

UNICAR*agil*

Disruptive Modular Architecture for Agile,
Automated Vehicle Concepts

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The UNICAR*agil* Project



~ 26 Mio. €
BMBF funding



Feb. 2018
–
Feb. 2022 +



15 university chairs
8 industrial partners



11/09/2021

The Consortium

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**RWTH AACHEN
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fly/drive



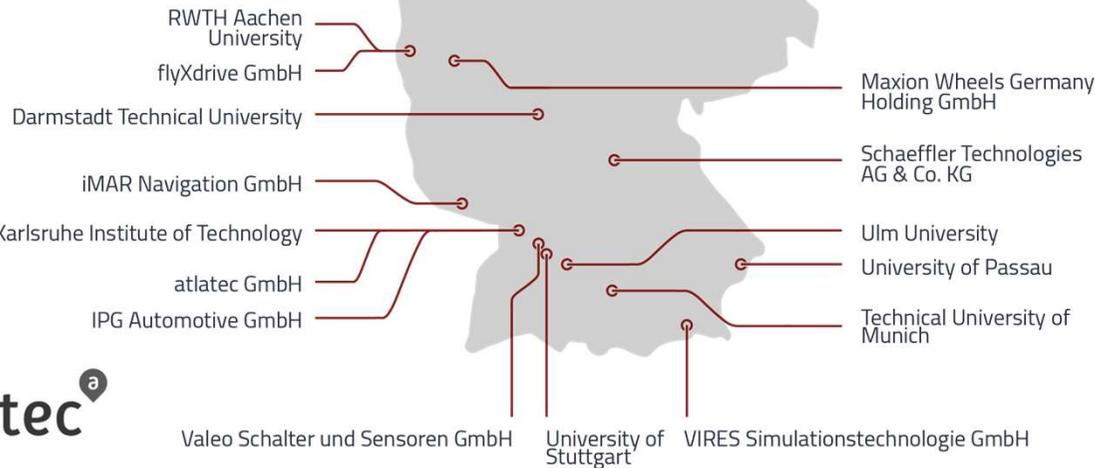
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Core Innovations

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User-centered Design Approach

