

Removing Barriers for Connected and Automated Vehicle (CAV) Testing

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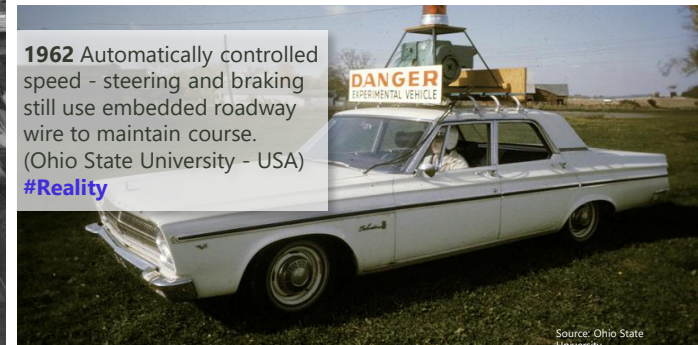
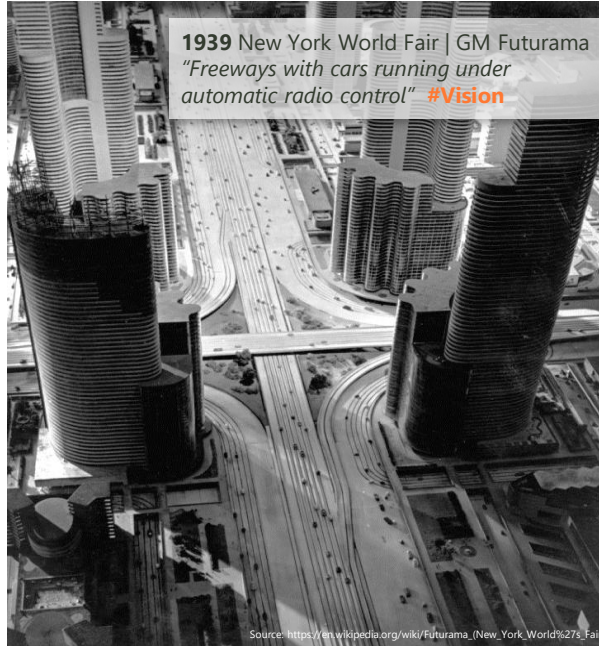
On the way to automation: Visions vs. technology limitations

