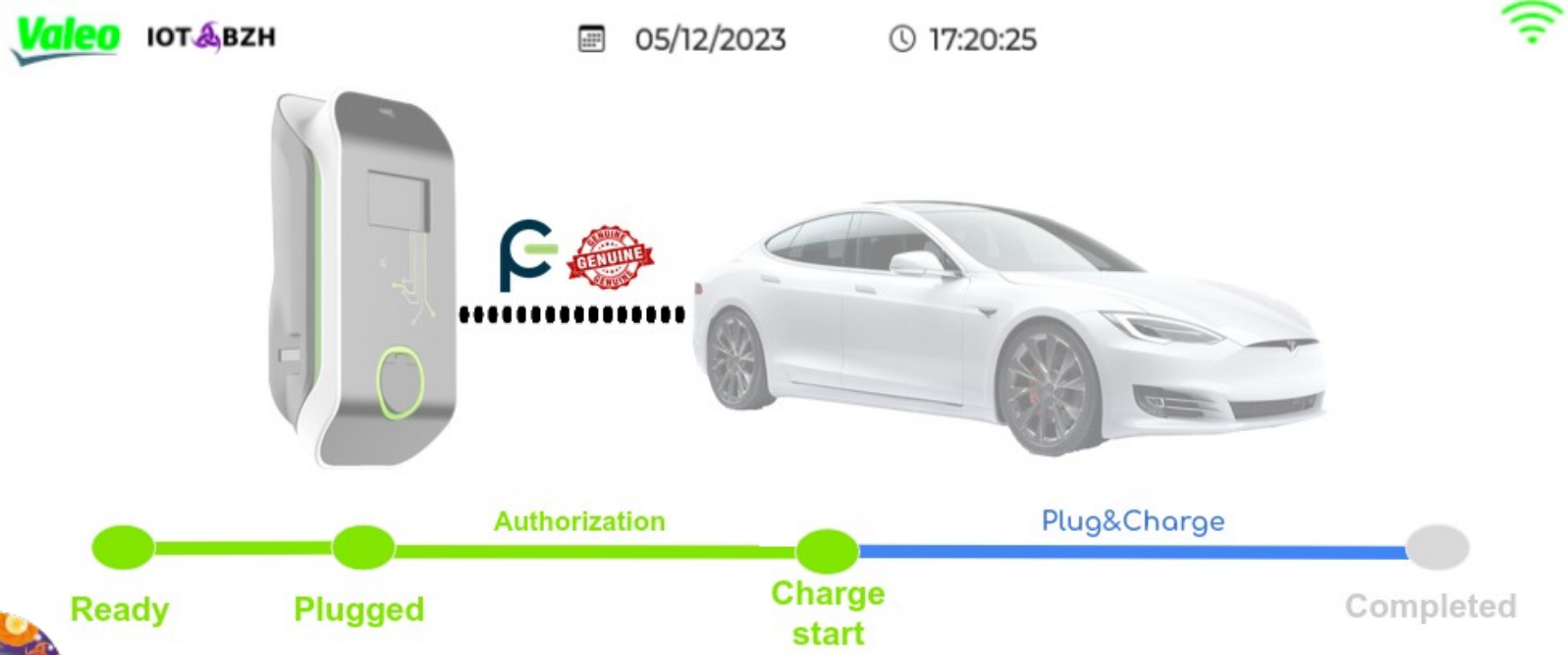


Tux-EVSE, an open-source EV charger

Hugo Mercier - Software engineer – IoT.bzh – FOSDEM 2025

IoT.bzh at a glance

Location: Lorient, Brittany, France

Our product

redpesk®: SaaS platform (or On Prem) Linux for industrial IoT (auto, mil-aero, energy...)

redpesk®

+30 years of embedded SW expertise

WIND RIVER

Vannes, France 1990
1st Wind River european R&D center

Open Source contributions

TIZEN
SAMSUNG

OS open source, Samsung TVs
Intel Vannes (2011-2015)

