

U-Shift – meeting the requirements of future urban road traffic

Hannover Messe - Germany

Prof. Dr.-Ing. Tjark Siefkes

April, 13th 2021

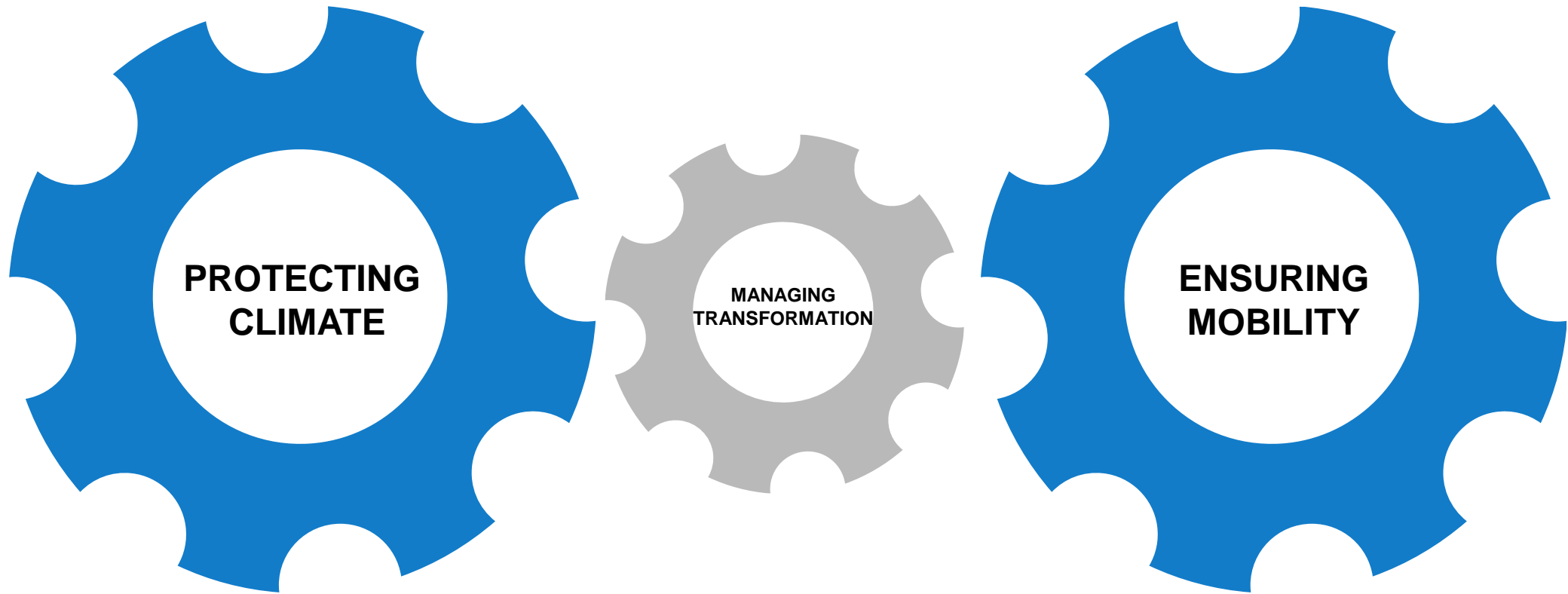


Wissen für Morgen









Thinking in Systems

Repair – can this be done by the vehicle itself?

Does a bus need a fixed stop?

Transport System

To whom does a vehicle talk to?

Who will be driving in the future?

May I ask the train to wait for me?

How much automation do I like?

What is important when it comes to mobility?

Psychology

What do I fear? Why?

Do I need to know what the vehicle knows?

Who owns the vehicle?

Can I execute my mobility through my smart phone only?

Can I tailor the vehicle“?

Technology

Can cars fly?

Are street signs and traffic lights required in the future?

What does a vehicle know?

Who is responsible?

CarSharing, Car2Go, Public-Shuttles – who defines the route?

