Herausforderungen rund um das Software-definierte Fahrzeug

Klausurtagung ‘Software als Management-Task’
Schloss Fürstlich Drehna, 24.-25.9.2025

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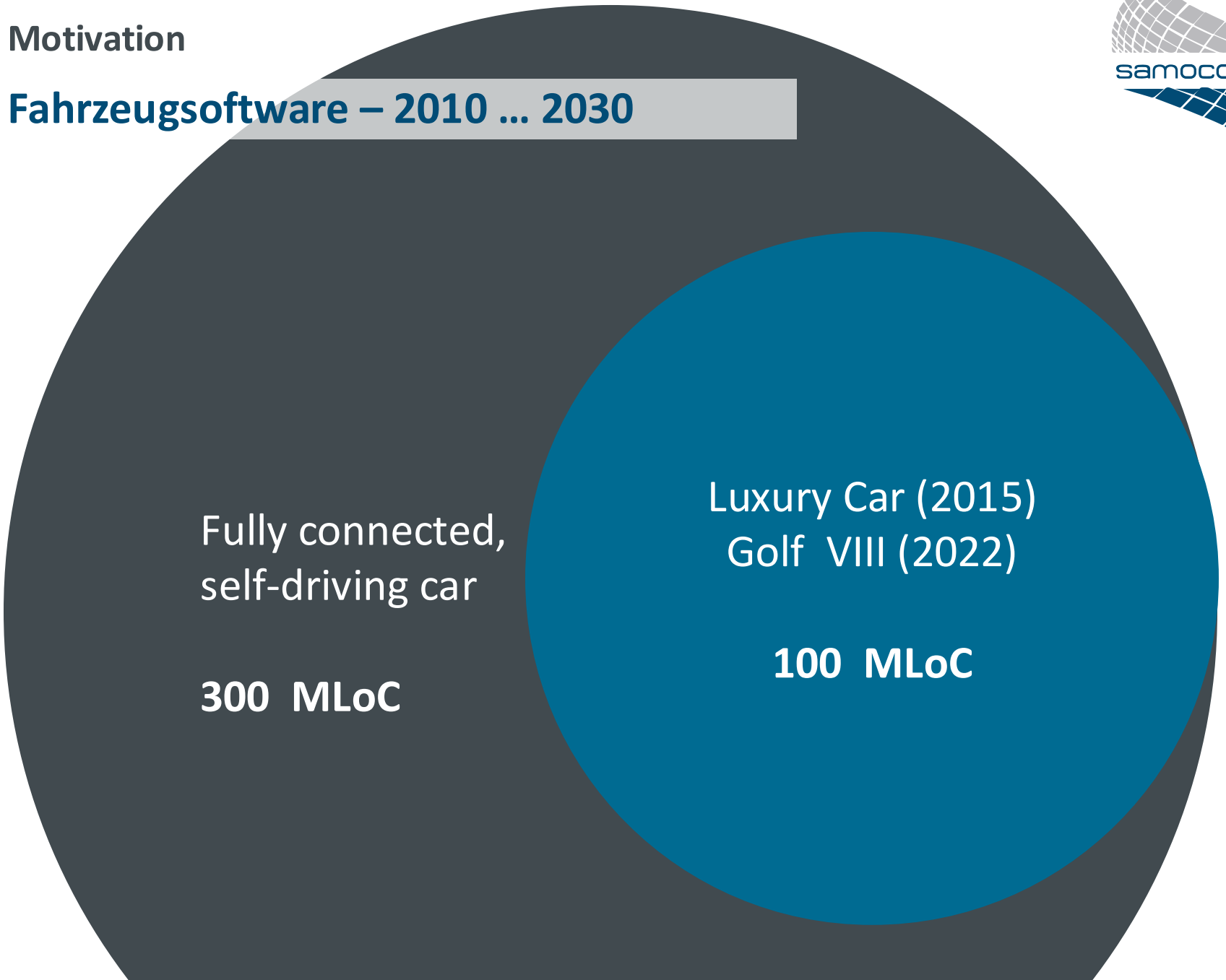
Fahrzeugsoftware – 1900 … 2010