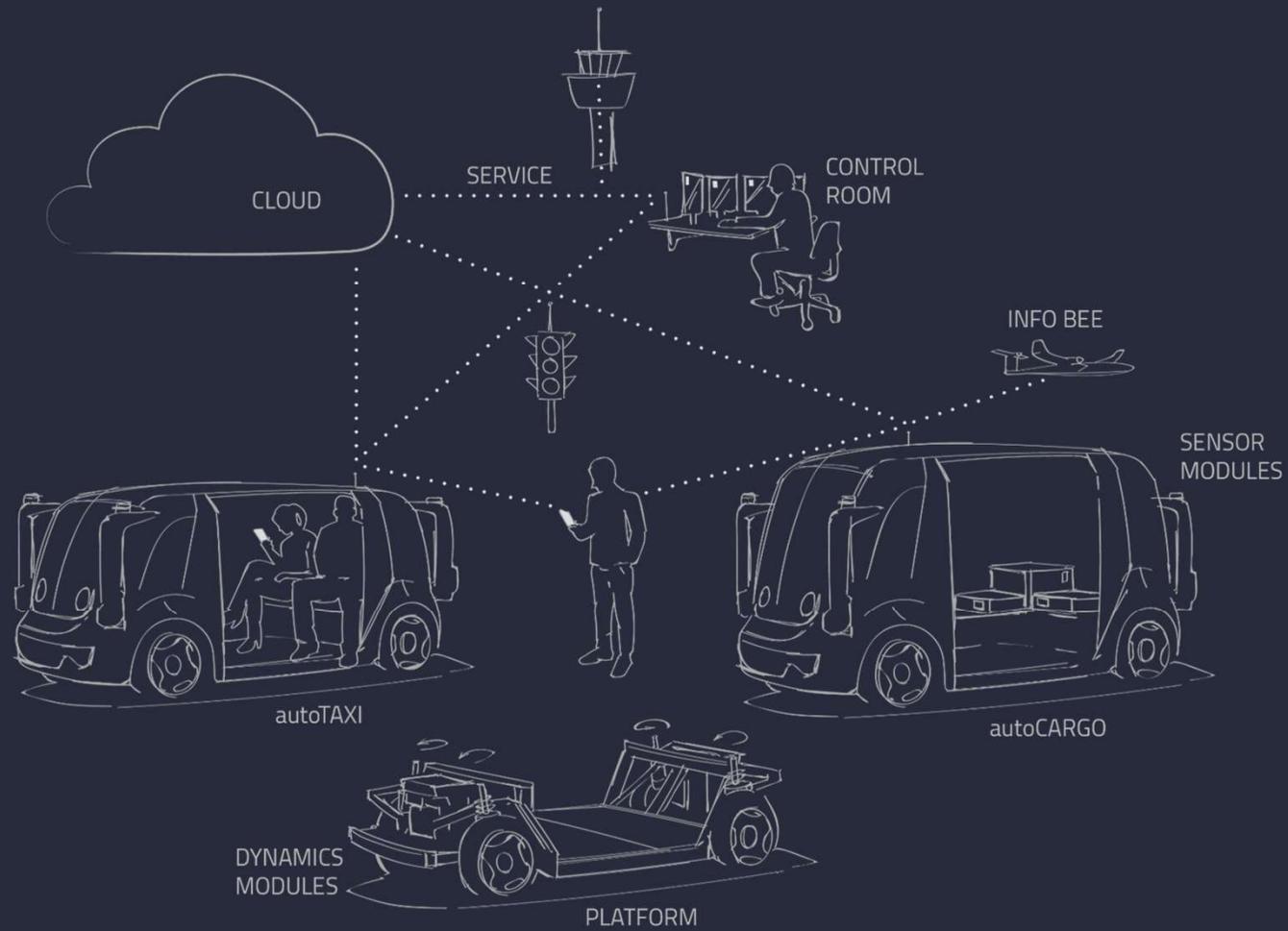
Collective Cloud Functions

Automotive Service-oriented Software Architecture

Innovative Electronics System Hardware Architecture

Consequent Modularization

Safety by Design



autoSHUTTLE



- Supplementing the public transport system
- 6 – 8 persons

autoTAXI



- Order, open, interact with CE device
- Cooperative and agile

autoELF



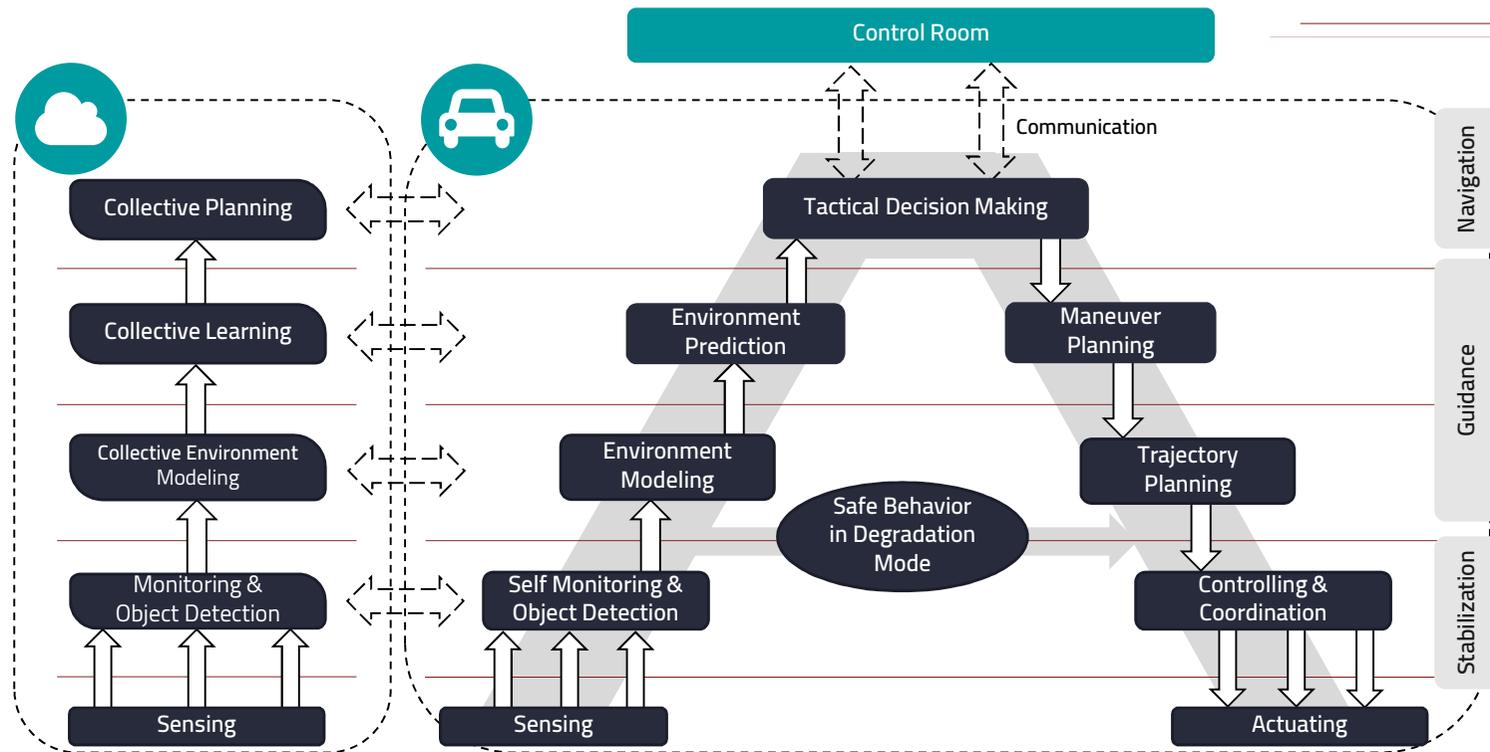
- Private „Butler / Nanny“
- Private, individual, accessible & trustworthy