Sociology

What else is the journey for?

Is an autonomous vehicle more sustainable?

Business Model

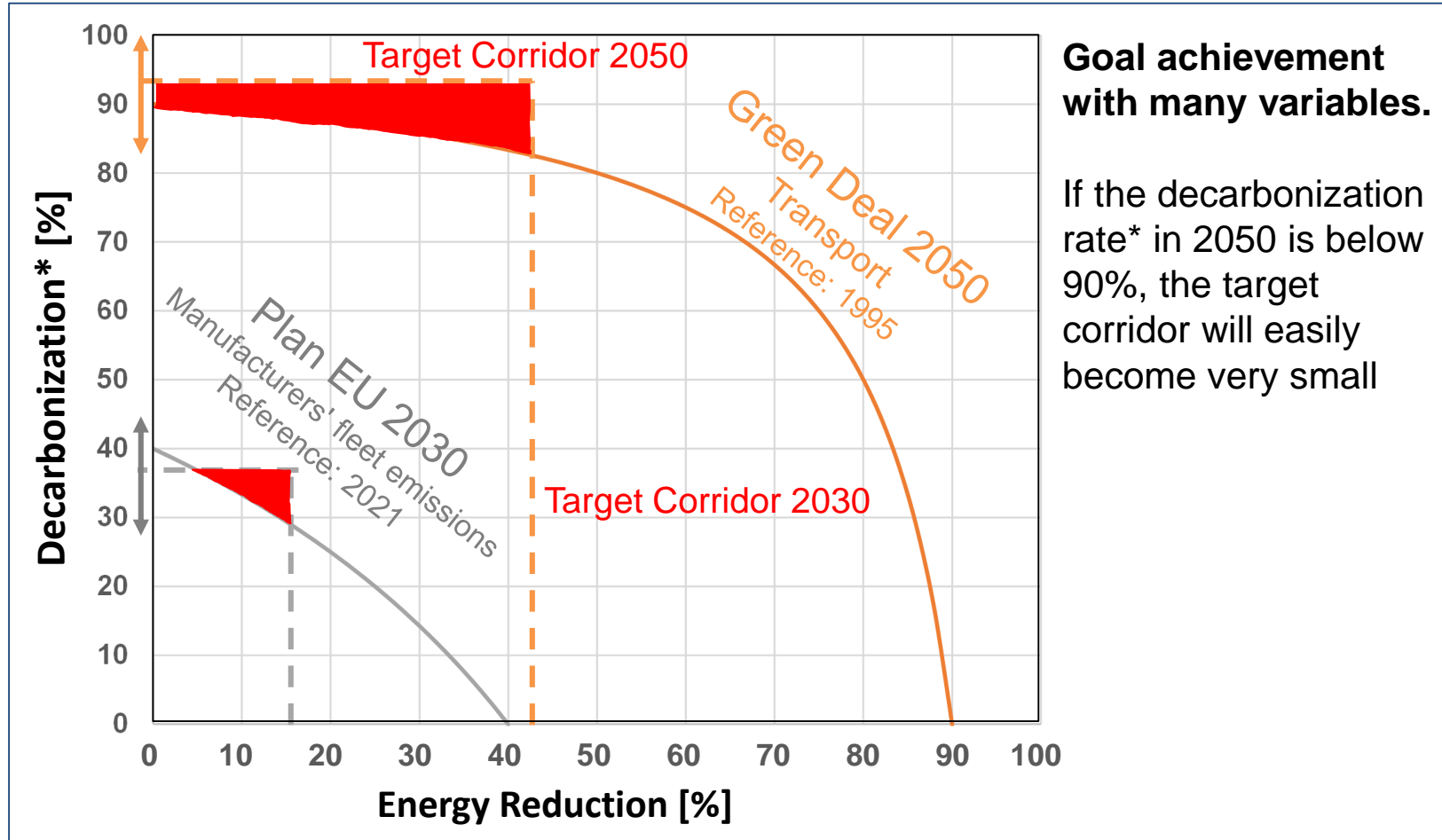
Car, bus, truck, train, bicycle – how to get from A to B?