Too Far in the Near Future

1920s-1960s

Infrastructure centric

„Magic Highways and the Guide-Wire Principle“

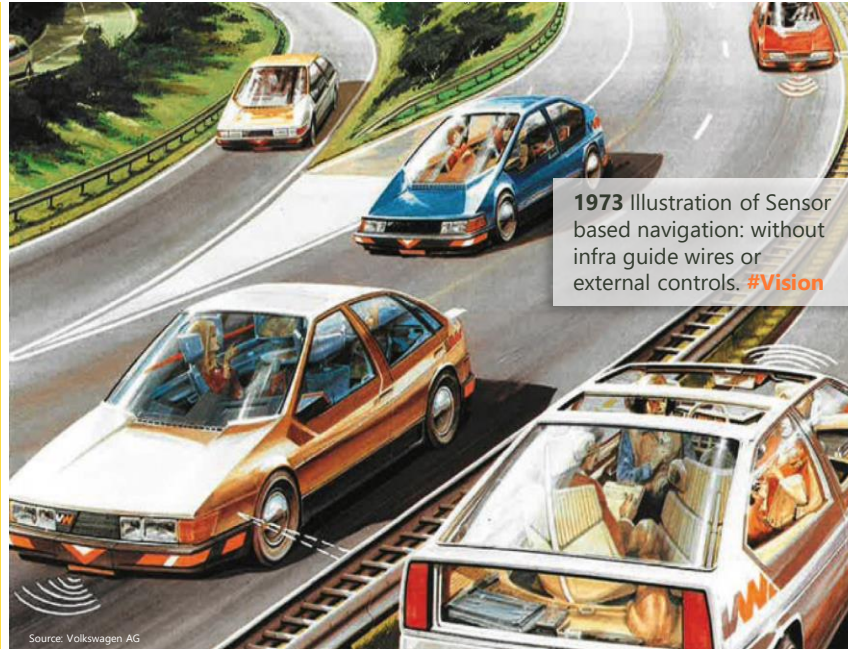


On the way to automation: Visions vs. technology limitations

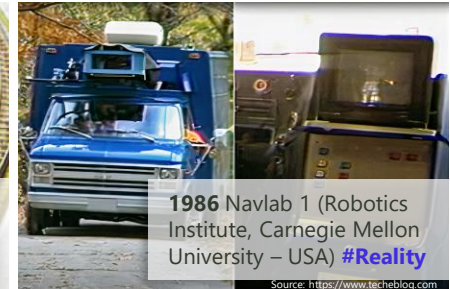
Too Far in the Near Future

1970s-1990s

Vehicle design centric
„Fully Sensor based navigation“



1973 Illustration of Sensor based navigation: without infra guide wires or external controls. #Vision



1986 Navlab 1 (Robotics Institute, Carnegie Mellon University – USA) #Reality



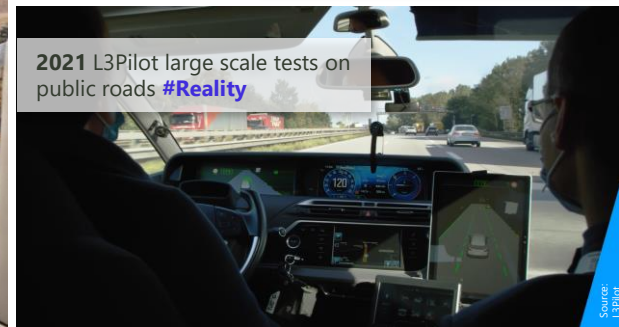
1986 Project Prometheus VaMoRs (Dr. Ernst Dickmanns – University of the Bundeswehr Munich) #Reality

On the way to automation: Visions vs. technology limitations

Too Far in the Near Future

2010s-today

A hybrid way forward
„Smart roads and Tech“



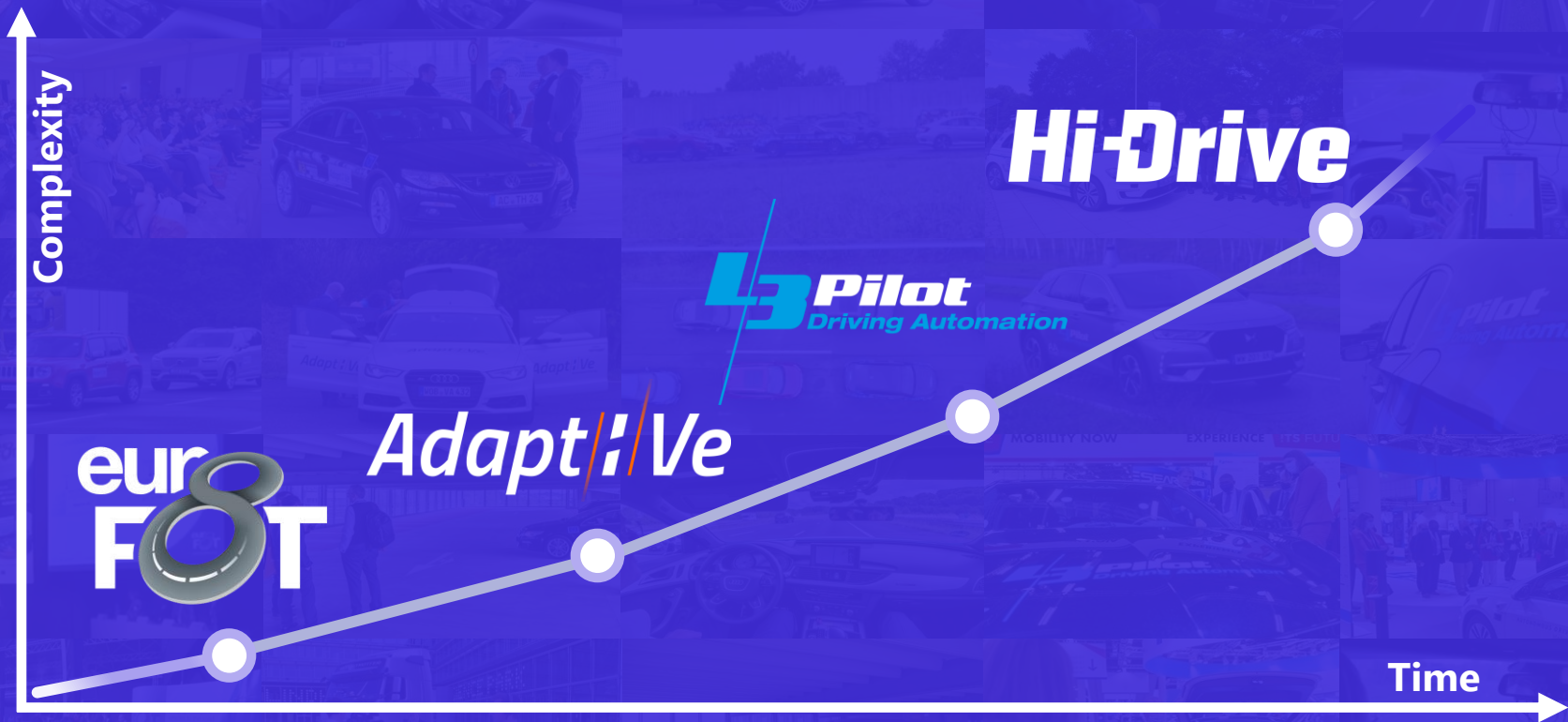
The pace of automation as a reflection of the tech industry development