autoCARGO

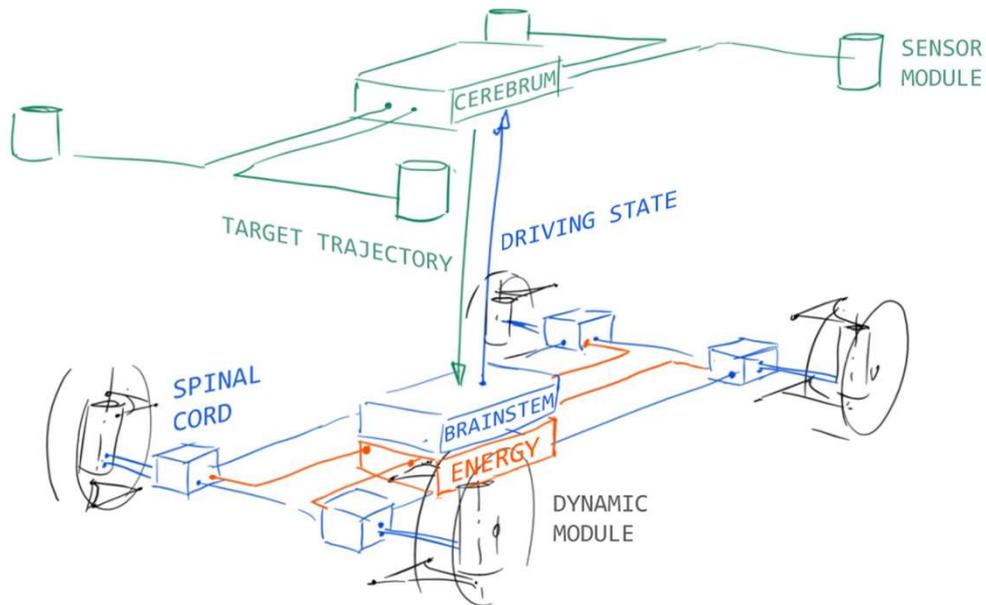


- Pick up and delivery service
- Automated handover

Functional Architecture



Mechatronic Architecture



"Brain" Structure

"Cerebrum":

- Environment representation
- Behavior and trajectory planning

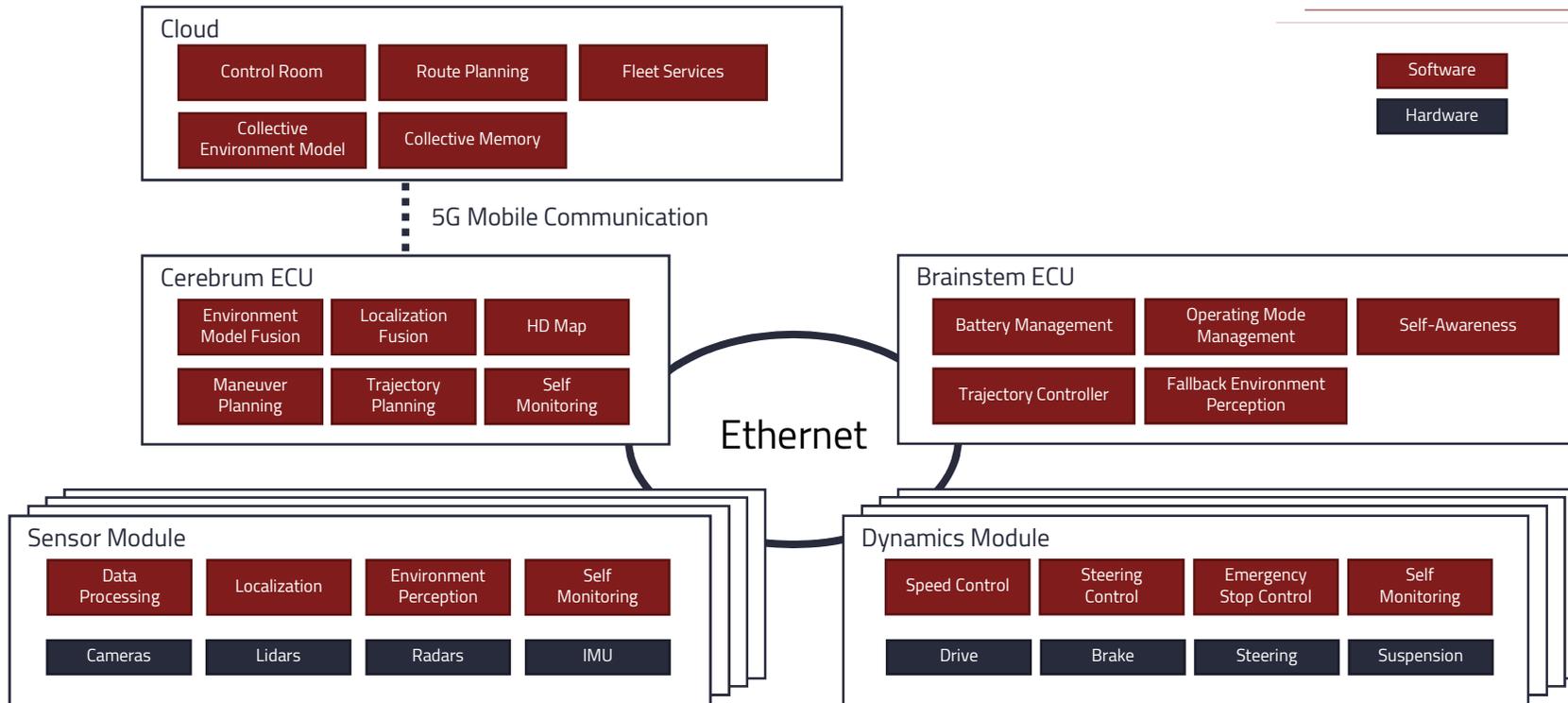
"Brainstem":

