SIP-adus Workshop 2020
Workshop on Regional Activities

Automated Driving in Germany

German Test Beds and UNICAR*agil* as a Flagship Project

October 2020

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➢ Many pilot tests on automated shuttles are running or

planned

 ➢ Private property and public road

 ➢ Mainly low speed operation up to 15 kph

 ➢ Very "easy" and controllable routes

 ➢ Safety guard or driver on board

➢ Special permissions needed and are in responsibility of local

authorities

 ➢ Government is working on legislation for automated

 driving with level 4 and 5

no claim for completeness of map

Overview on German Activities
Digital test beds for connected and automated driving in real Traffic

Digital Test Field for Automated and Conncted Driving Hamburg

AIM Braunschweig and Test Field Niedersachsen

Digital Test Field Düsseldorf and Corridor Aachen-Düsseldorf

Test Field Autonomous Driving Baden-Württemberg

Digital Test Field Autobahn A9

Digital Test Field for Automated and Conncted Driving Hamburg

AIM Braunschweig and Test Field Niedersachsen

Digital Test Field Düsseldorf and Corridor Aachen-Düsseldorf

- KoMoD and KoMoDnext projects:
  - Testing of automated and connected functions on motorways and in urban areas
  - Connection of infrastructure and traffic management systems
  - Level 4 valet parking
- ACCorD project
  - Connecting the research campus Aachen to the Test Field Düsseldorf
  - Generation of reference data for function development and safety assurance

Test Field Autonomous Driving Baden-Württemberg

Digital Test Field Autobahn A9

Regional Activities in NRW and the Aachen-Düsseldorf Area

Legend:
- City / Municipality
- Test Environment
- Hotspot = Competence Center
- Center
- Rural Mobility
- Urban Shuttles
- Start-Up Environment
- Corridor
- Database and Marketplace
- Brain Train
- Living Labe = Pilot Application

L. ECKSTEIN '19
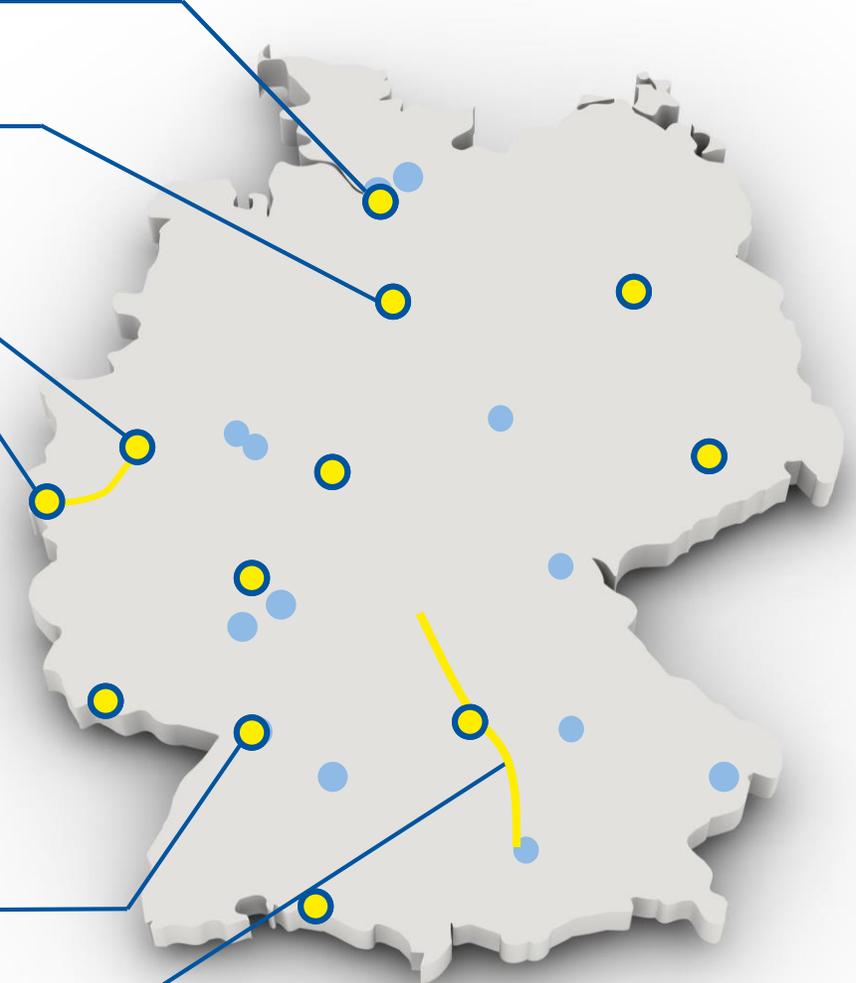
ika @ KoMo:D*next*
Automated Driving in the Digital Test Field Düsseldorf

