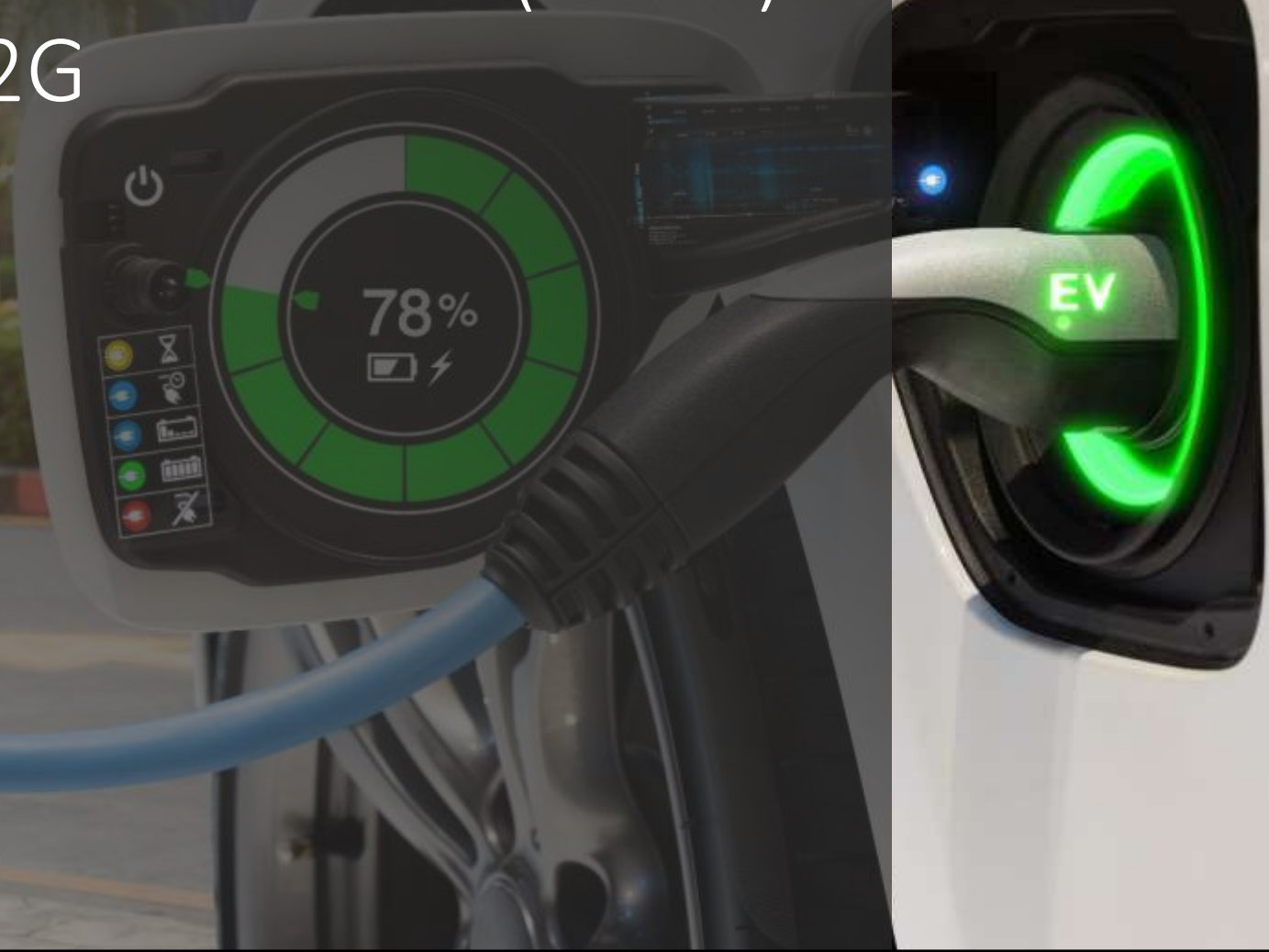
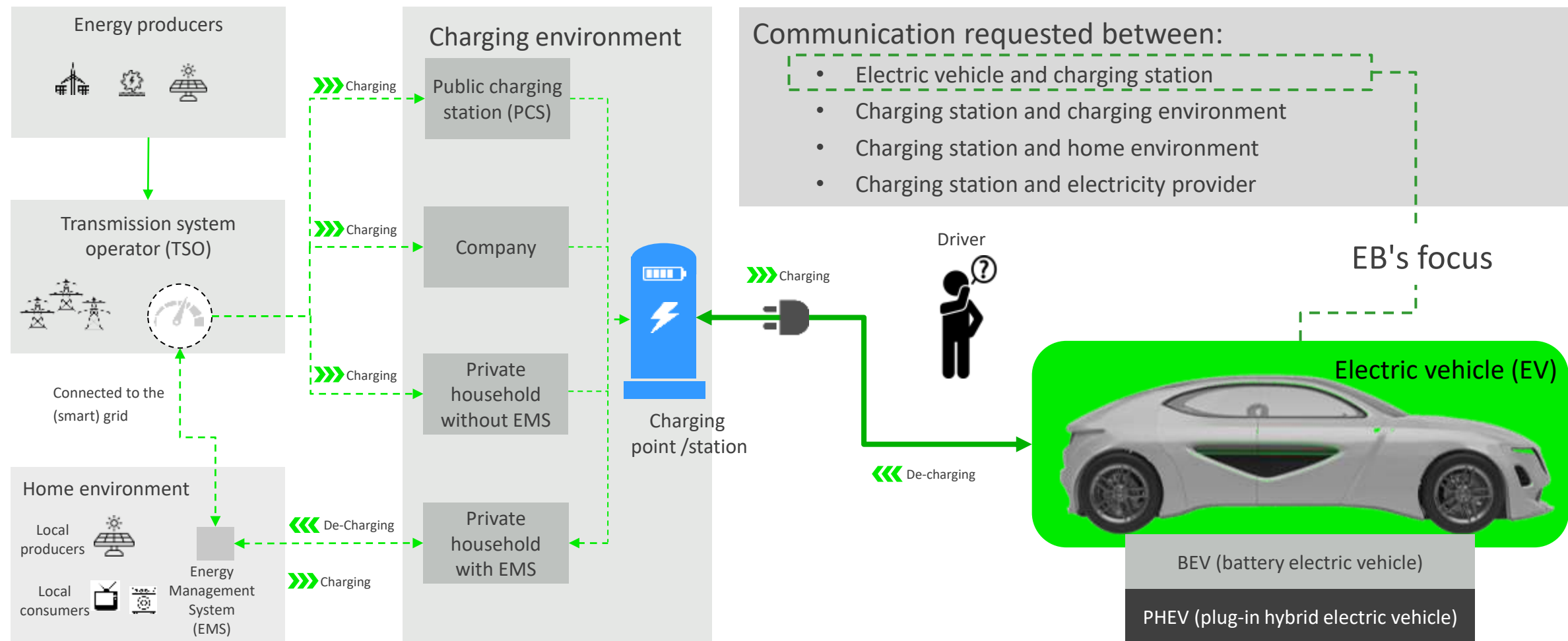