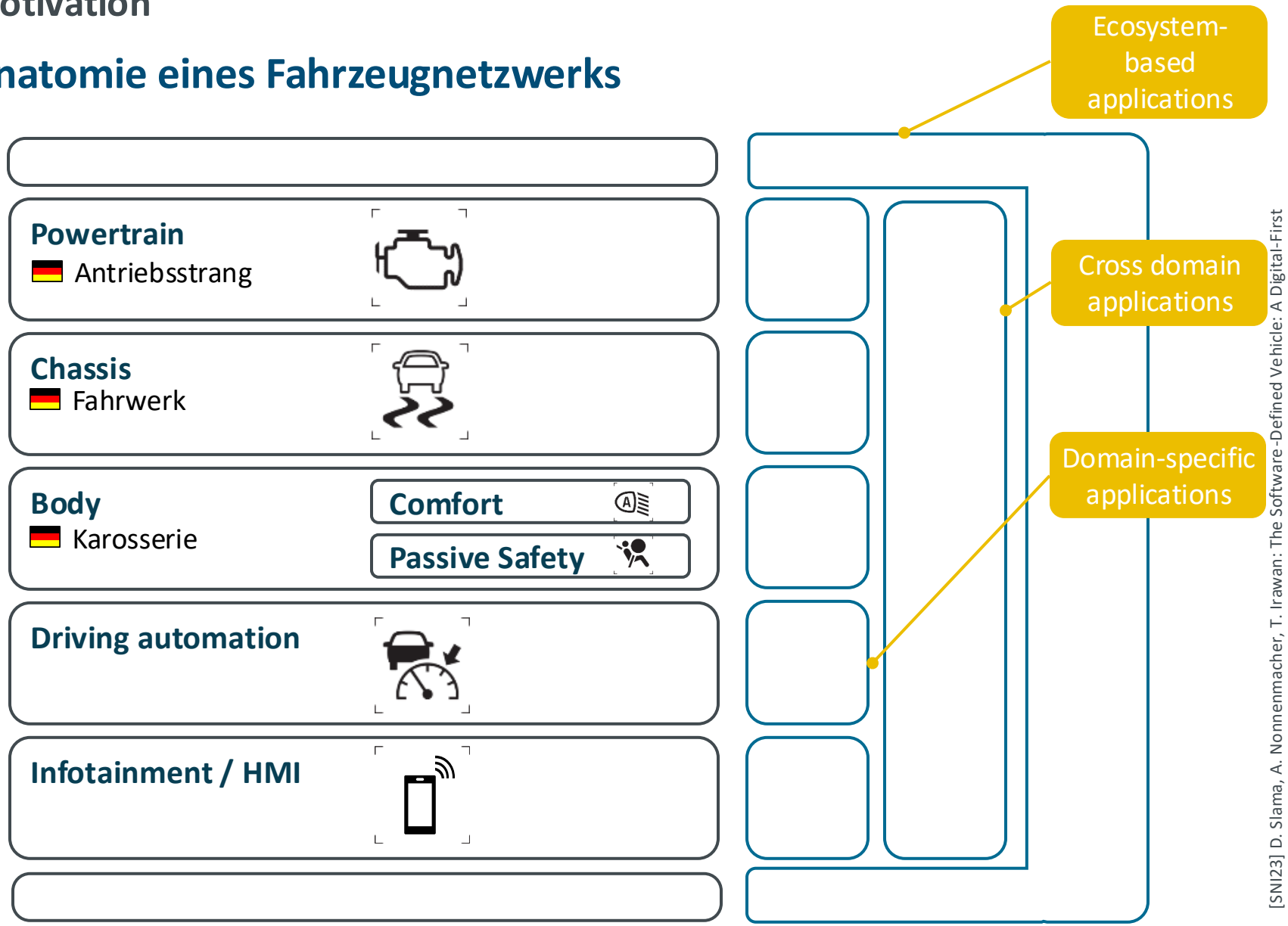
[DCG+04] M. Conrad • I. Fey • . Grochtmann • T. Klein Modellbasierte Entwicklung eingebetteter Fahrzeugsoftware bei DaimlerChrysler. Informatik Forsch. Entw. (2005) 00: 1–8 DOI 10.1007/s00450-005-0197-5