- Realization of desired trajectory
- Safety ECU
- Dedicated HW developed

"Spinal Cord":

- Steering angle and drive control
- Fallback in case of "Brainstem" failure

Modular E/E Architecture



ASOA – Automotive Service Oriented Software Architecture



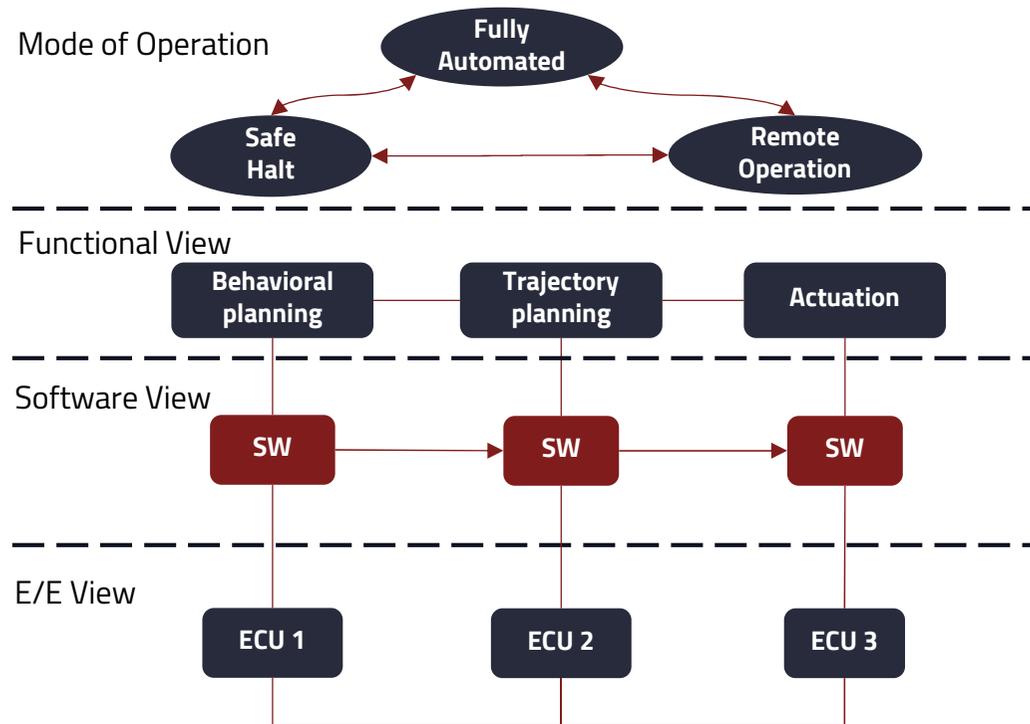
Classic Approach

- SW integrated at design-time
- Hard to update, repurpose, replace



ASOA

- SW integrated at run-time
- Machine interpretable service specification
- Easy to repurpose, update, replace
- Transparent implementation across various computer platforms