Gefördert durch:

Bundesministerium für Verkehr und digitale Infrastruktur
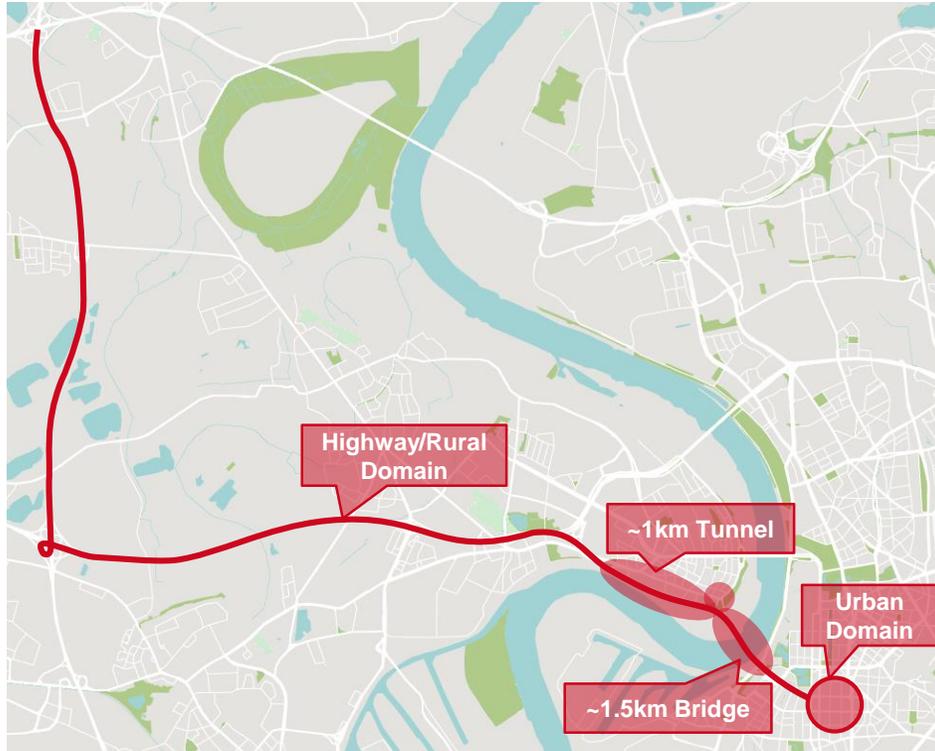
aufgrund eines Beschlusses des Deutschen Bundestages

Highway/Rural Domain

~1km Tunnel

Urban Domain

~1.5km Bridge

➤ Development of a cross-domain driving function for lateral and longitudinal vehicle guidance

➤ Implementation of V2I Interfaces and usage in driving function

ETSI Messages with PKI Certification

➤ ODD-Support Information for a-priori takeover-request or replanning of route

➤ Communication via ITS-G5 (802.11p) and Cellular Communication

ACCorD
Corridor for New Mobility Aachen – Düsseldorf

Project goals:

➢ Establishment of reference sensor technology

➢ Acquisition of traffic data, trajectories and scenarios

➢ Investigation of new driving functions and infrastructure measures in the simulation

➢ Replication and testing of selected scenarios on the test track

➢ Roll out the functions and actions into the field

➢ Linking existing test fields

Track sections with infrastructure sensors:

Urban
Campus Melaten, Aachen
2.4 km, 46 measuring stations

Aldenhoven Testing Center (ATC)
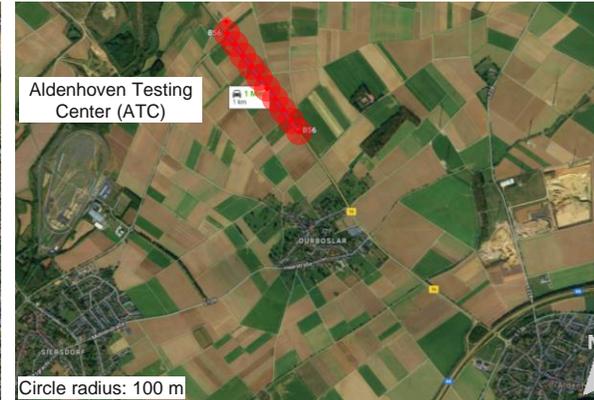
Rural
B 56, Aldenhoven
1 km, 11 measuring stations
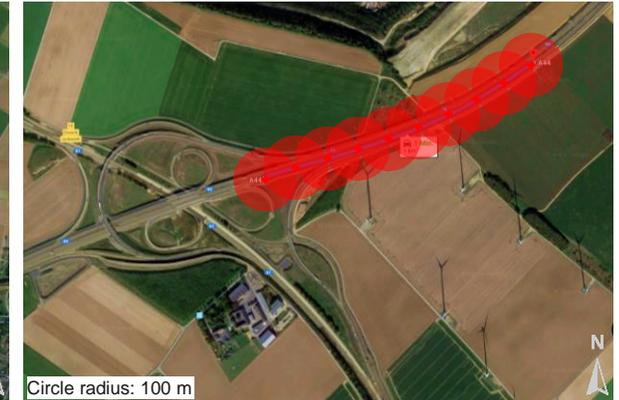
Highway
A 44, highway junction, Jackerath
1 km, 11 measuring stations
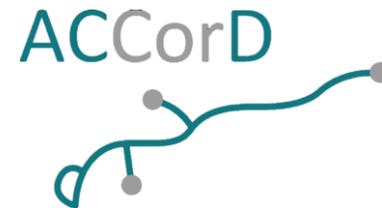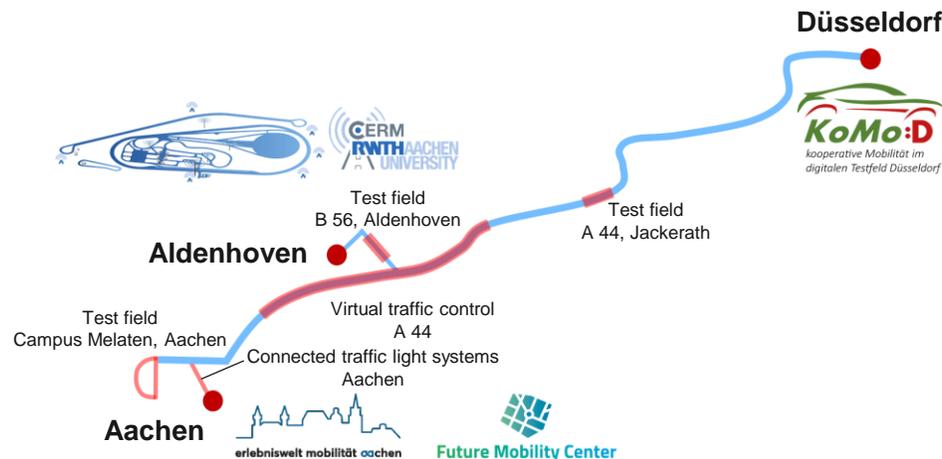
Circle radius: 100 m

Düsseldorf

Test field
B 56, Aldenhoven

Test field
A 44, Jackerath

Aldenhoven

Test field
Campus Melaten, Aachen

Virtual traffic control
A 44

Connected traffic light systems
Aachen

Aachen

2x 4K Dome Cameras

2x 128-Layer LiDARs

Switch Cabinet with
Data Processing Unit

V2X Road Side Unit

Multiband Antenna
(GNSS/Wi-Fi/4G/5G)