Fahrzeugsoftware – 2010 … 2030



[[Ber15] Consolidation in Vehicle Electronic Architectures. Roland Berger, 2015

Anatomie eines Fahrzeugnetzwerks

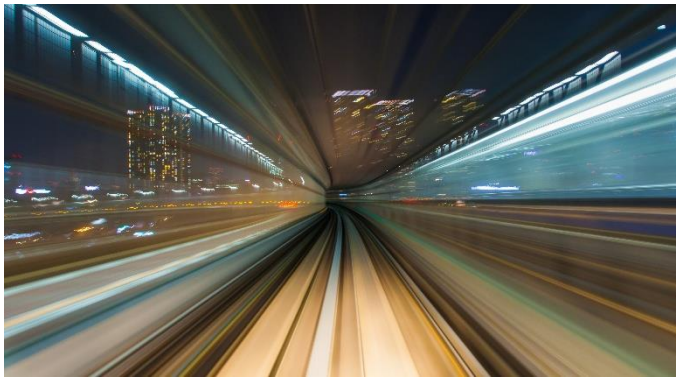


[SNI23] D. Slama, A. Nonnenmacher, T. Irawan: The Software-Defined Vehicle: A Digital-First Appraoch to Next-Generation Experiences. O'Reilly Media, Inc., Sept. 2023

Was ist ein Software-definiertes Fahrzeug?

Software-Defined Vehicle (SDV)

- **Vehicle whose features and functions are primarily enabled by SW**, as a result of the ongoing transformation from a mainly HW-based product to a SW-centric electronic device on wheels
- **Car that keeps improving** due to the continuous wireless delivery of new SW features and updates **throughout its lifetime**



- **Vehicle fully integrated into the digital live of its driver**
- **Vehicle design strategy to** help **enable intelligent mobility** rather than one specific design
- Not just mobility, but an **ecosystem with the user at its center**

APTIV, 2020; HORIBA MIRA, 202x; BOSCH MOBILITY, 2020; Slama et. al, 2023; PWC, 2024

[APTIV20] What is a Software-Defined Vehicle? Mobility Insider, Mar. 2019.
[MIRA2x] Software Defined Vehicles: Why SDVs are critical to support future mobility. HORIBA MIRA202x.
[BOSCH20] The software-defined vehicle, Bosch Mobility, 2020.
[SNI23] D. Slama, A. Nonnenmacher, T. Irawan: The Software-Defined Vehicle: A Digital-First Approach to Next-Generation Experiences. O'Reilly, Sept. 2023
[PWC24] What is an SDV? Defining SDVs beyond just vehicles. PwC Japan, Oct. 2024