AUTOMOTIVE GRADE LINUX

THE LINUX FOUNDATION

Some customers

Valeo

STELLANTIS

RENESAS

IDEMIA

THALES

saft
a company of TOTAL

SAFRAN

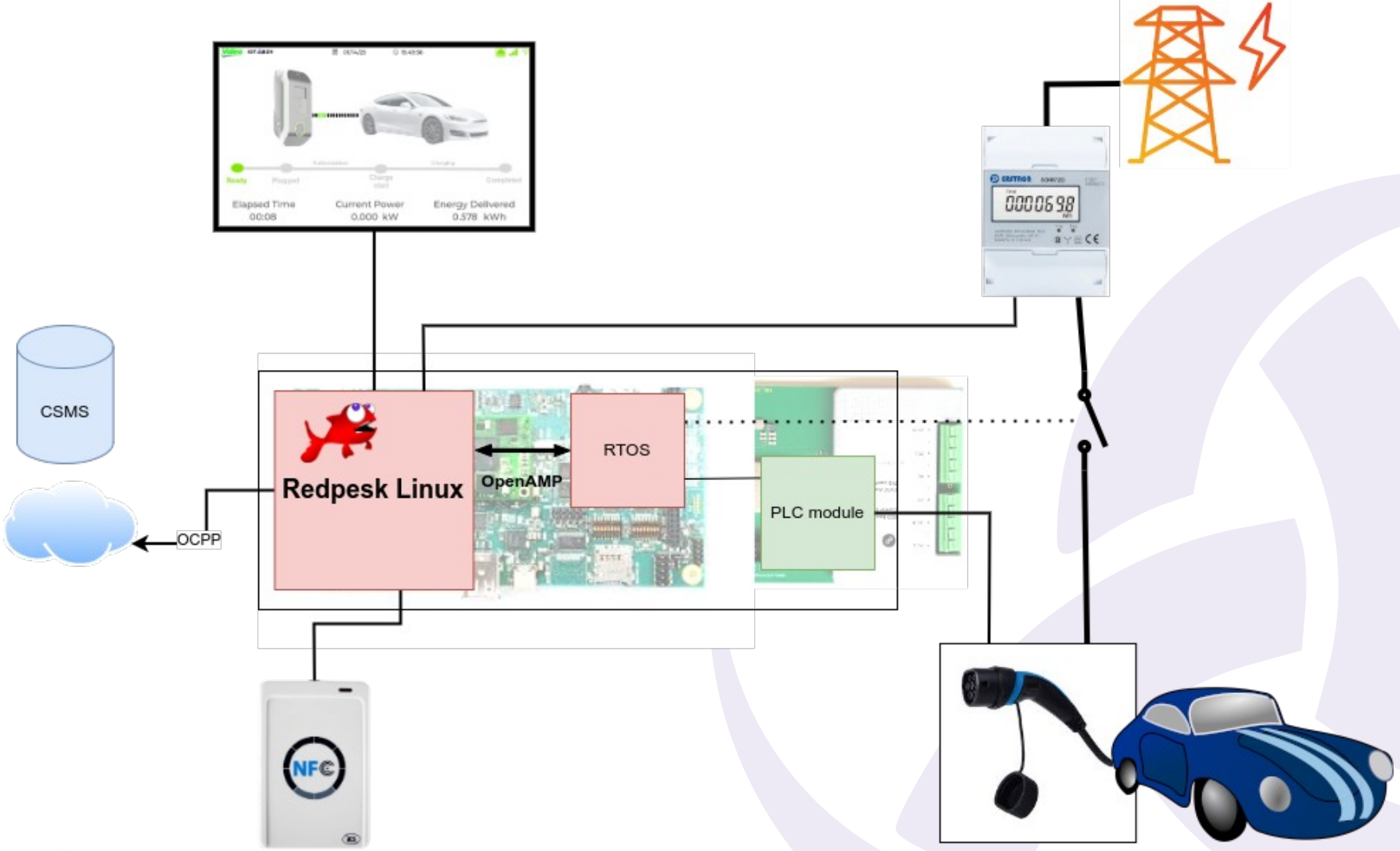
THE LINUX FOUNDATION

Tux-EVSE, an open-source EV charger

- Work in collaboration with Valeo 
  - Demo of an EV charger
- Integration of third-party commercial mobility stacks