The rise of microelectronics



Time →

Our history of automated driving: carrying the legacy forward





Hi-Drive
Designing Automation

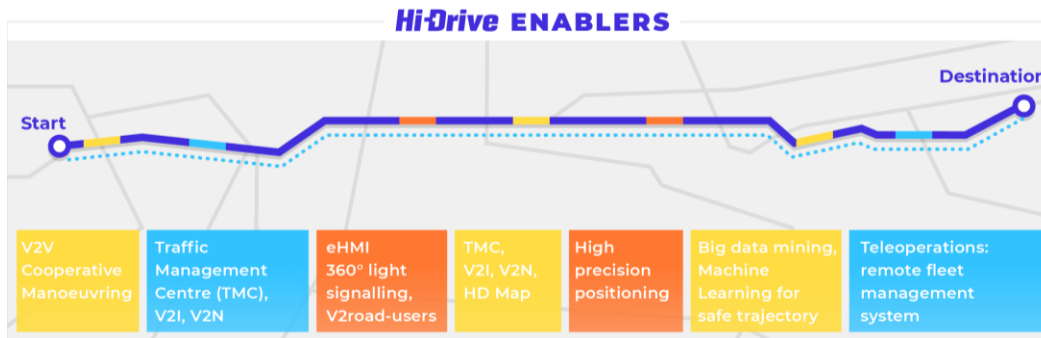
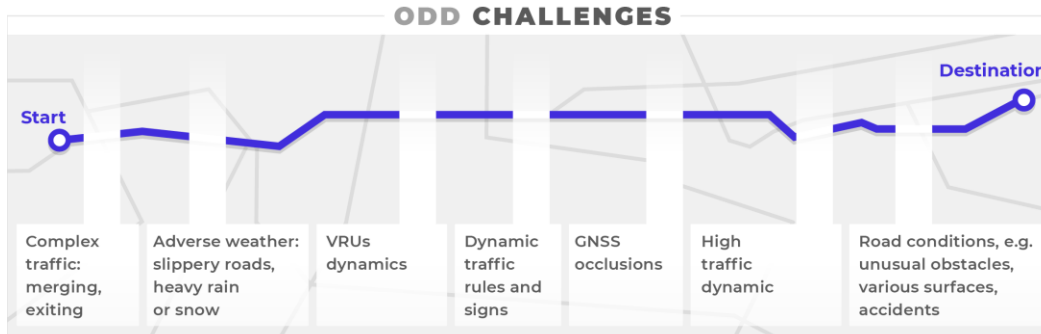
PUSH TOWARDS HIGHER AUTOMATION