I) Software 1st Mindset and Organizational Culture / Structure

Powertrain
Antriebsstrang

Chassis
Fahrwerk

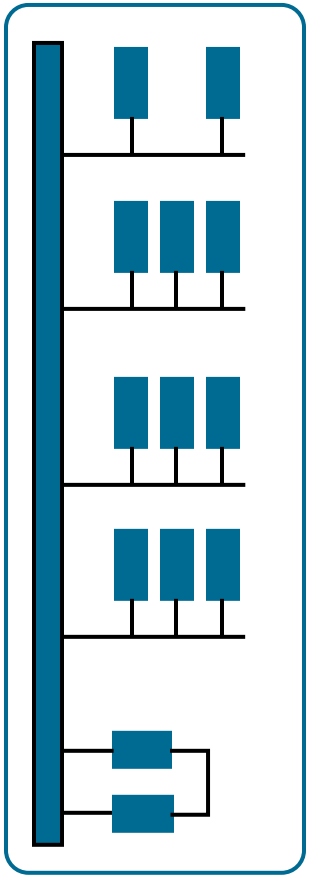
Body
Karosserie

Comfort

Passive Safety

Driving automation

Infotainment / HMI



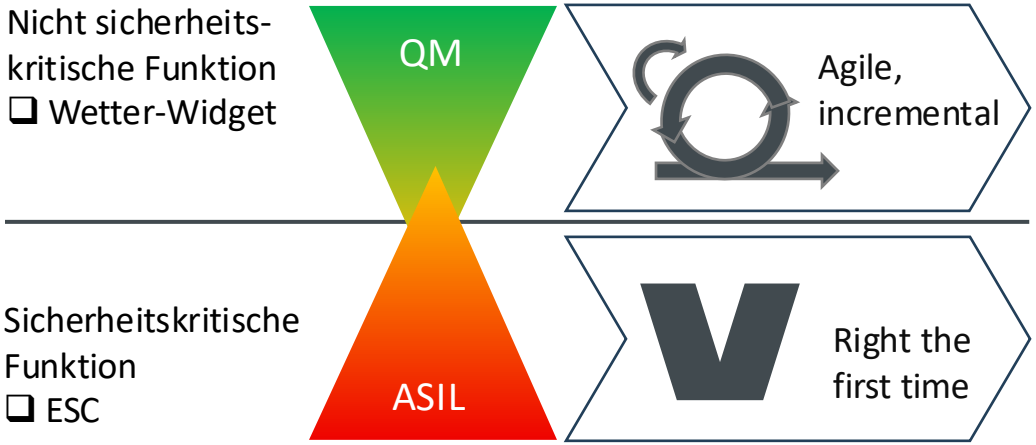
Conway's Law

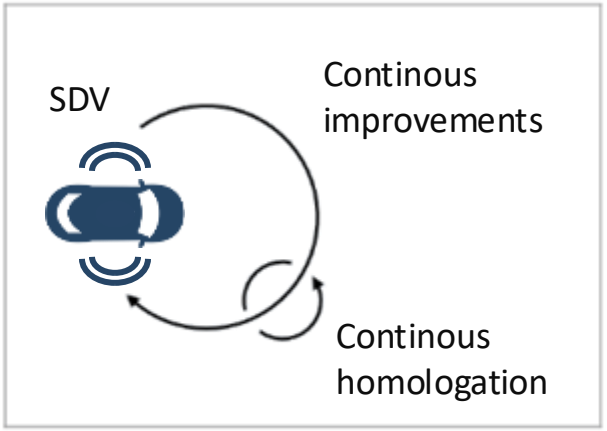
The structure of any system designed by an organization is isomorphic to the structure of the organization.

[YC79] E. Yourdon, L. L. Constantine: Structured Design: Fundamentals of a Discipline of Computer Program and Systems Design. Prentice Hall, 2nd ed., 1979

Herausforderungen

II) Two Speed Delivery Model



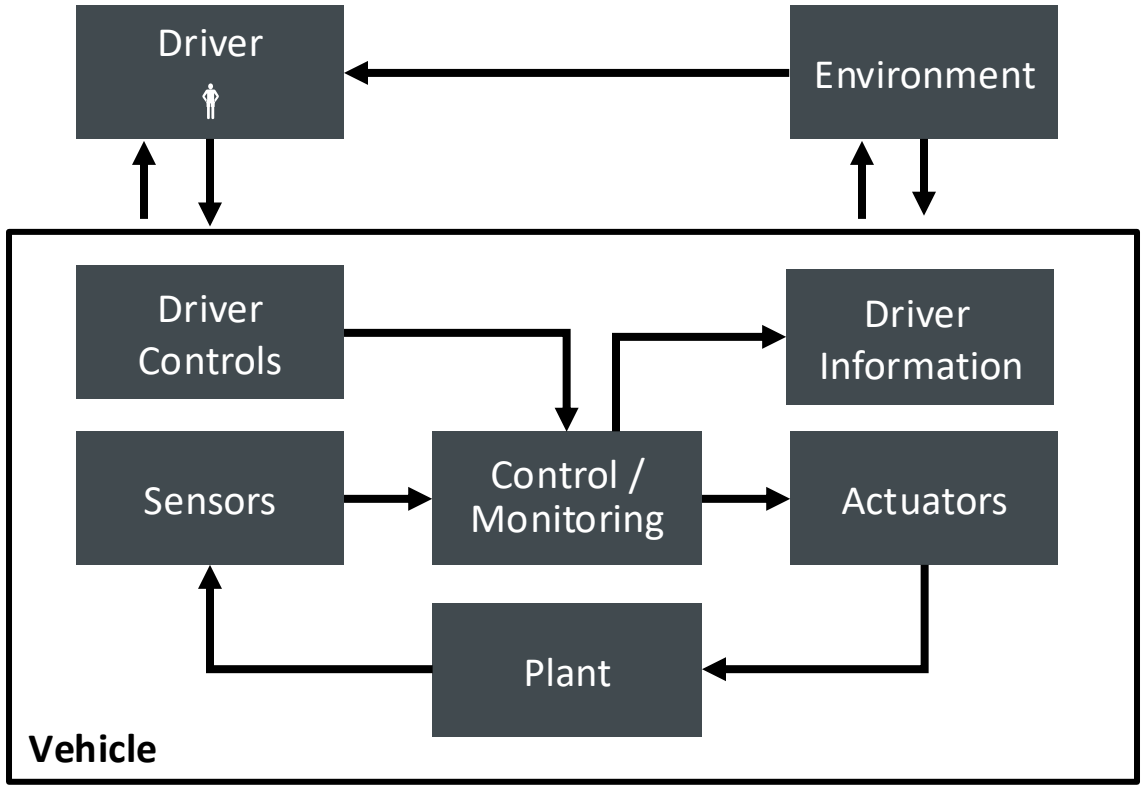


Source: www.digital.auto

[SDV Guide] https://www.sdv.guide/sdv101/part-a-essentials/sdv-domains-and-two-speed-delivery