ASOA – Automotive Service Oriented Software Architecture



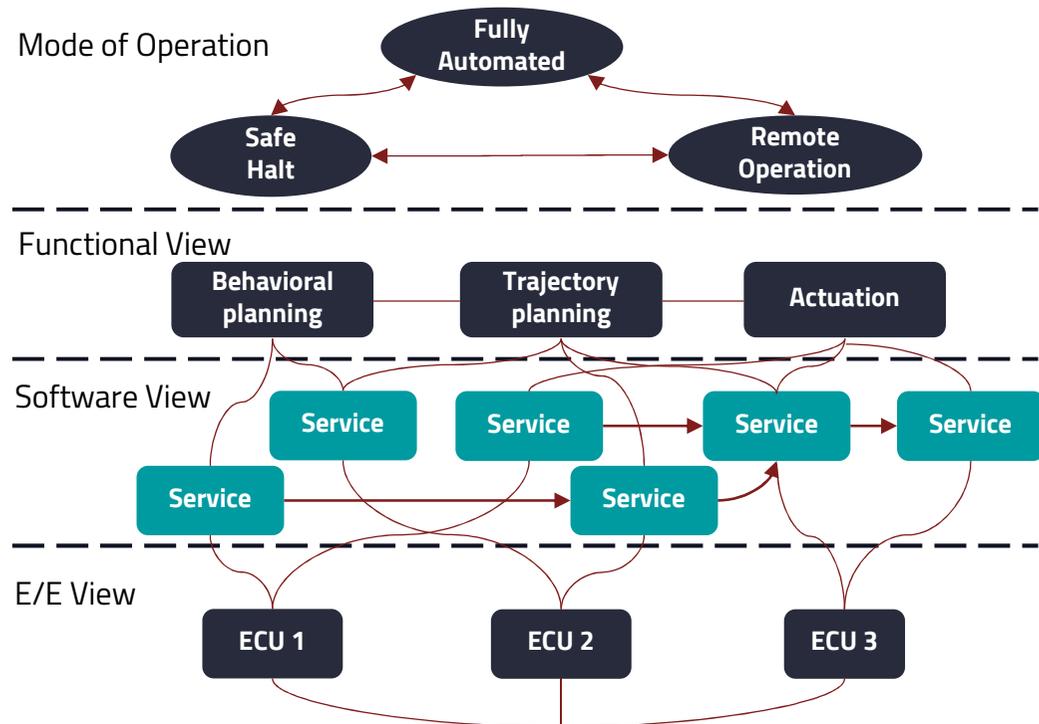
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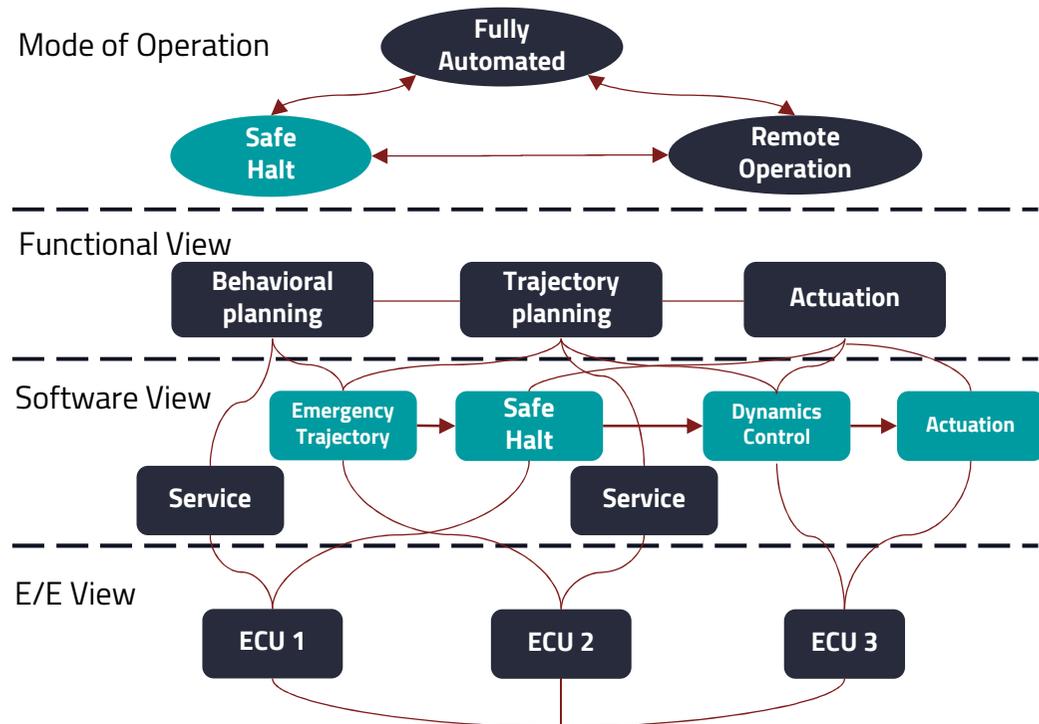