EB tresos AutoCore Generic 8 (ACG8) Vehicle 2 Grid: V2G



Charging eco-system overview

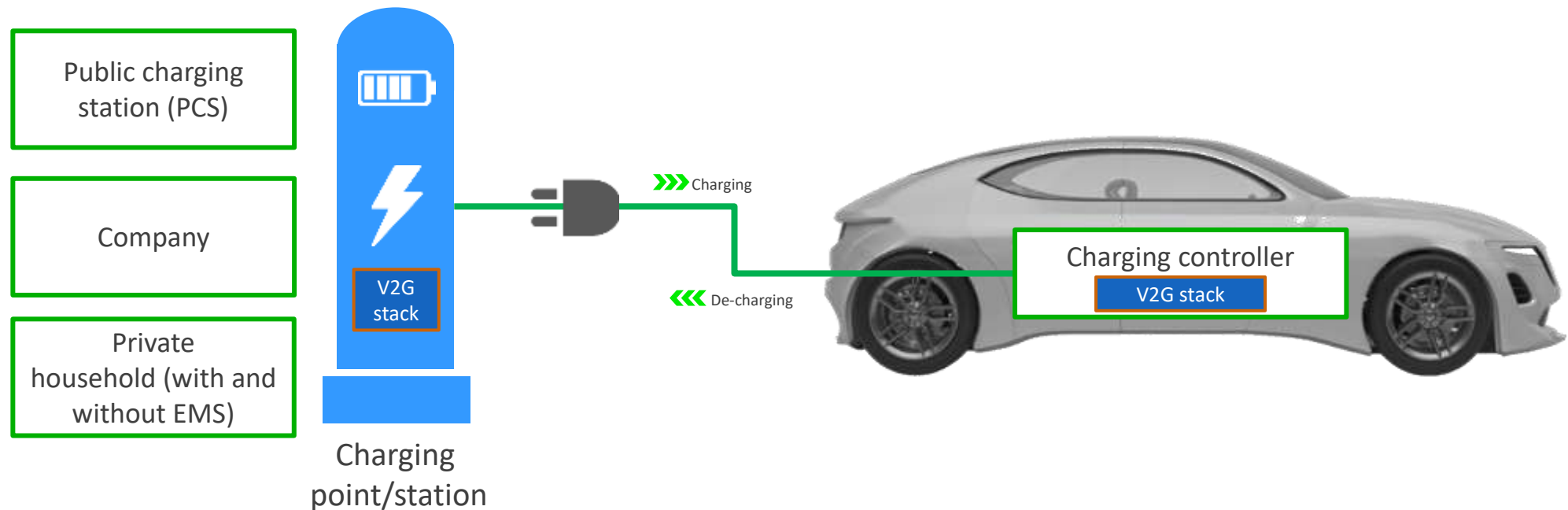


V2G communication overview

Charging controller inside EV

Includes communication stack with V2G extensions for charging along with

- charging control application
- communication stack itself
- relevant hardware driver