III) Physics Aware Software and Software Engineers

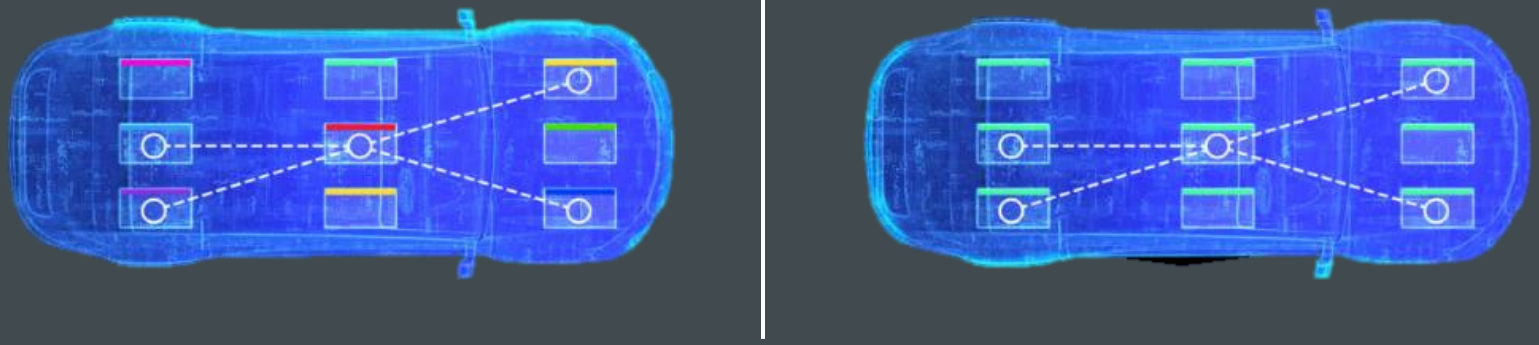
- **Electronic Stability Control (ESC) system**



Herausforderungen

IV) Automotive OS

From different SW stacks in each ECU … to a unified SW platform for onboard functions