ISO-15118-2x

- TCP/TLS
- Authentication by RFID card
- Or “Plug and Charge”: online verification of signed contract through a trust chain (PKI)
- “Vehicule to Grid”: ability to discharge

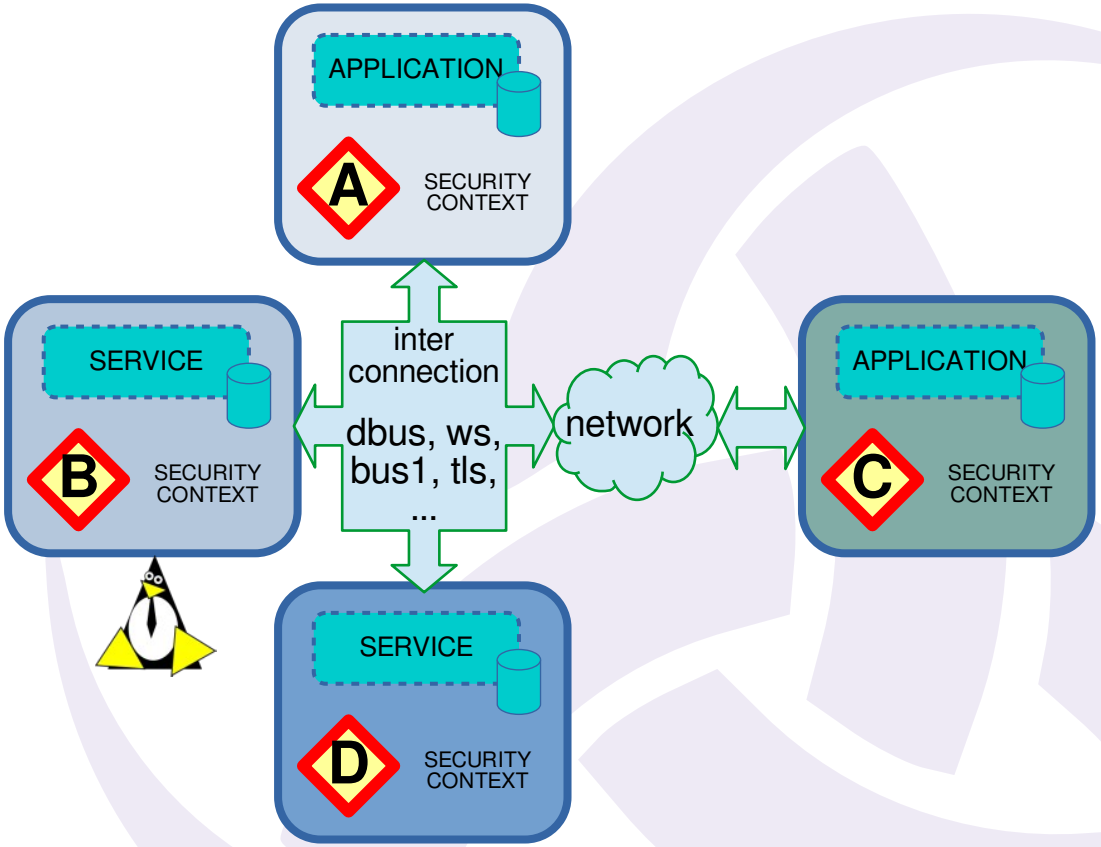

Elapsed Time
00:08
Current Power
0.000 kW
Energy Delivered
0.578 kWh
CSMS
OCPP
Redpesk Linux
OpenAMP
RTOS
PLC module
NFC