ACCorD
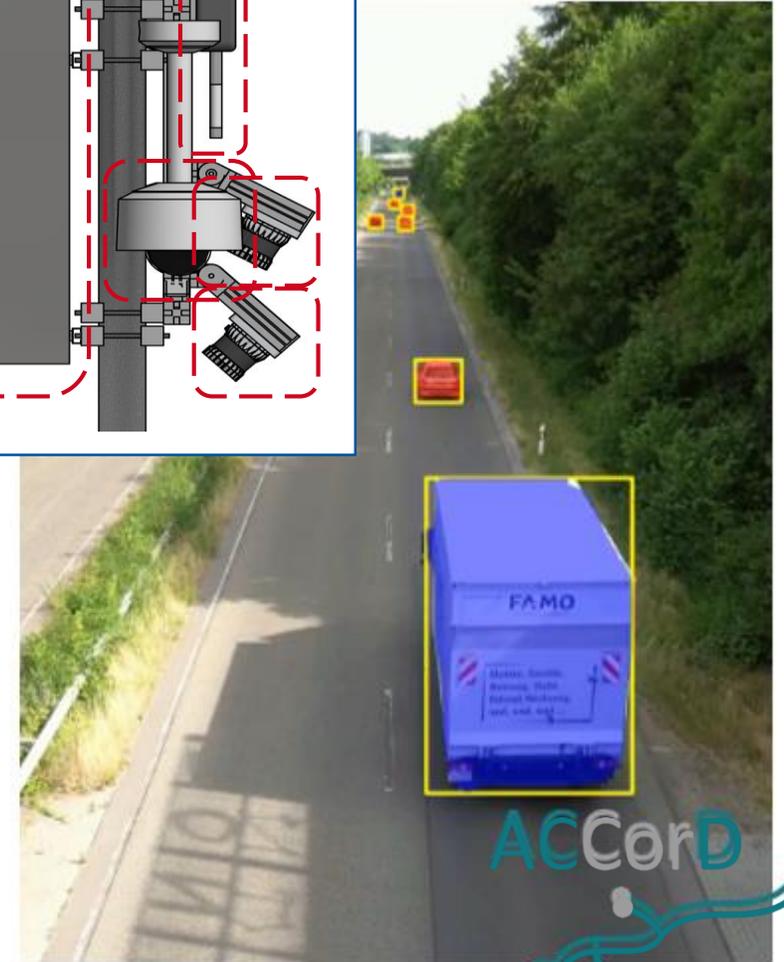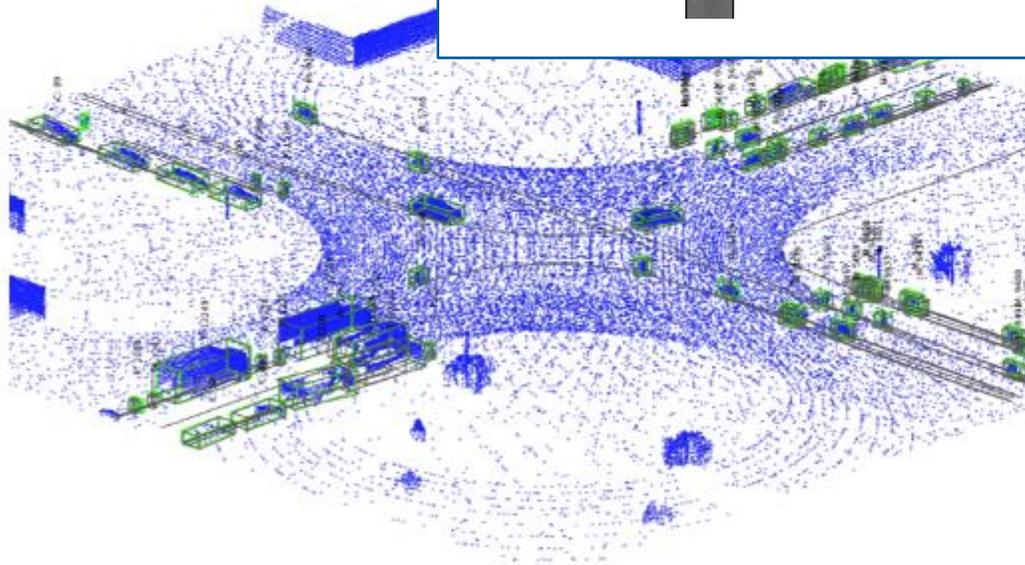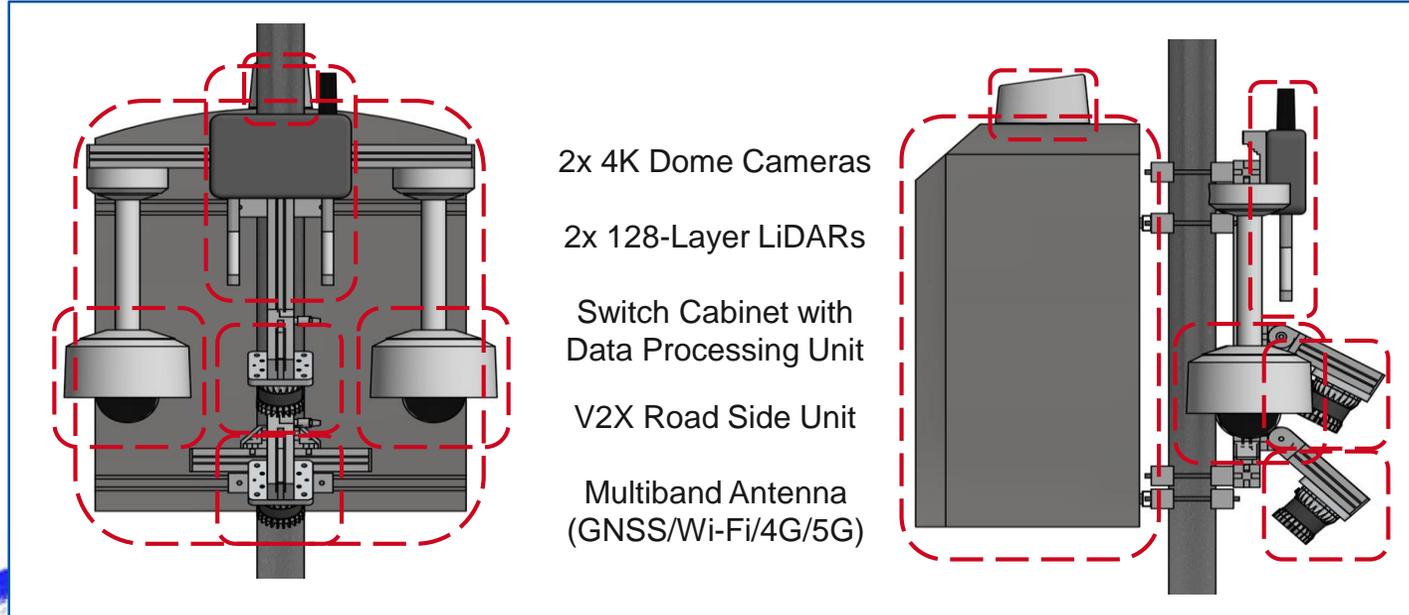
Field operational tests on higher level of automation
EU Project L3Pilot – Pilot tests in Aachen