Decarbonization and New Vehicles

Joint Field of Action for Politics and Industry

CO₂ footprint (European Transport)



Goal achievement with many variables.

If the decarbonization rate* in 2050 is below 90%, the target corridor will easily become very small



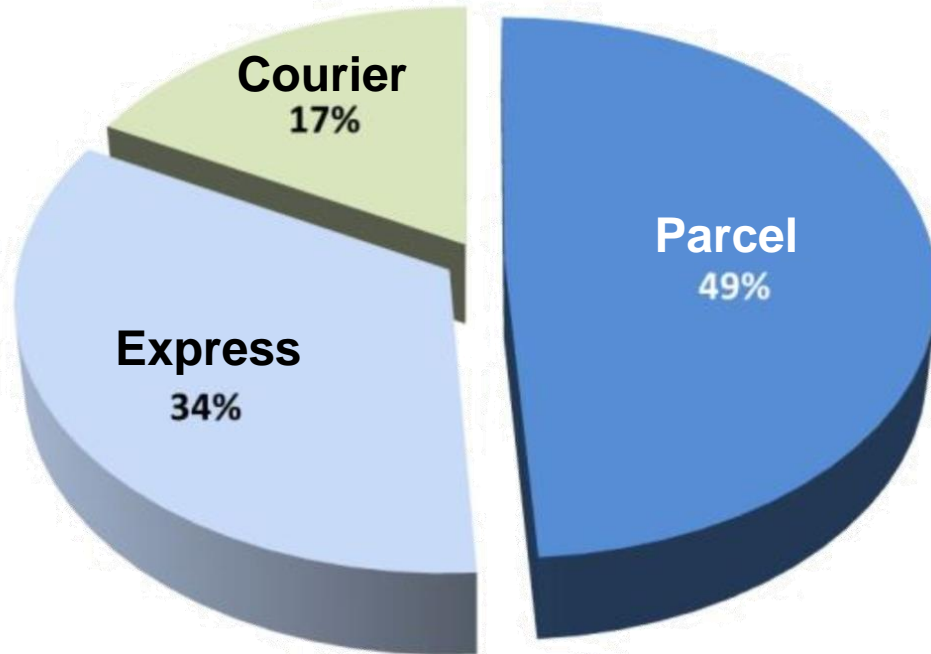
Source: OptiTrans Interreg Europe. 2021



H2 Certified Roller Test Rig
Source: DLR. 2021

Urban Cargo Mobility

Friend of Foe?

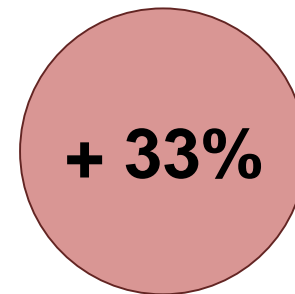


Source: BILD.de 30.03.2019

CEP in Germany, 2017

3,4 bn. Deliveries; Turnover 21 bn. Euro

- Annual increase 5-7% within the last five years
- 140.000 vehicles
- 230.000 employees



Expected CEP in Germany, 2022:

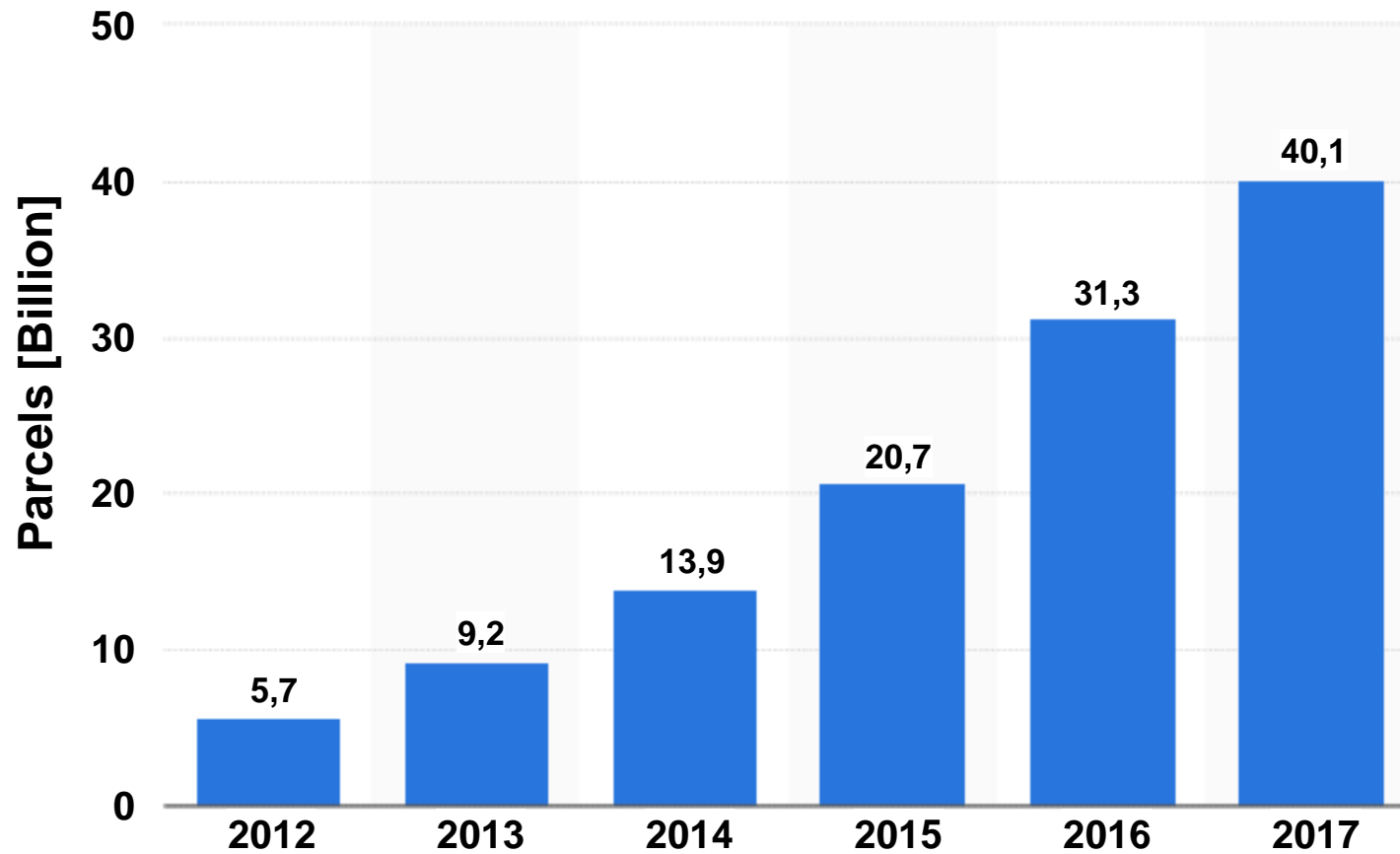
4,5 bn. Deliveries

CEP: Courier, Express, Parcel



China

Total Volume of Express Delivery



Factor of 13 in Comparison to Germany



**+ 60%
per
Year**



Source:
National Bureau of Statistics of China

FINANCIAL TIMES

“China ecommerce boom fires up logistics sector”

August 20 2018

Problem and Solution

Mobility in urban Areas – Quo Vadis?