ASOA – Automotive Service Oriented Software Architecture



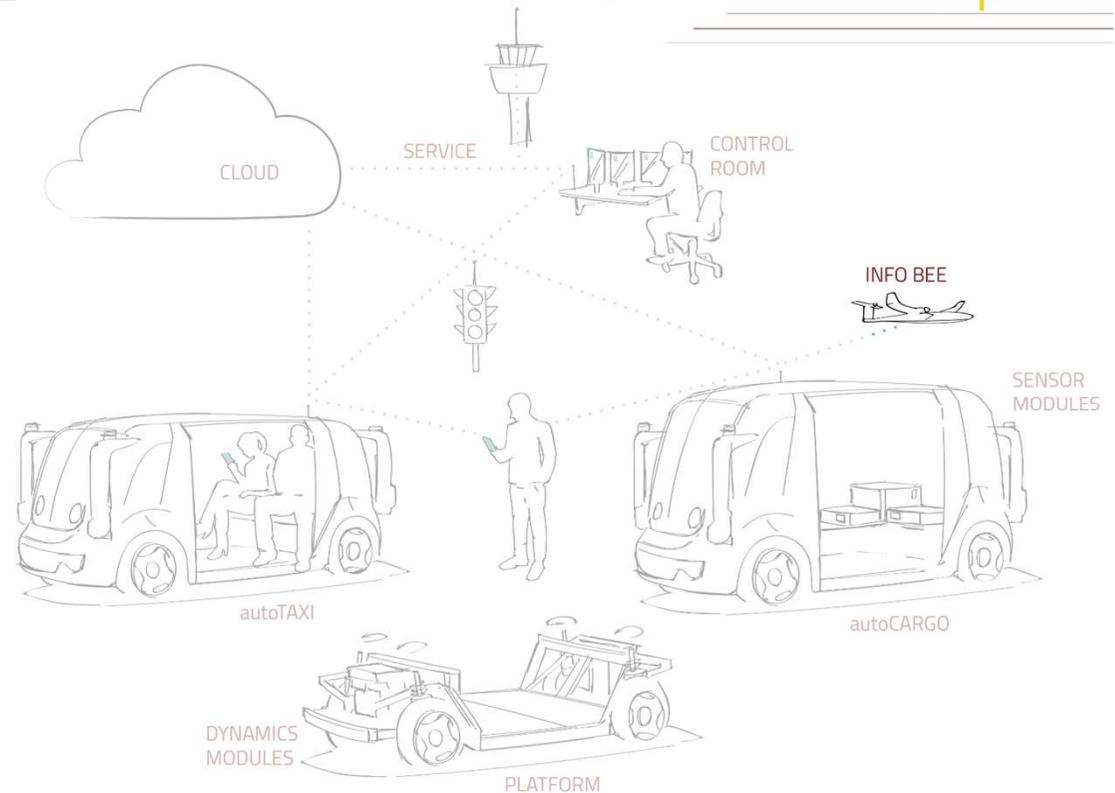
Example: Safe Halt

- Capable to transfer the vehicle into a risk-minimal state
- Additional sensors to check the free space
- Separate emergency trajectory



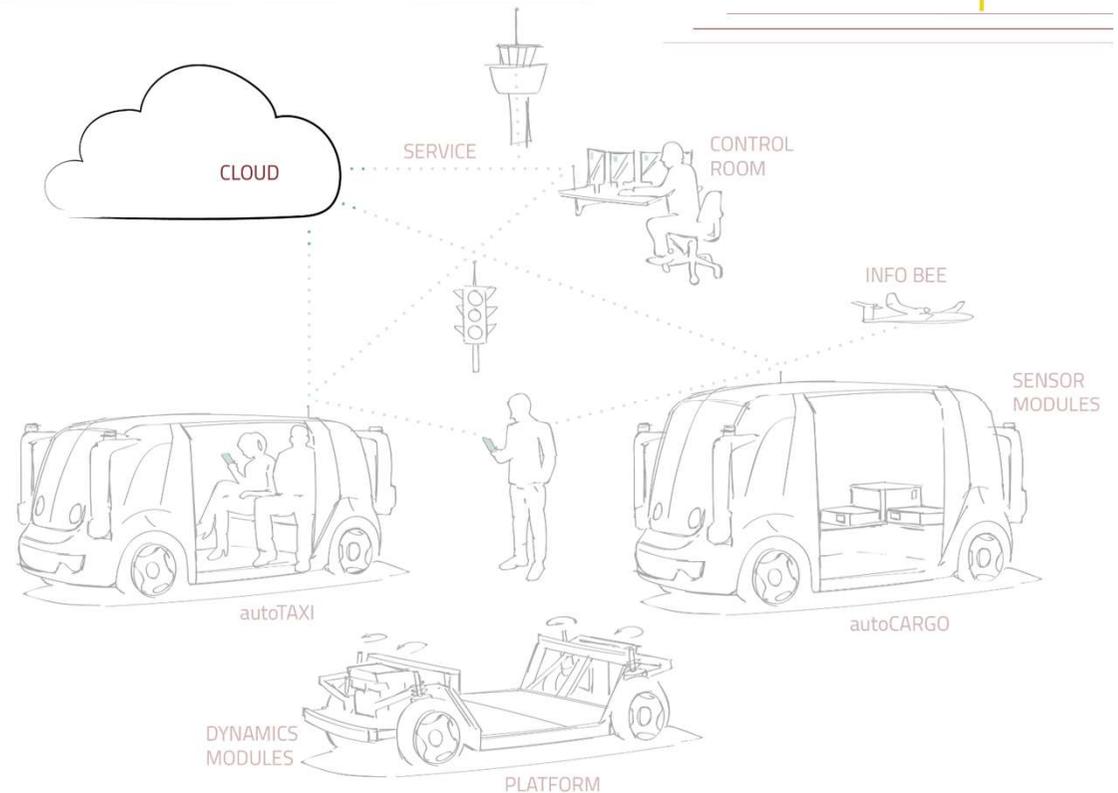
Intelligent Infrastructure

- Minimal stationary sensors
- Dynamic supplement by automated flying sensor cluster = UAVs
- Info Bee gathers and transmits environment data