Security issues

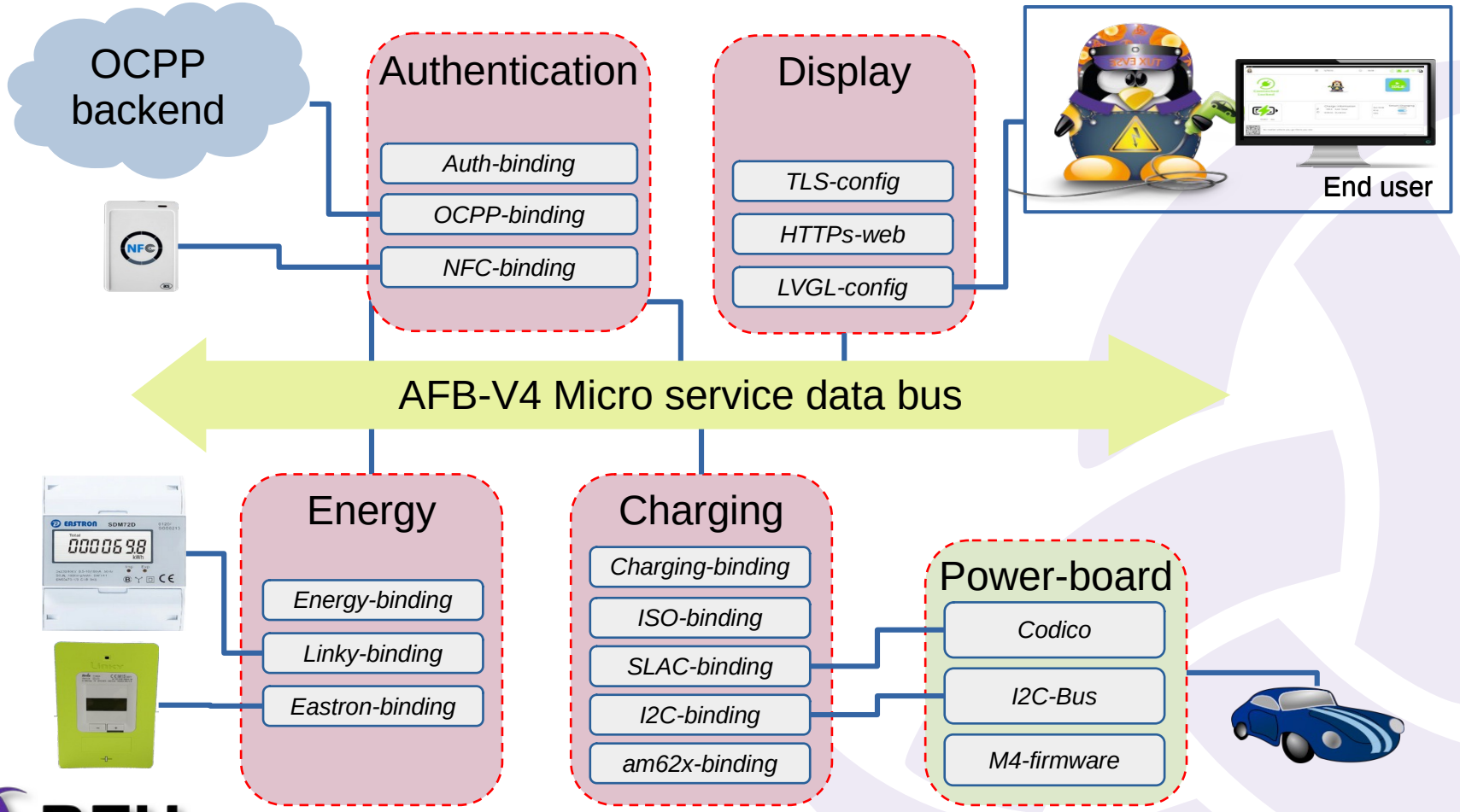
- Large surface of attack
  - Internet: payment, authentication, etc.
  - PLC: vehicle
  - Complexity of protocols (ISO-15118, OCPP, PKI)
- Threats
  - Free riding
  - Compromission of station’s or car’s network
  - Electrical risk