- Robust and reliable automated driving
- Extended and defragmented ODDs
- Interoperability across countries and brands

Partners



Defragmentation of the Operational Design Domain (ODD)



ODD

MANUAL DRIVING

AUTOMATED DRIVING

Cybersecure,
interoperable,
interactive and
user-aware vehicles

1

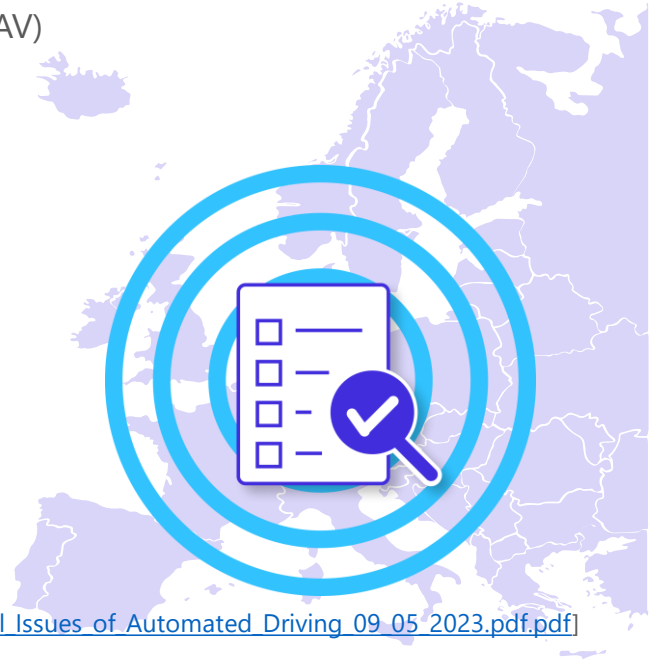
Harmonized admission procedures:
Code of Practice (CoP) for Road Testing

Code of Practice for Road Testing – Initial Situation

Type approval regulations for connected and automated vehicles (CAV) and their systems are available on 3 different levels:

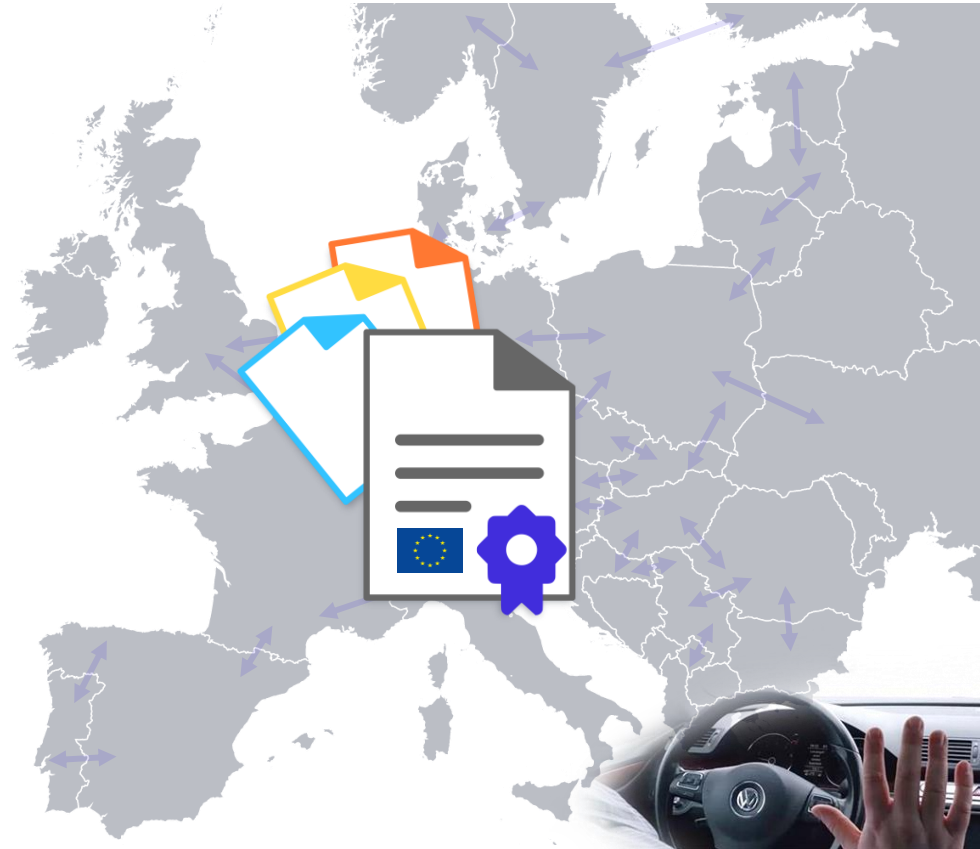
- **International** (e.g. UN-R157)
 - **European** (Regulation (EU) 2022/1426)
 - **National** (e.g. German AFGBV)
- **UN and EU regulations** do not provide guidelines for test operations
- **German AFGBV**, e.g., only focuses on testing developmental stages of future series vehicles

