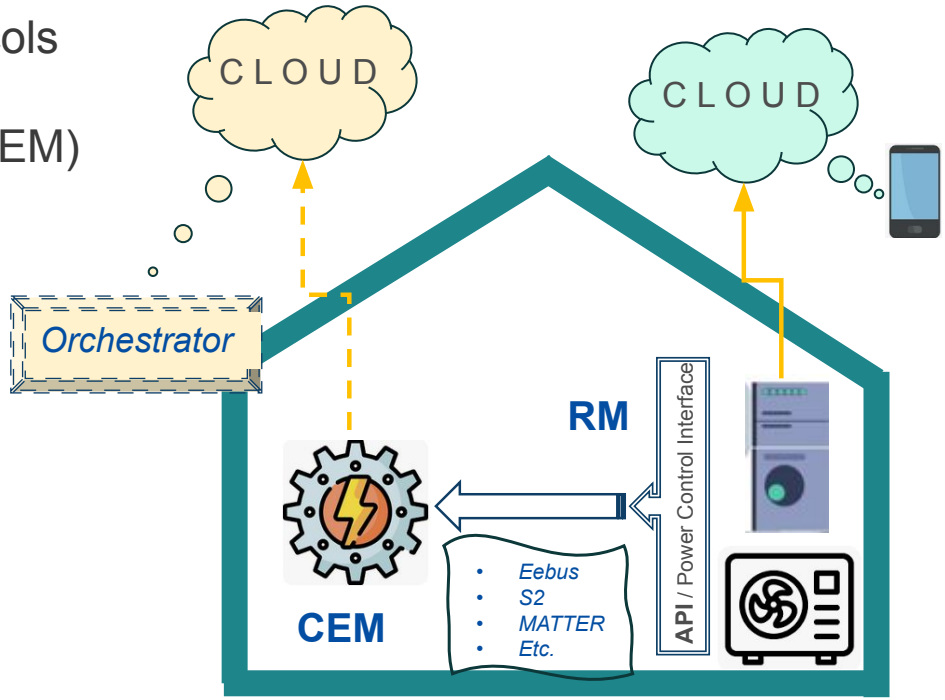
Apps

Smart charging ranks among the main use cases in fast rising cross-industry IoT use cases

Landscape Report (2023):
Energy and flexibility data models and interoperability across the sectors energy, mobility and buildings

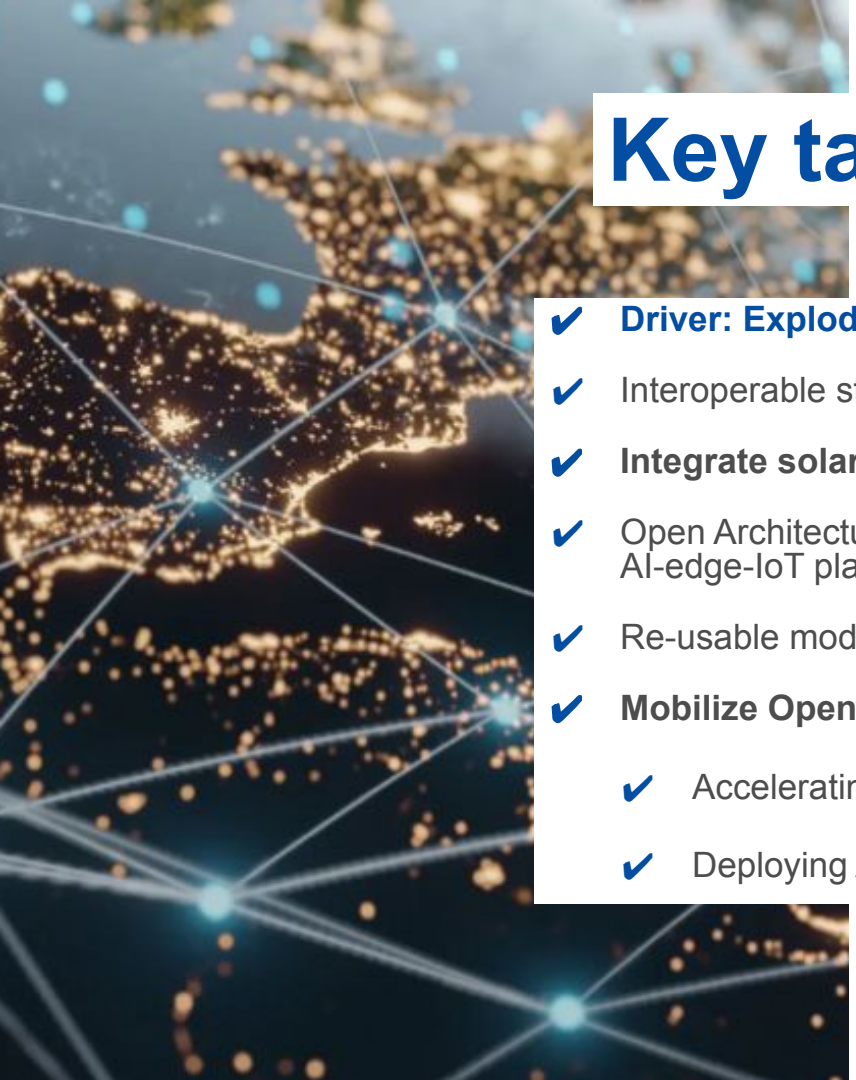
CEN/CENELEC S2 – *Orchestration Scenarios*

- **Separating DATA and CONTROL plane**
  - virtualisation of objects and protocols
- The **Customer Energy Manager** (CEM)
  - the choice of the customer
  - An App store for HEMS/BEMS
- The **Resource Manager** (RM)
  - standardised API
  - define asset administration
- ***Different communication protocols***
  - **S2**
  - **eebus**
  - **sunspec - Modbus**
  - **MATTER, CSA**
  - **KNX, BACnet, etc.**



connectivity standards alliance

European Commission



Key take-aways

- ✔ **Driver: Exploding energy prices**
- ✔ Interoperable standards are key to manage energy flows in buildings
- ✔ **Integrate solar, HVAC, mobility, security into building operations**
- ✔ Open Architecture for a vibrant IoT ecosystem is key in support of the AI-edge-IoT platform
- ✔ Re-usable modular Building blocks require open APIs and standards
- ✔ **Mobilize Open Source Communities for**
  - ✔ Accelerating standards adoption
  - ✔ Deploying AI models

European Commission

What’s Next?

Call to Action

- Get in touch with us and help us coding:
  - ⇒ Get EVerest and SunSpec connected!

- Use & join EVerest
  - ⇒ everest.github.io
- Join SunSpec
  - ⇒ sunspec.org
- Join OCX Conference!
  - 21-23rd of April 2026 in Brussel
- Join the Open Energy Hackathon
  - The SunSpec Modbus & EVerest Challenge

  ⇒ Register: luma.com/6jvum8on

Call for Participation

We invite contributors interested in:

- SunSpec model implementation
- Modbus protocol stack development
- EVerest module integration
- Testing and validation

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Q&A