AFB: a micro-service framework for security

- Coming from Tizen (Samsung TV)
  - Reused in Automative Grade Linux
- Micro-services communicate through RPC (api, verbs, events)
- Security isolation with network transparency
- Linux Security Module: SMACK
  - “embedded” SELinux
- Permission database: cynagora



Micro services



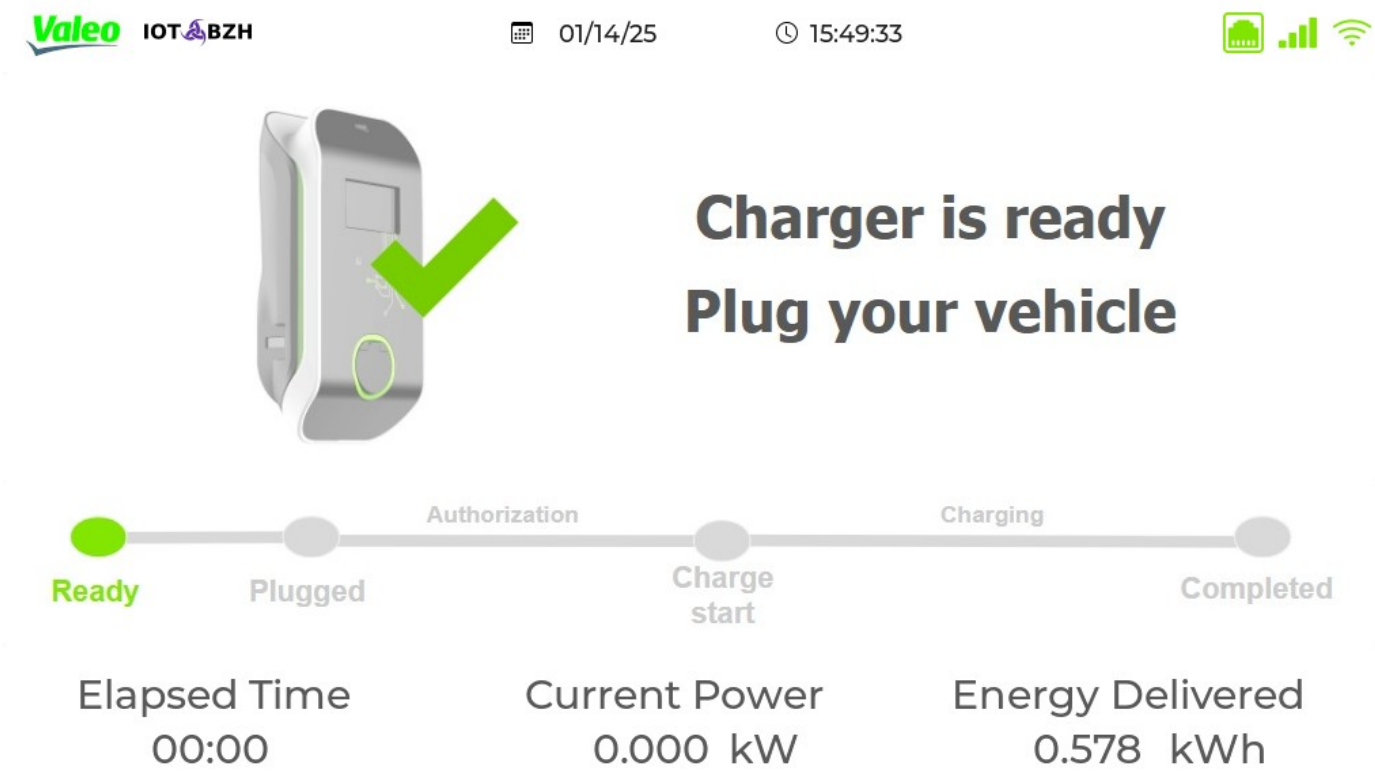
In Rust we trust

- Memory safety without performance sacrifice
- Core part in C with Rust wrapping
  - https://github.com/redpesk-common/afb-librust
  - FFI with “unsafe” parts
- All services written in Rust