[More info: https://www.innocam.nrw/wp-content/uploads/2023/06/Study_Legal_Issues_of_Automated_Driving_09_05_2023.pdf.pdf]

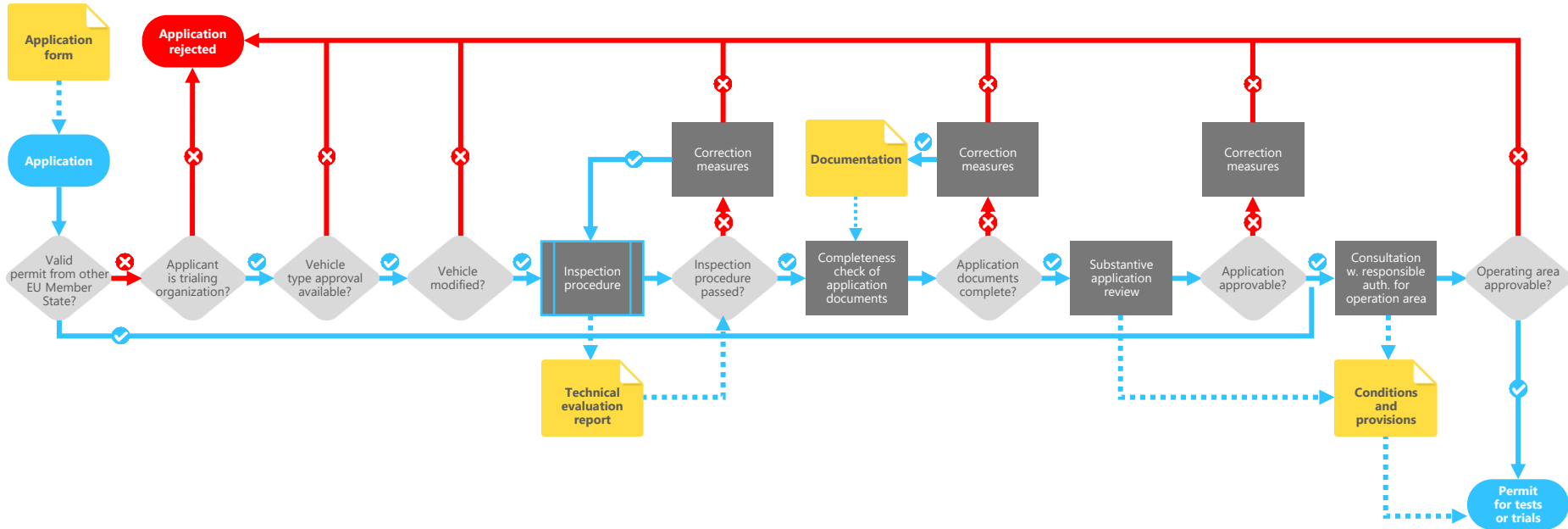


CoP - cross-border road testing

- **Forum of European member states and industry stakeholders**
- **Harmonized release and admission procedure:** prerequisite for future large-scale cross-border pilots and FOTs
- **Establish collaboration** between vehicle owners and inspection bodies
- **Proposal on a harmonized release procedure**
- **Recommendations catalogue** for authorities on adapting their existing practice