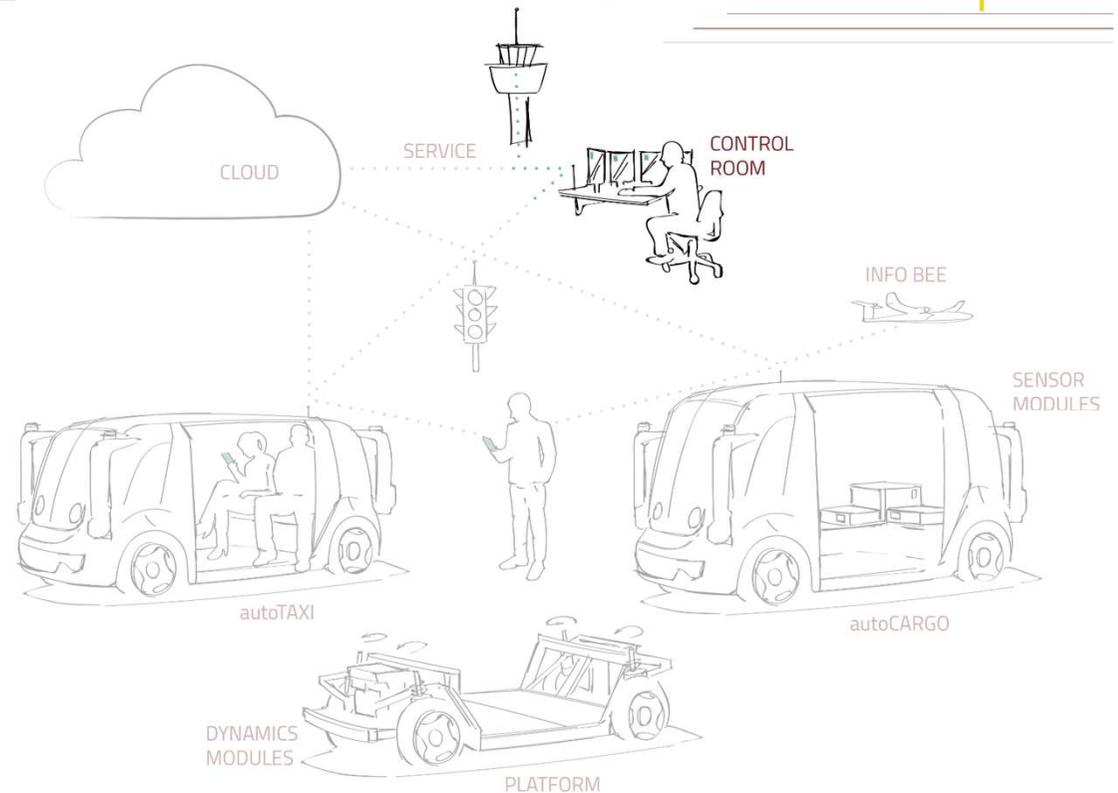
Cloud Functionality

- Additional information for automated driving function
- Collective environment model
- Collective traffic memory



Control Room

- Remote or trajectory approval vehicle operation
- Service center for emergencies or sovereign interventions

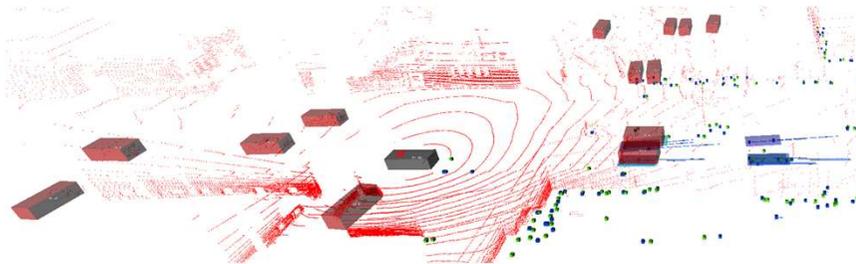
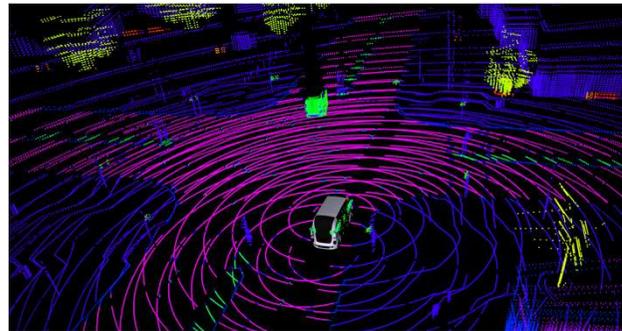
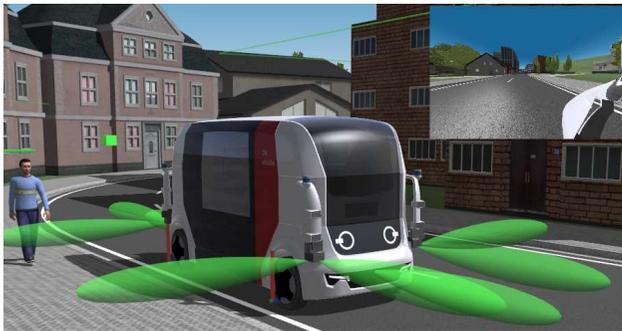


Info-Bee is finished, automation is on-going

- Specific tilt-wing aircraft, electrically propelled, VTOL, 1 hour / 80 km range.
- Fully automated including take-off and landing, beyond visual line of sight.
- Operation also during night, rain and windy weather with automated collision avoidance.
- Nose can be equipped with different sensors, e.g. camera with gimbal in order to provide bird's eye view of road traffic
- Complements static traffic sensors, i.e. Road Side Units (RSU)