Piloting Vehicles

Vehicle is a retro-fitted VW Passat B7
- Sensor Setup as shown on the right
- High Performance PC in the trunk
- Stock-ADAS Interfaces for vehicle control
- §70 Exemption from StVZO for testing automated driving functions

automated driving

Camera System
stereo vision

Laser Scanner
360° surround view

Long- and Mid-Range Radar
front- and rear-facing

Short Range Radar
at each corner

Laser Scanner
front-facing
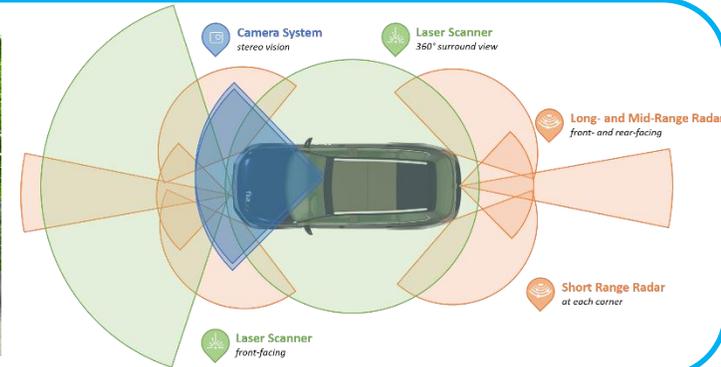
Geographical roads/areas, ODDs, study design

- Campus Melaten, Aachen, Germany

- 2.5 km round-trip

- Urban roads. Speed Limit 50 kph
  - Roundabout
  - Intersection with right-turn
  - Small Construction Site with temporary speed limit

- ~ 10 naïve drivers for baseline

- ~ 3 safety drivers

- ~ 50 naïve test passengers

- ~ 500 km planned

fka

L3Pilot Driving Automation

Field operational tests on higher level of automation
EU Project L3Pilot – Outlook to Hamburg 2021

TAVF HAMBURG

➢ L3Pilot is testing Automated Driving in Hamburg

   ➢ More than 120 test persons drove through the center of Hamburg, Germany, in fully equipped research vehicles of Volkswagen AG

   ➢ fka GmbH from Aachen is planning to drive in Hamburg 2021

➢ Laying the foundation for level 4 field tests in follow up activities

KEYFACTS

- ca. 26 Mio. € BMBF funding
- 01.02.2018 – 31.01.2022 (48 months)
- 15 university chairs / institutes
  8 industrial partners

OBJECTIVE

1. Modular structures for agile, automated vehicle concepts
2. Disruptive concepts in hardware and software architecture
3. Modular platform with dynamic modules
4. Fully automated and driverless vehicles
5. Four prototypes of different characteristics

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Example Project of Level4+ Automation
UNICARagil – Core Innovations

Our **user-centered design approach** focusses on the human being as the center for future mobility system development.