Problem situation is multi-layered and highly complex

- Mobility infarction in metropolitan areas
- Health endeavors (e.g. NOX discussion)
- Ecological turnaround (energy transition)
- Increasing competitive pressure from Asia
- High innovation pressure in the economy
- Transformation pressure in the automotive industry
- Fears in society and in politics
- High activism at all levels with low coordination

➔ **Leapfrog Innovation Required** ←



14. Oktober 2019

„Mayor of Stuttgart goes for Car-free Inner City in 2030“

„The amount of traffic flowing into Stuttgart, is not in line with better urbanity.“

Multiple approaches

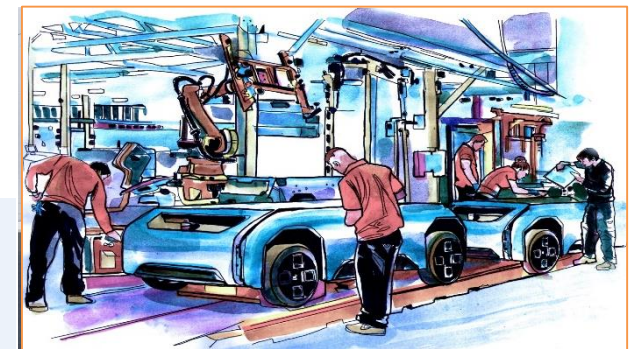
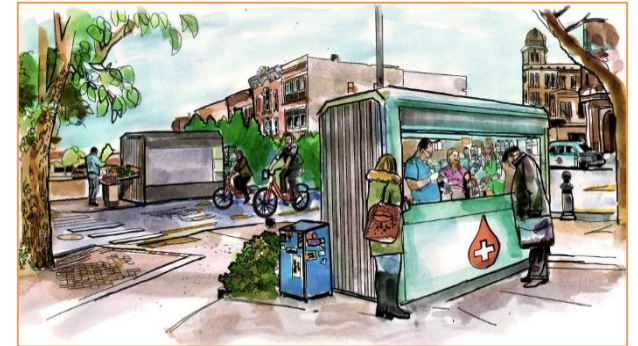
- Entangling freight and passenger transport
- Emission-free mobility
- 24/7 operation of capital intensive systems
- Use of digitization
- Flexibility and modularization
- New business models
- Citizen participation
- Integrated approach



U-Shift Vision

Marketability of an on-the-road modular, autonomous vehicle family with electric drive in urban areas

- ✓ Opening the mindset of partners and players to completely new applications, vehicles, boundary conditions and methods, detached from evolutionary vehicle development
- ✓ Layout of perspectives for industrialization and application in the tension of application potentials, technical challenges, and political constraints
- ✓ Standardization of open application technologies, based on a white paper with international participation



➔ Invented in Baden-Württemberg ←

U-Shift

Urban Mobility for Tomorrow

Drive Board

- Costly components
- 24/7 operation (minus maintenance)
- Quiet night operation
- Autonomous

Cargo Capsules

- Intermodal (size and interfaces standardized)
- Individual functionalities

Passenger Capsules

- On demand
- Edge zone operation (time and place)