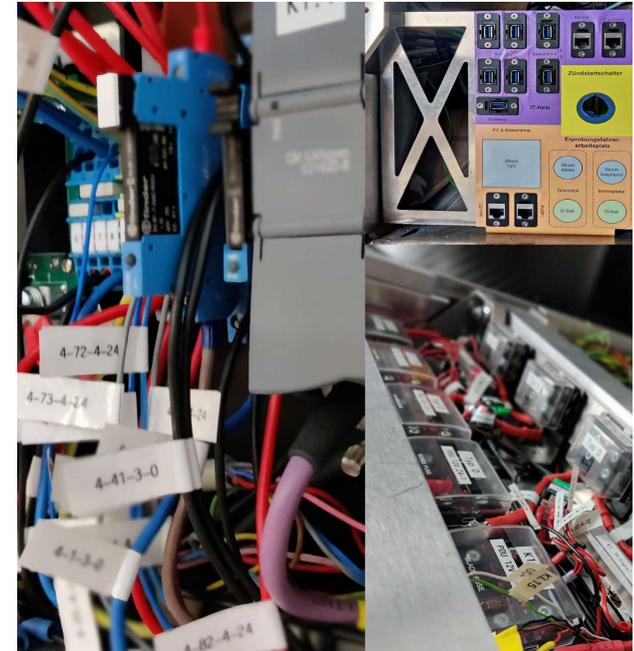
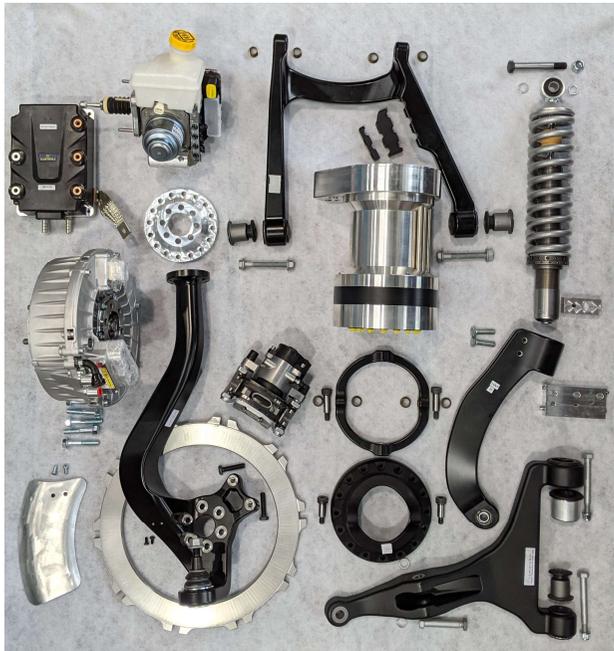


Software development



Images: TU Darmstadt, RWTH Aachen University, Ulm University, Karlsruhe Institute of Technology

Hardware build-up



Images: RWTH Aachen University, University of Stuttgart

*auto*SHUTTLE

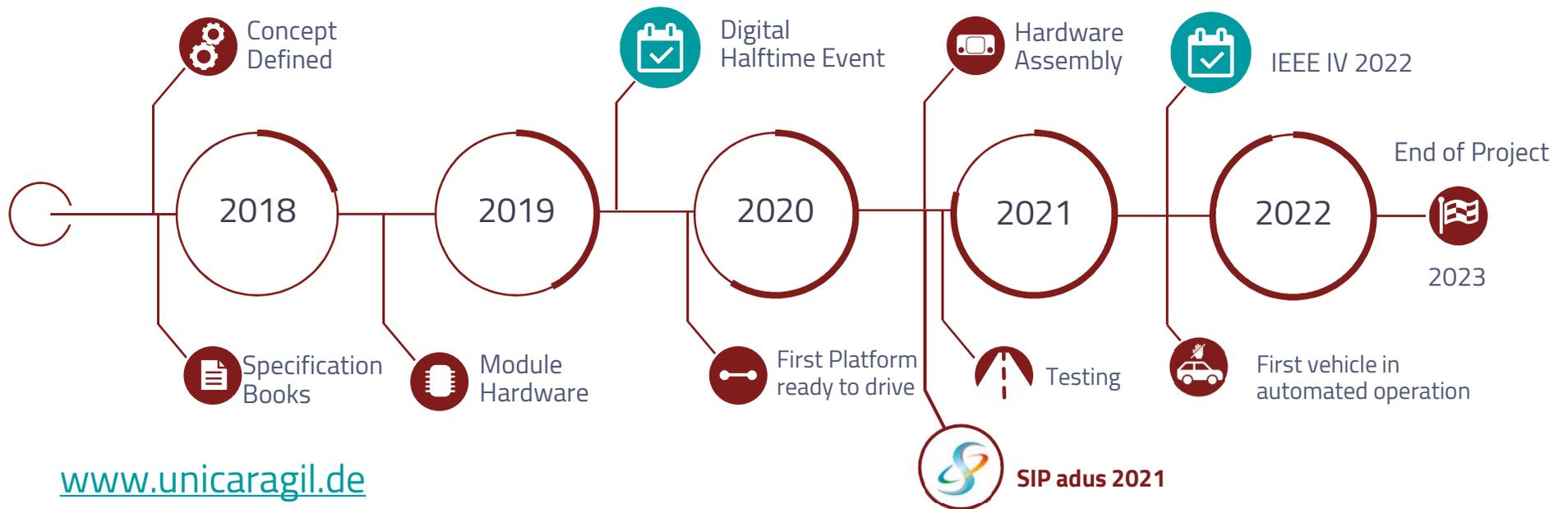
*auto*TAXI

*auto*ELF

*auto*CARGO



Outlook



www.unicaragil.de

Where to find more information?

- Large documentation on **mid-term results** on www.unicaragil.de/hzevent
- Accompany our **integration progress** on social media,
e.g. <https://www.linkedin.com/company/unicaragil>

Contact

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