ISO15118-2 debugging

- Trialog ComboCS
- Open-source ISO-15118 simulator / injector
  - https://github.com/tux-evse/iso15118-simulator-rs/

Screens


Valeo
IOT BZH
01/14/25
15:49:33
Charger is ready
Plug your vehicle
Authorization
Charging
Ready
Plugged
Charge start
Completed
Elapsed Time
00:00
Current Power
0.000 kW
Energy Delivered
0.578 kWh

Valeo IOT BZH 05/12/2023 17:20:25

Plug&Charge **not available**

Please present your NFC card

Ready — Plugged — Authorization — Charge start — Charging — Completed

Time elapsed
-

Current Power
-

Energy transferred
-

Valeo IOTBZH 05/12/2023 17:20:25

Authentication done
Ready to charge

Ready — Plugged — Authorization — Charge start — Charging — Completed

Time elapsed
-

Current Power
-

Energy transferred
-

Valeo IOT BZH 05/12/2023 17:20:25

Authorization

Plug&Charge

Ready

Plugged

Charge start

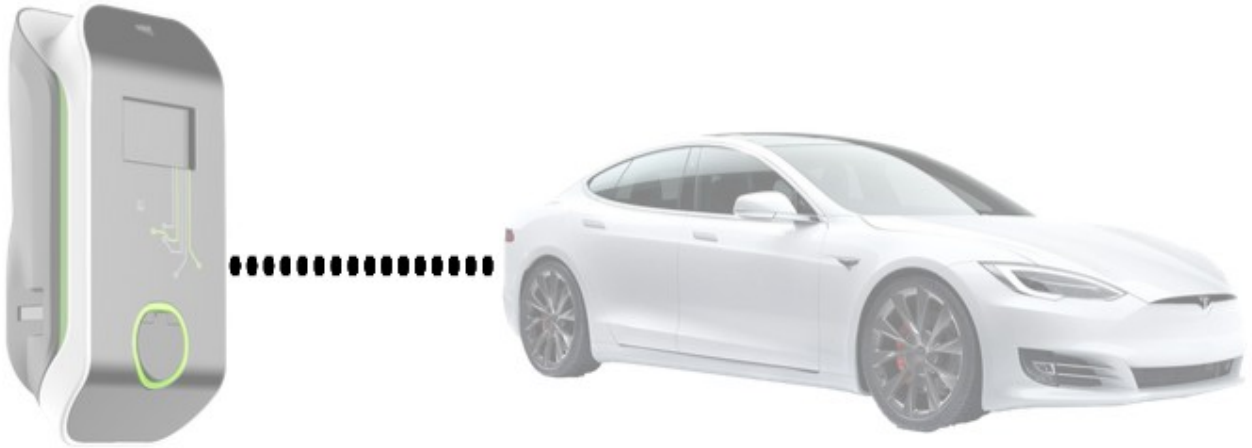
Completed

Time elapsed
2h15min

Current Power
6.5 kW

Energy transferred
13 kWh

Valeo IOTBZH 05/12/2023 17:20:25



Ready → Plugged → Authorization → Charge start → BasicCharging → Completed

Time elapsed
2h15min

Current Power
6.5 kW

Energy transferred
13 kWh

Valeo IOT BZH 05/12/2023 17:20:25

Session summary

- Protocol used: Plug&Charge (ISO15118-2)
- Charging time: 2h15min
- Energy transferred: 22.36 kW.h
- Total session cost: 16.45 €

Thank you. See you soon!

Conclusion

- https://github.com/tux-evse
  - Apache v2 AND (GPL v3 OR Commercial)
- Challenges
  - Debugging ISO-15118-x ? => SW and HW simulators helped
  - Understanding ISO-15118-2x PKI
  - Synchronization between different “state machines” (SLAC, ISO15118-2, OCPP)
- Next steps
  - ISO-15118**-20** support in simulator
  - Open-source ISO-15118-2x logic

Q&A

Lorient Harbour, South Brittany, France

Appendices

Basic Charging

- Car → charger: voltage levels
- Charger → car: PWM duty cycle