➔ **U-Shift integrates**
Vehicle- and Plant Engineering Concepts ←



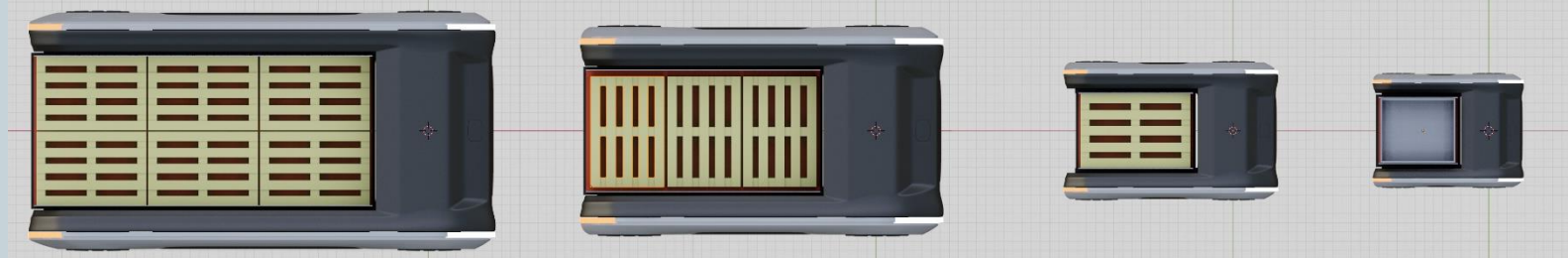
Leapfrog Innovation

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U-Shift

Technical Layout



Large

Medium

Small

X-Small

Type		„Lkw / Bus“	„Kleinbus“	„Kleinwagen“	„Micro-Mover“
Drive Board:	(L*W; mm)	5100 x 2570 ^{*1}	3970 x 2250	2340 x 1480	1200 x 1200
Total Weight:	(to)	7,5 (+ 0,75) ^{*1; *2}	3,5 (+ 0,75) ^{*1, *2}	tbd. 1,5	0,6
Range:	(km)	200 (∞) ^{*3}	200 (∞) ^{*3}	200 (∞) ^{*3}	100
Max. Speed:	(kph)	80	80	tbd. 100	50
Load:	(#pallets)	6 (8) ^{*4}	3 (4) ^{*4}	1	½
	(#passengers)	12 (16) ^{*4}	10 (12) ^{*4}	2+2	1 +1
Payload:	(to)	> 2	> 1	> 0,5	> 0,3

*1) German StVZO *2) incl. battery

*3) with extra battery for capsule *4) stretched capsule (excess length)

➔ U-Shift is scalable ←



U-Shift

The Challenge: Safe and Secure Operation

Backend

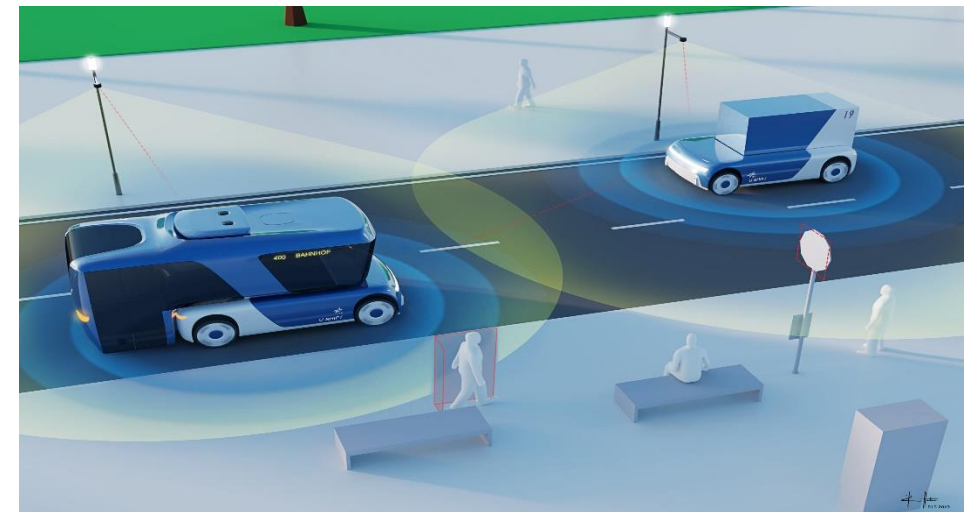
- Traffic control center, fleet management, strategic route and deployment planning
- per quarter/city tbd.

Edge Computing

- On-site control computer (see traffic light switchgear), operational route planning (trajectory, e.g. who, how - speed, where - lane)
- per road section / intersection / roundabout / etc.