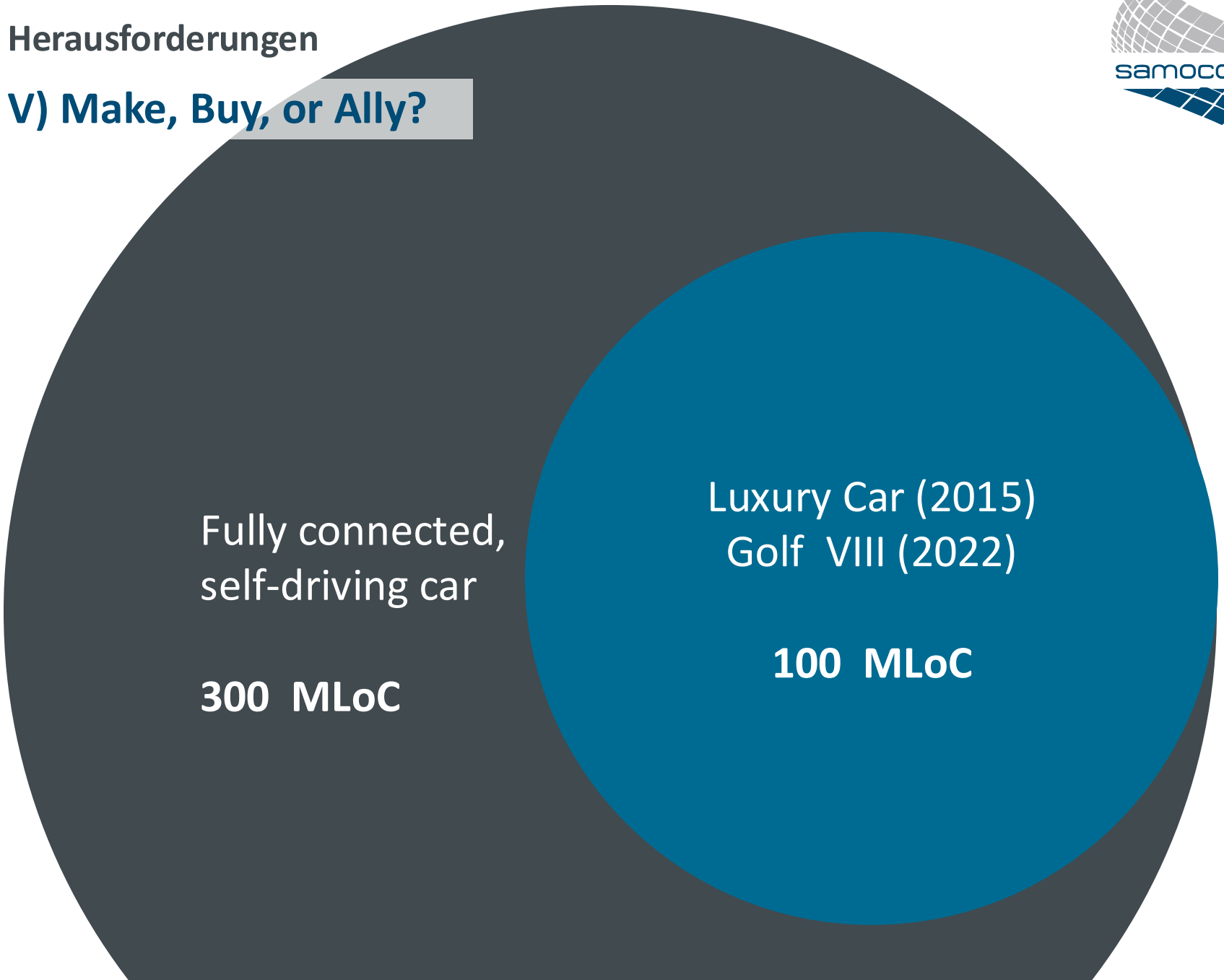


- Arene OS (Toyota)
- Xmart OS (Xpeng)
- MB.OS (Mercedes-Benz)
- Ford.OS (Ford)
- VW.os (Volkswagen)
- ASIMO (Honda)

https://cariad.technology/de/en/news/stories/vw-os-software-platform-explained.html (2024-09-04)

Herausforderungen

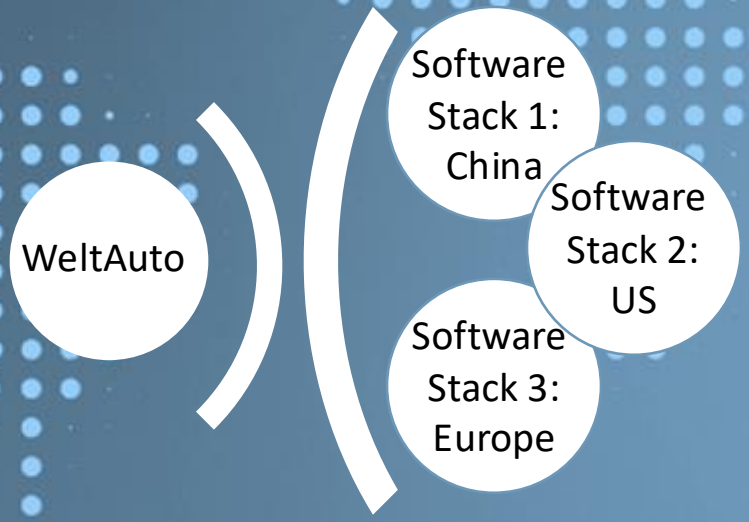
V) Make, Buy, or Ally?



[[Ber15] Consolidation in Vehicle Electronic Architectures. Roland Berger, 2015

Herausforderungen

VI) Local for Local



- China Electrical Architecture (VW + XPENG)
- 1st Gen E/E Architecture, Next-Gen SDV (VW + Rivian)

SDV Herausforderungen

I) Software 1st Mindset and Organizational Culture / Structure

II) Two Speed Delivery Model

III) Physics Aware Software and Software Engineers

IV) Automotive OS

V) Make, Buy, or Ally?

VI) Local for Local