EB's focus

Charging communication standards

ISO/
IEC 15118

GB/T

CHAdeMO

US, Europe	Based on Power Line Communi- cation	Periodic updates 2018: bi-directional charging included
China	Based on CAN Communi- cation	Harmonization ongoing: new joint standard "ChaoJi"
Japan	Based on CAN Communi- cation	

ISO/
IEC
15118

EB's first focus:
EB tresos with fully integrated charging software
(Charging controller software based on
ISO 15118 compliant communication stack)

Charging technology is changing

Charging technology now require powerful host

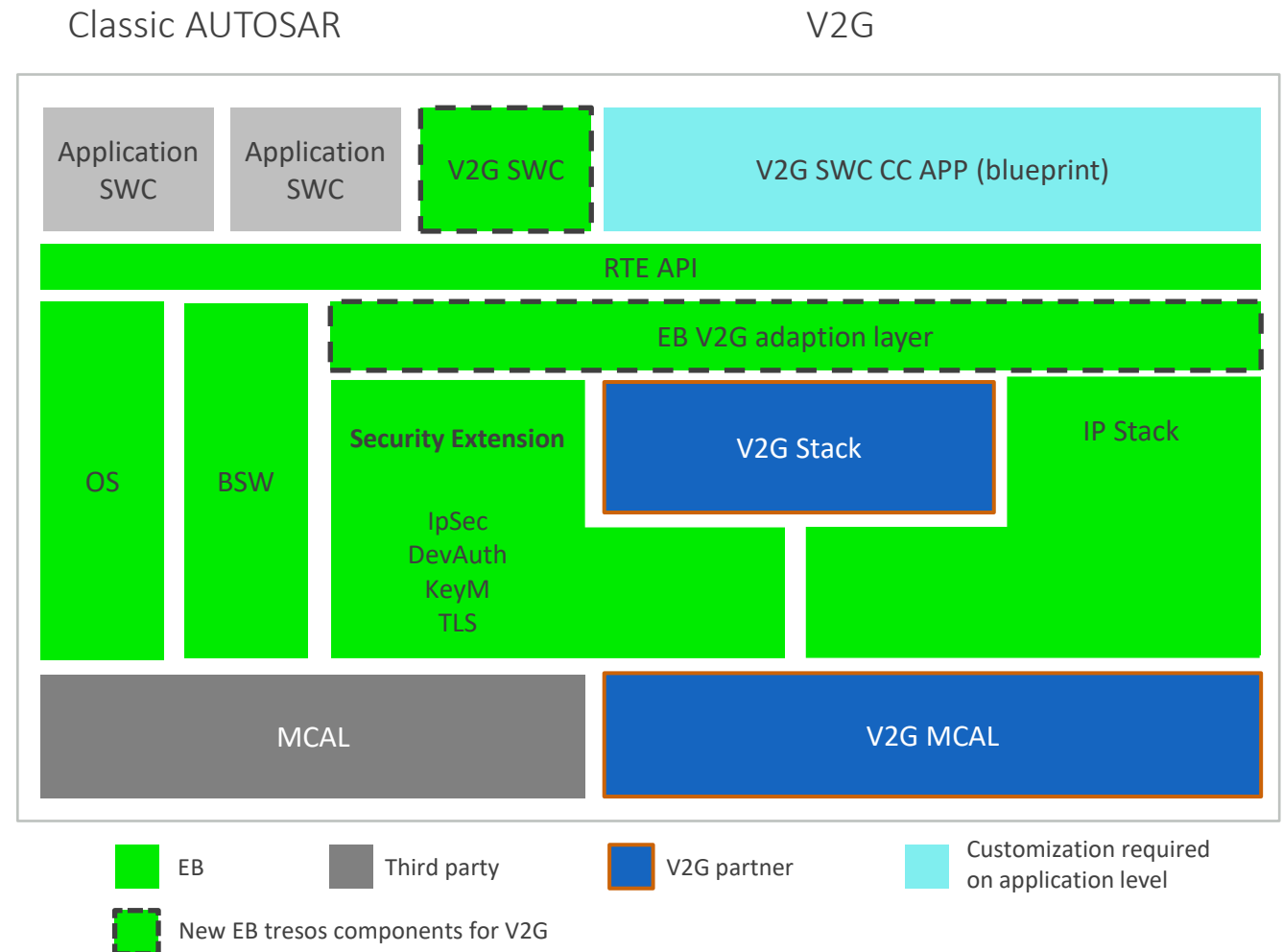
- Charging process today is not stable and user-friendly.
- Especially communication between charging control software inside electric vehicle and charging station causes problems.
- **New ISO 15118-20 and new features (e.g. Plug and Charge) require more complex communication between electric vehicle and charging station and therefore, requires more powerful hardware**
- Integrate the V2G stack in AUTOSAR environment.
- Use **"classic" ECU with AUTOSAR OS** or new **High-Performance Computing platform (HPC)** as host for the V2G stack.
- Interact with existing AUTOSAR modules (e.g. IP stack, TLS stack) to use similar functions also for charging communication.