Cooperative and **collective cloud functions** and an **accompanying control room** assure the availability of the vehicle automation.

Safety by Design: Consistent safety orientation enables the development of safe autonomous vehicles from idea to approval.

The **automotive service-oriented software architecture (ASOA)** is the basis for upgradeable and updatable software for automated mobility.

Our **innovative electronics system hardware architecture** enables the implementation of efficient and safe ECUs.

Consequent modularization creates flexibility in the usage of automated vehicles.

CLOUD

SERVICE

CONTROL ROOM

INFO BEE

SENSOR MODULES

autoTAXI

autoCARGO

DYNAMICS MODULES

PLATFORM
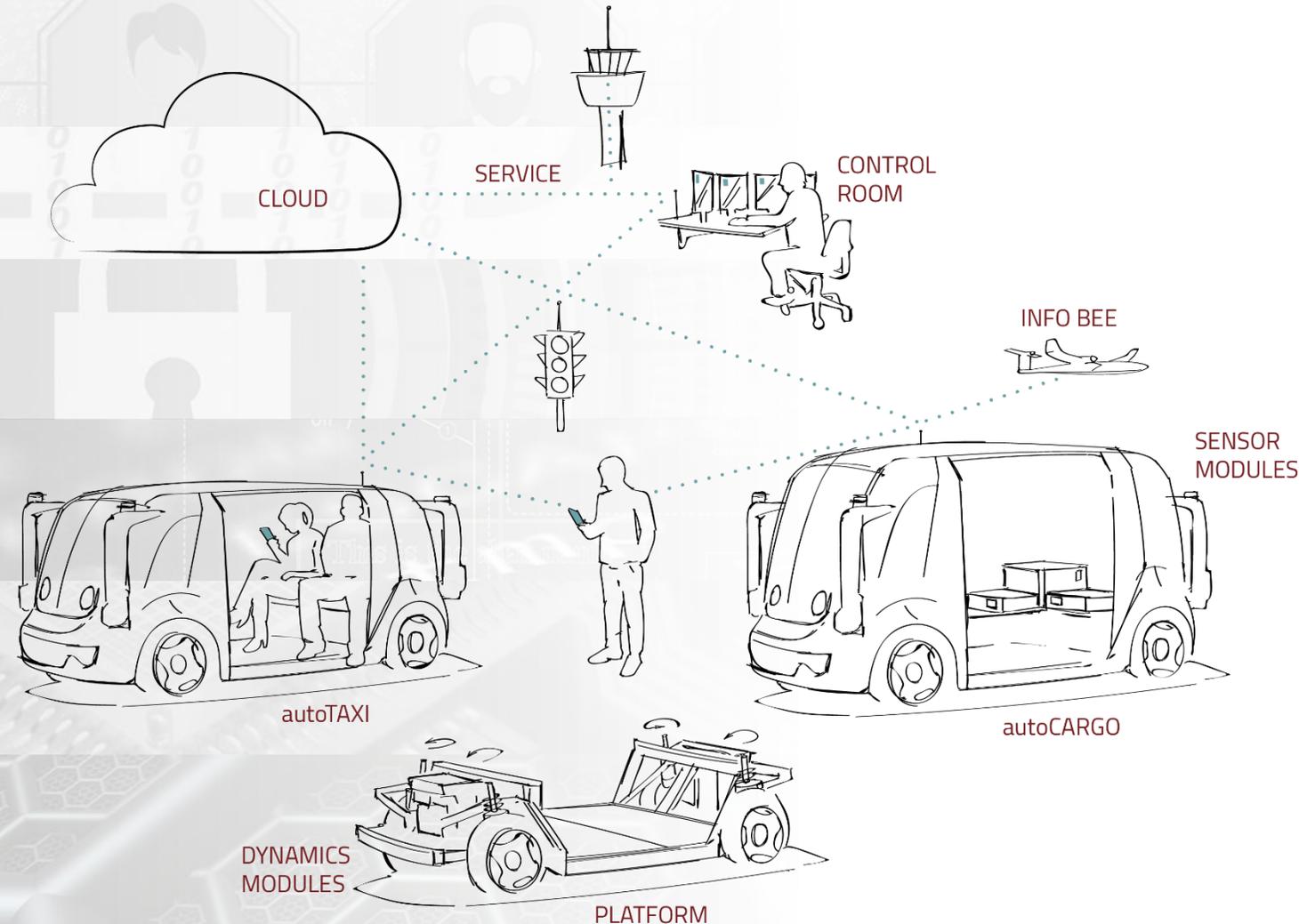
autoSHUTTLE

SHUTTLE

- Supplementing the public transport system
- 6 – 8 persons

autoTAXI

TAXI

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

autoELF

ELF

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

autoCARGO

CARGO

- Pick up and delivery service
- Automated handover
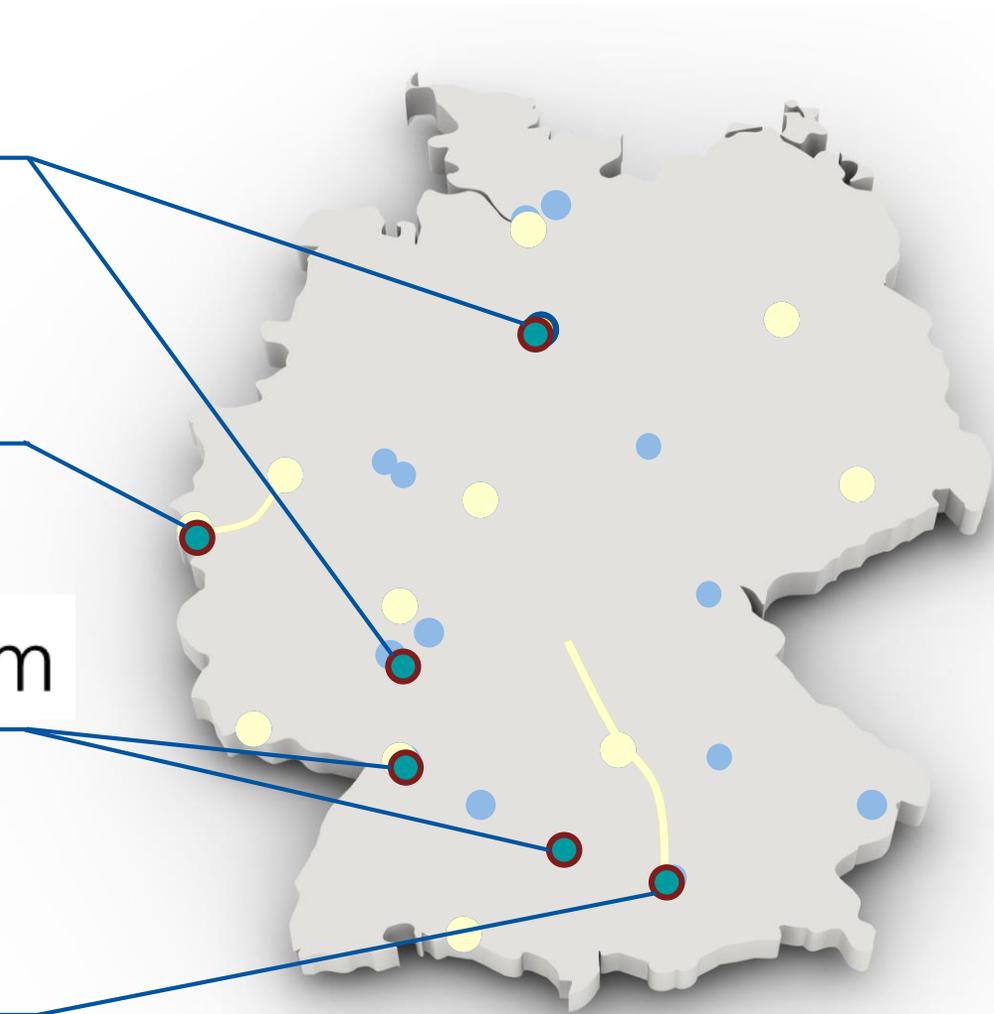
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