Road Capturing Unit

- Sensor unit, object recognition (GDPR* compliant)
- Communication e.g. 5G (city: Smart Cells)
- Distance 50-150m (e.g. integration in lantern)



➔ **Managed Automated Driving** ←

U-Shift - Urban „on-the-road-modular“ Vehicle

SAE-Level 5; electric drive; demonstrated on Stuttgart Fair Grounds

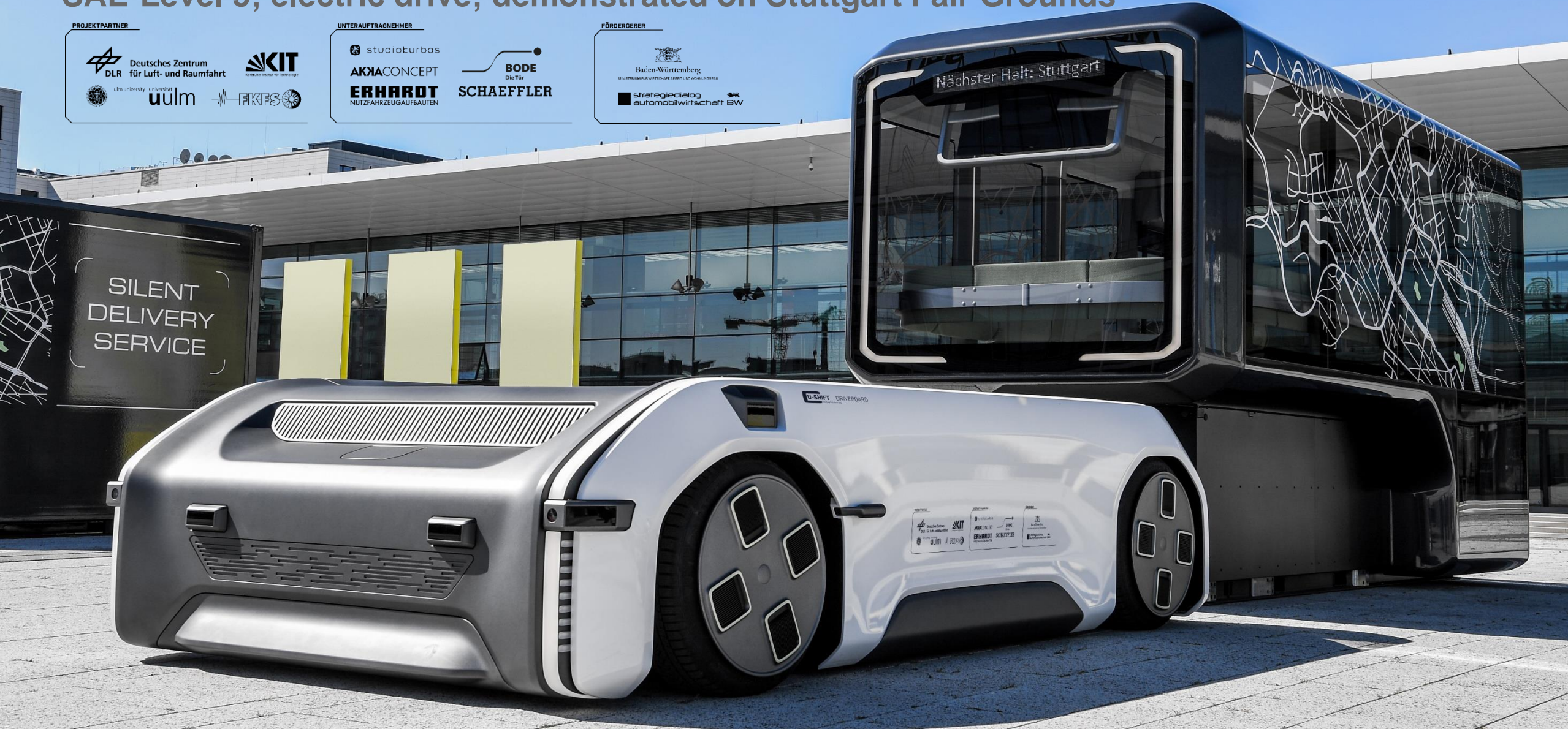
PROJEKTPARTNER



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Please visit and enjoy video: <https://www.youtube-nocookie.com/embed/ZJtopEtaGeU>

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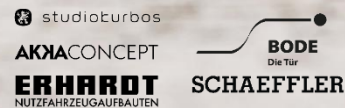
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THANK YOU VERY MUCH !

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