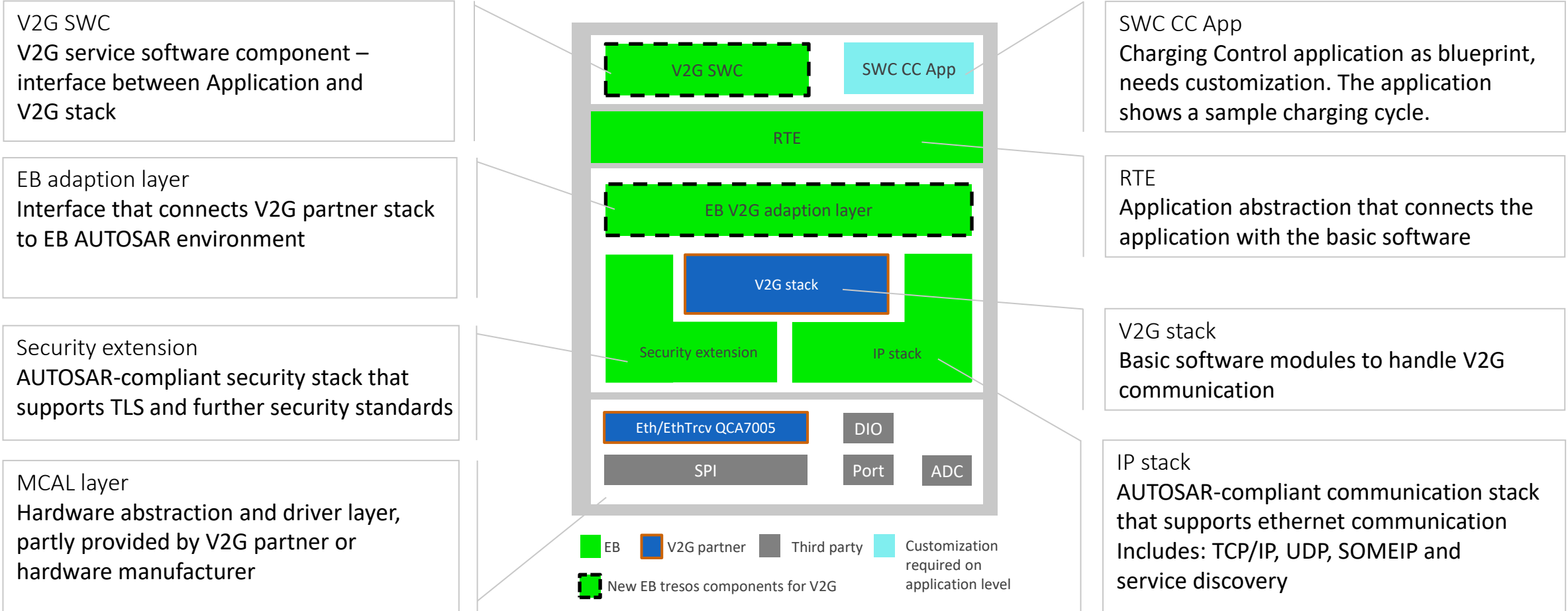
A charging controller including communication stack (V2G) needs a "more-powerful host" than currently used battery management solution can provide

V2G in AUTOSAR environment

- V2G stack is integrated inside EB tresos AUTOSAR environment.
- Communication via RTE API is realized via EB V2G adaption layer.
- V2G stack uses EB tresos components for communication and security (Plug and Charge).