Draft of harmonized procedure



2

User awareness & driver training

User education and training

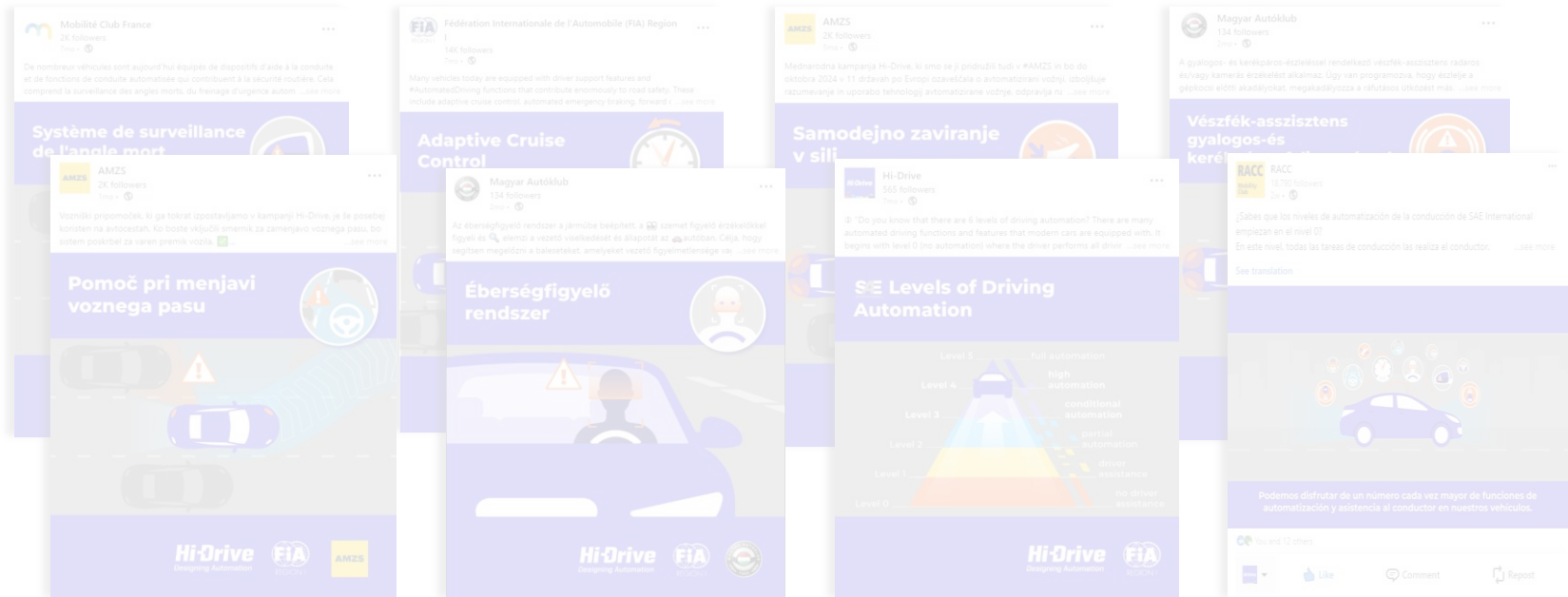


USER EDUCATION CAMPAIGN

USER TRAINING PROGRAM
Implemented by mobility clubs




User Education Campaign



User Education Campaign – Animated Video

Level 1

Driver assistance

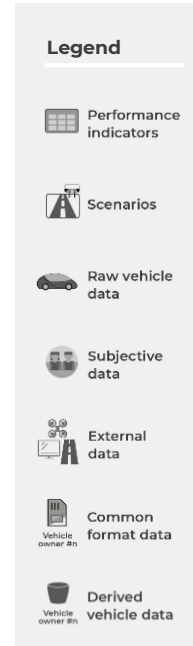
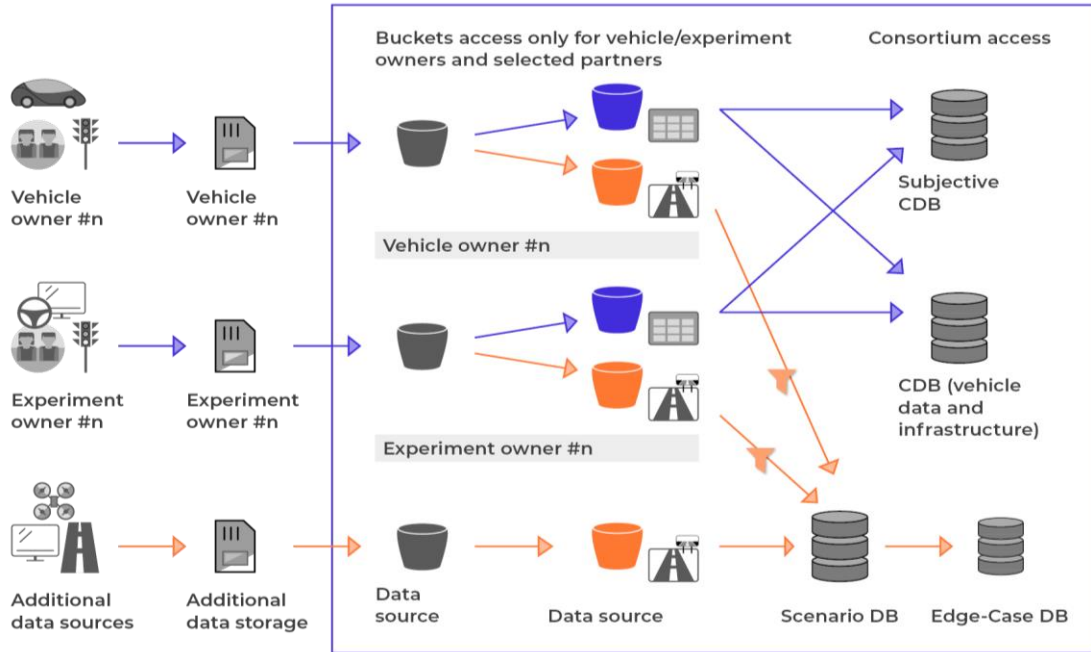
Find the full video here:  **YouTube** @hi-drive-21-25

A vehicle with adaptive cruise control or lane assist features is a level 1 vehicle.

3

General Data Protection Regulation (GDPR)

Data collection and protection



4

Interoperability, physical & digital infrastructure

Interaction with road and communication infrastructure

A hybrid way forward: Smart roads and Tech


CONNECTED DRIVING

Autonomously through Hamburg with the e-Golf

Field-testing
Since February Volkswagen AG have been testing autonomous driving in Hamburg's city center.

Traffic light communication
The autonomous vehicles are connected to the traffic lights via wireless communication.

Safety First
A trained specialist driver is always prepared to take back control.



Implementation by 2020
Current wireless communication traffic signals
Wireless communication traffic signals by 2020

Landmarks: Binnenalster, Elbe, U11, U12, U13, U14, U15, U16, U17, U18, U19, U20, U21, U22, U23, U24, U25, U26, U27, U28, U29, U30, U31, U32, U33, U34, U35, U36, U37, U38, U39, U40, U41, U42, U43, U44, U45, U46, U47, U48, U49, U50, U51, U52, U53, U54, U55, U56, U57, U58, U59, U60, U61, U62, U63, U64, U65, U66, U67, U68, U69, U70, U71, U72, U73, U74, U75, U76, U77, U78, U79, U80, U81, U82, U83, U84, U85, U86, U87, U88, U89, U90, U91, U92, U93, U94, U95, U96, U97, U98, U99, U100.



Hamburg C-ROADS Germany Urban Nodes (CEF)





THANK YOU FOR
YOUR KIND ATTENTION.

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Hi-Drive

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