High-level description of each module



System overview

SW architecture / data path

L3

V2G stack uses ACG IP stack to communicate via TCP/UDP

L2

SLAC module is transmitting raw Ethernet frames via QCA

L1

EB V2gEth QCA provides interfaces of Eth Driver to ACG and includes QCA module

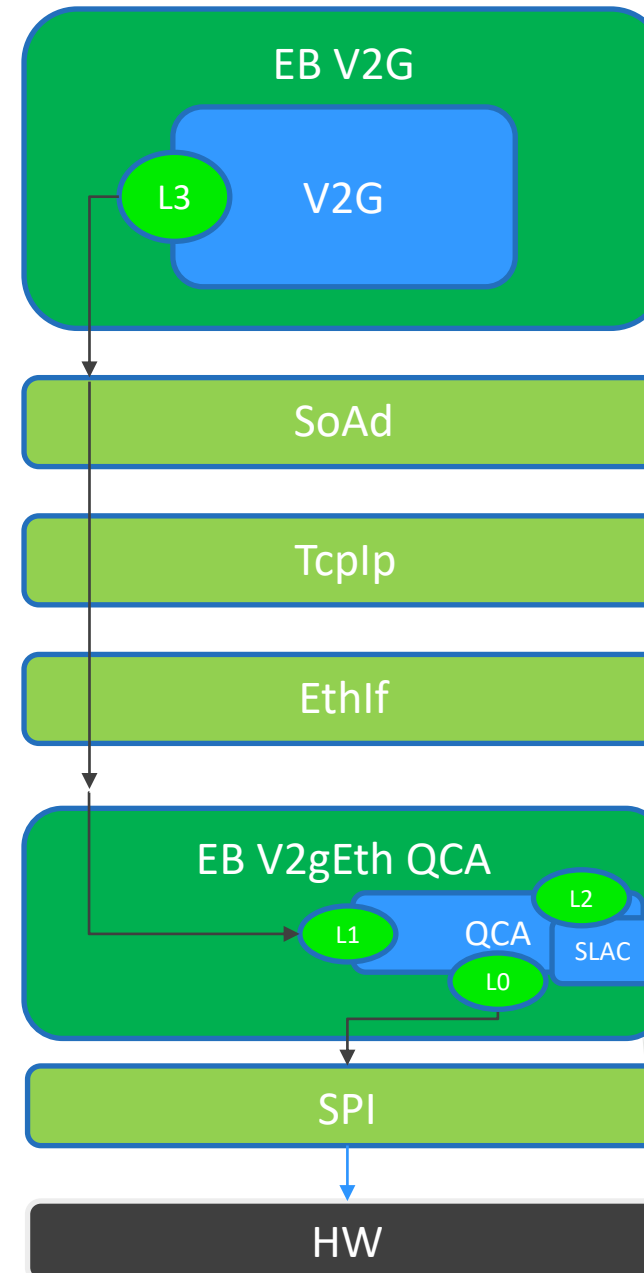
L0

QCA is configured via SPI, Ethernet communication is tunneled over standard AUTOSAR SPI API

Notes:

- QCA: Qualcomm transceiver type
- SLAC: Signal Level Attenuation Characterization-Mechanism

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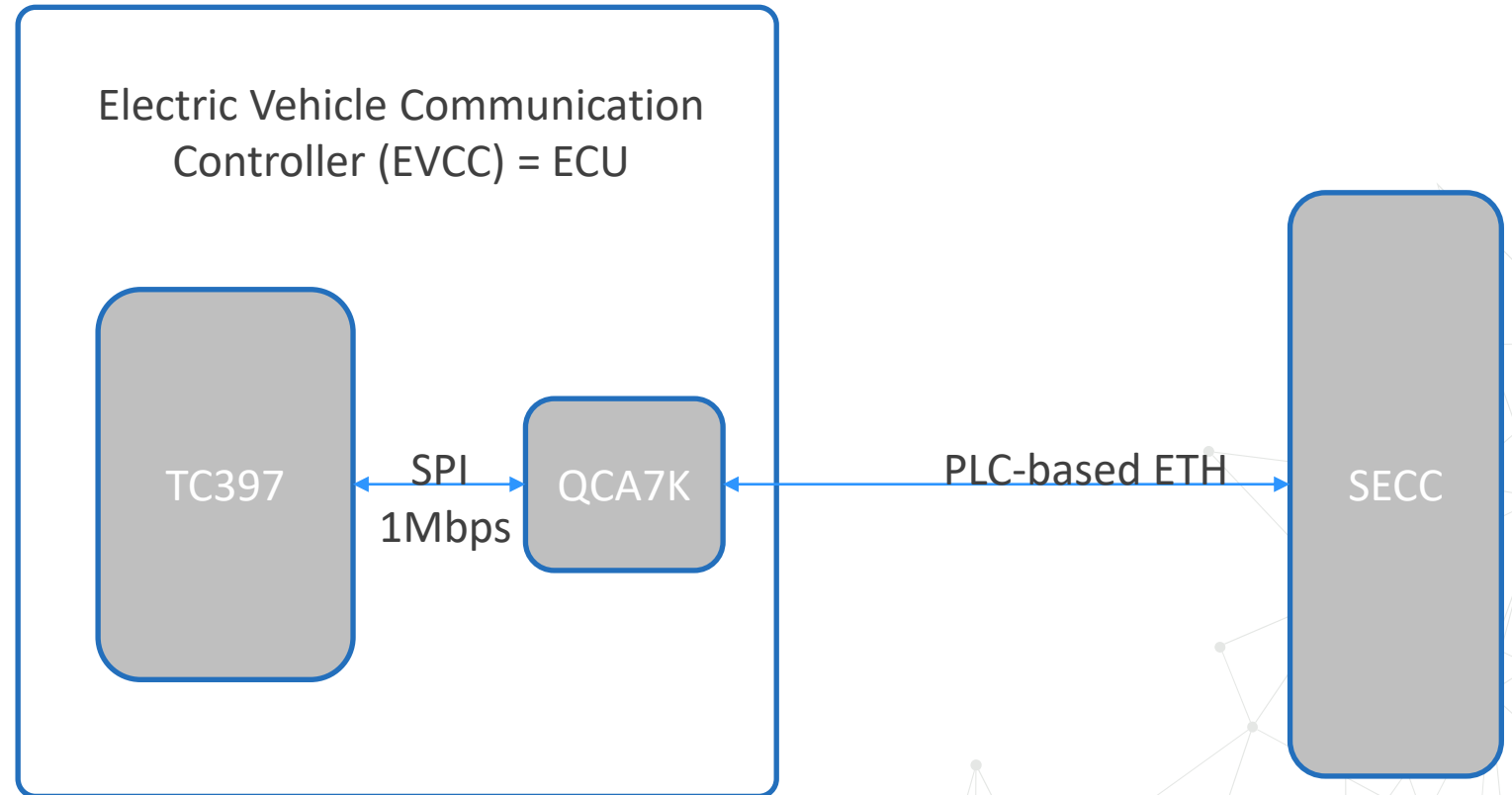
System overview

Sample: Hardware and HW requirements

- QCA PLC controller is connected to TC397 via 1Mbps SPI
- QCA performs PLC communication to charging station (SECC)
- Memory footprint from eval project (on TC397):
 - V2G stack : 210 kB ROM / 46 kB RAM
 - V2G adaption: 4kB ROM / 5kB RAM

Notes:

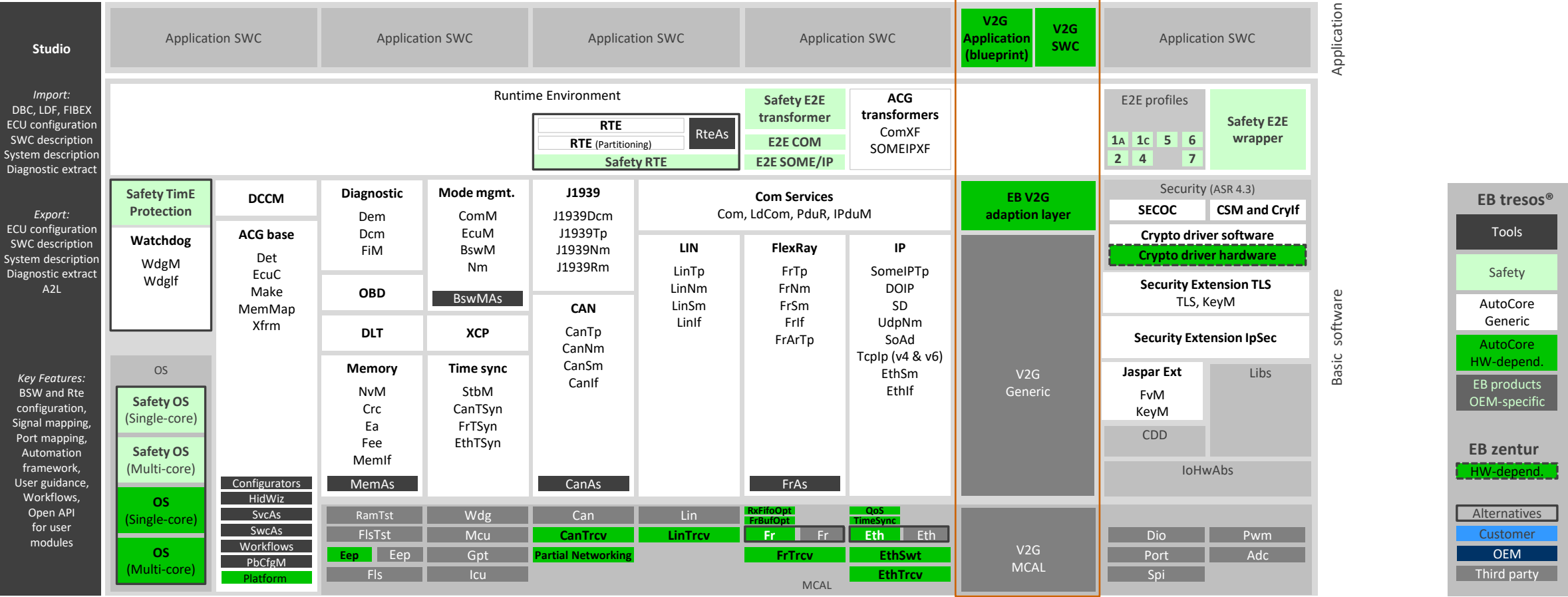
- PLC: Power-Line-Communication
- ETH: Ethernet
- QCA7K: Qualcomm transceiver type
- TC397: Infineon Aurix TC397 micro controller
- SECC: Supply Equipment Communication Controller (= charging station)



EB tresos AutoCore 8 & V2G stack

V2G 3rd party: SEVENSTAX

All **bold** names are licensable items.



EB tresos AutoCore 8 & V2G stack

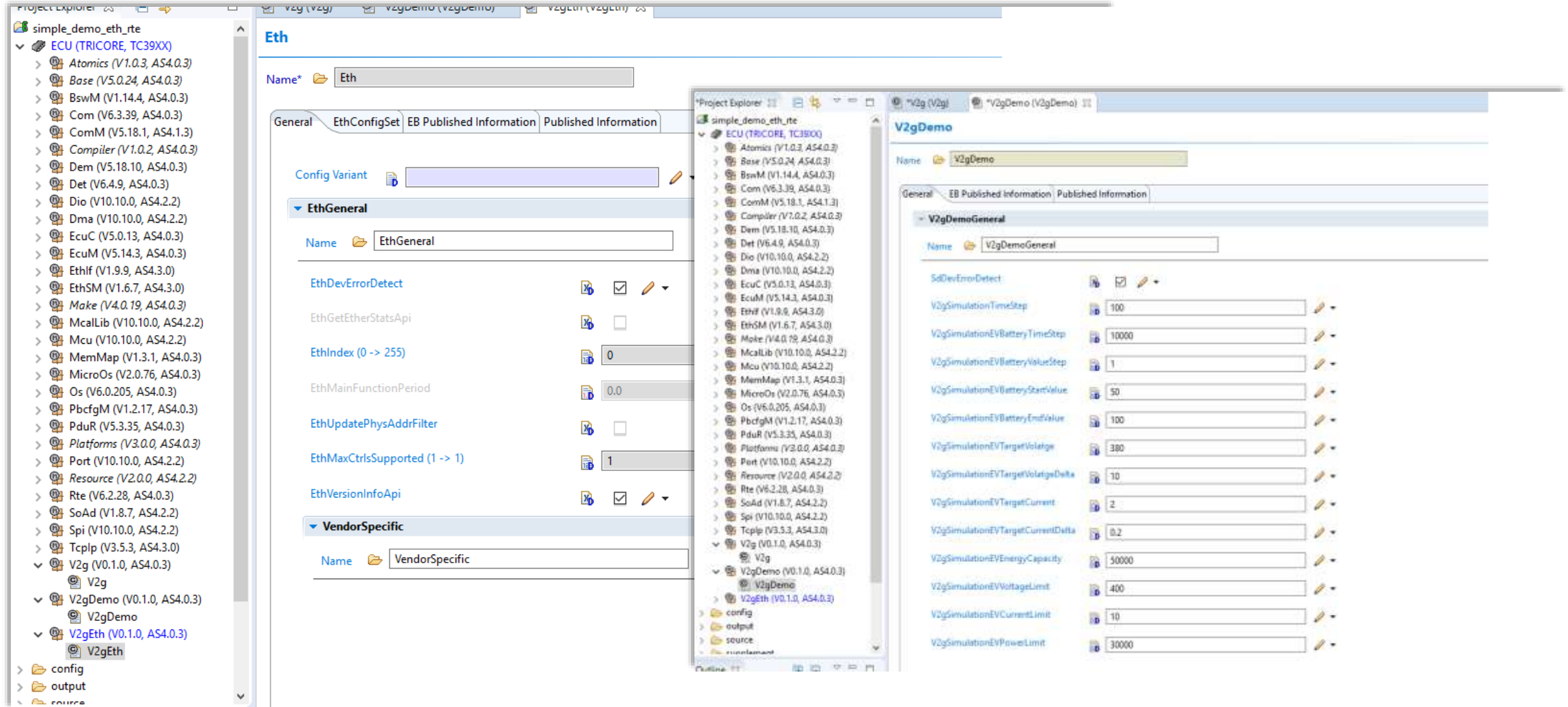
Configuration Screenshots – Communication Channel Configuration

The screenshot shows the V2gChannelConfig configuration window. The 'V2gRxPdu' tab is selected, displaying a table with the following data:

Index	Name	V2gRxPd...	V2gRxPduRef	V2glPduT...
0	V2gRxPdu_0	0	/EcuC/EcuC/EcucPduCollection/Pdu_V2G_R_UDP	DISCOVERY
1	V2gRxPdu_1	1	/EcuC/EcuC/EcucPduCollection/Pdu_V2G_R_TCP	SERVICE

EB tresos AutoCore 8 & V2G stack

Configuration Screenshots – General Configurations



V2G stack by SEVENSTAX - product features (1)

The V2G stack by SEVENSTAX supports:

- **Charging relevant standards:**
 - DIN SPEC 70121 (early forerunner of ISO 15118; for DC charging only)
 - ISO15118-2
 - SAE J2847/2
- **ISO 15118 – Smart charging for electric and hybrid**
 - Describes and defines the communication between electric/hybrid vehicle and charging station for charging process
 - Enables the intelligent charging with AC and DC
 - Especially DC charging requests the power requirement communication between charging station and the vehicle itself
 - Communication is established via Powerline communication based on HPGP standard (HomePlugGreenPHY)
- **DC and AC charging**



V2G stack by SEVENSTAX - product features (2)

The V2G stack by SEVENSTAX supports:

- **External Identification Means (EIM) and Plug & Charge as payment methods – automated and secured method for payment**
 - ISO 15118 defines two different payment methods for energy supply
 - EIM (External Identification Means) defines a separated payment process fully uncoupled from the charging communication (e.g payment via RFID token directly on charging station)
 - Plug & Charge provides a fully automated and secured method for payment by using the ISO 15118 based charging communication. TLS as encryption standard and X.509 certificates for authentication are used here.
- **Bipolar Power Transfer (BPT) – de-charging back in the energy network**
 - This is the key features which makes the charging "smart" in the future.
 - An electric vehicle is now able to act as energy storage for the home network and can transfer the energy back into the home network and via this back into the transmission system.
 - ISO 15118-20 defines the messages necessary for this bi-directional charging.



Why SEVENSTAX as V2G stack supplier?

About SEVENSTAX

- German-based company known for IoT software solutions for almost 20 years
- Member of ISO 15118 norming group
- Flexible and customer oriented,
- Expert support provided by highly experienced development engineers

Proof points

- Software powers million of devices (electric vehicles, charging stations, test equipment, IoT devices, ...)
- SEVENSTAX V2G stack is in productive use in
 - Electric vehicles on the road and charging stations (EVSE)
 - Companies using the stack during ECU development process (EV-OEMs and Tier1/Tier2 companies)
 - Test systems (e.g. HIL) and for Protocol Analysis



Why SEVENSTAX as V2G stack supplier?

Technical expertise

- SEVENSTAX V2G stack is fully compliant with ISO 15118 standard
 - DIN SPEC 70121 (early forerunner of ISO 15118 for DC charging only)
 - ISO15118-2 EIM (DC charging, AC charging, AutoCharge: API to retrieve MAC)
 - SAE J2847/2

Certification

- Certified supplier for test system manufacturers (also for HIL's used in automotive area)
- Certified software supplier for CODICO (Hardware distributor for Qualcomm in Europe)



Why SEVENSTAX as V2G stack supplier?

Success stories

- World's first commercial V2G implementation in 2012 for a European OEM
- Since 2012, in productive use by OEMs for passenger and commercial vehicles in Europe, U.S. and Japan
 - More than 400k EV use this stack on the road
 - Existing contracts with 10 automotive OEM/Tier-1. (7 projects inside Europe, 2 in U.S. and 1 Japan)
- In productive use by 8 EVSE* suppliers in Europe
 - more than 50k charging stations in productive use with this V2G stack
- More than 80 requests from OEM / Tier-1 / EVSE in the pipeline currently



Electric charging solution with EB tresos, summary

SEVENSTAX V2G stack fully integrated in EB tresos

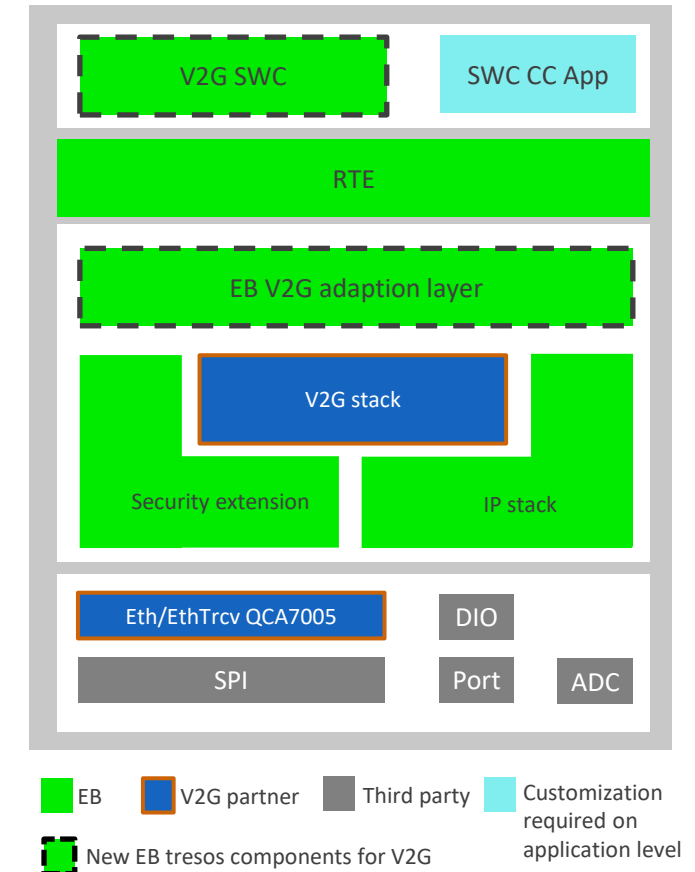


Highlights

- Support of ISO 15118 standard
- DC and AC Charging incl. external authentication
- Available Add-On products
 - ISO15118-2 Plug & Charge
 - ISO15118-20 BPT (coming soon)

Benefits

- Fully integrated into EB tresos AutoCore Generic
- Charge control software as “blueprint” application
- Defined interface to charge control software (SWC interface or CDD)
- Flexibility regarding architecture, features and support



Contact sales@elektrobit.com how to order the V2G solution for your project.

Contact us

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Elektrobit

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[elektrobit.com](https://www.elektrobit.com)

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