



Federal Ministry  
of Education  
and Research



# Research on autonomous driving in Germany

SIP-adus Workshop, 09.11.2021

Federal Ministry of Education and Research

Division for  
Electronics and Autonomous Driving; Supercomputing

Mr. Reinhold Friedrich

[bmbf.de](https://www.bmbf.de)



## Autonomous Driving in Germany – Actors and Objectives



Federal Ministry  
of Education  
and Research



Federal Ministry  
for Economic Affairs  
and Energy



Federal Ministry  
of Transport and  
Digital Infrastructure



National Platform Future  
of Mobility

- Three ministries work together to ensure that
  - autonomous driving is safe, secure, sustainable and suitable to the needs of all citizens.
  - Synergies are exploited in research and implementation for efficient and successful roll-out
- New fund by the German Government (1 bill. €) for medium and longterm transformation of the automotive industry and respective technology challenges as e.g. automated driving
- National Platform Future of Mobility presents results at ITS World Congress: Mobility data platforms as digital twin of mobility system needs to be standardized, accessible, secure, protect personal data to enable full potential of connected and autonomous driving.



## BMVI - automated and connected driving in road traffic

### **Act on autonomous driving** in effect since July 2021

- Focus on autonomous shuttles (driverless vehicles as people mover and goods mover)
- Establishes a new set of rules for level 4 vehicles, going beyond experimenting with prototypes and enables commercialization of automated (driverless) transport
- Three step approval process

### **RealLabHH – Laboratory of the NPM and funded by the BMVI**

- Hamburg is until end of 2021 the place to test innovative mobility solutions for people and goods in real live
- 10 projects, more than 30 partners, 21 Mio. Euro funding
- One project tests on-demand autonomous shuttle



Source: MAN Truck & Bus AG



Source: Technische Universität Hamburg, Matthias Grote



## BMW i – investments for industry and systemic approaches on standardization

**PEGASUS family projects:** Method-oriented projects for overall safety assurance for level 4/5 automation in urban environments (SET Level 4to5, VV Methods)

- Exchange on methods on national level and with CAD VIVID (German-Japanese Research Cooperation)
- International Cooperation on standardization in international standardization bodies and with Japanese and US-American partners

**Investments for automobile industry within the Economic Stimulus Package** shall

- fund strong clusters for R&D for innovative technologies
- support transfer of results into market

Among the focus topics shall be

- autonomous driving
- data infrastructure ecosystems



03/2019 – 08/2022,  
20 Partners, Vol. 30 Mio. €



07/2019 – 06/2023, 23 Partners, Vol. 47  
Mio. €



## BMBF – research on basic technologies for autonomous driving

The German Federal Government's Framework Programme for Research and Innovation 2021–2024

### **Microelectronics. Trustworthy and sustainable. For Germany und Europe.**

- Safe electronic hardware and secure data exchange are necessary prerequisites for autonomous driving
- High-performance specialised processors and efficient electronic systems for AI, data processing and edge computing are key technologies to sustain technological sovereignty
- High requirements for automotive applications (performance, latency, reliability, certifications, i.e.)
- Sustainability is also key for the design of the functionalities: electronics and AI need to be high-performance and at the same time efficient





## Disruptive Modular Architecture for Agile, Automated Vehicle Concepts (UNICARagil)

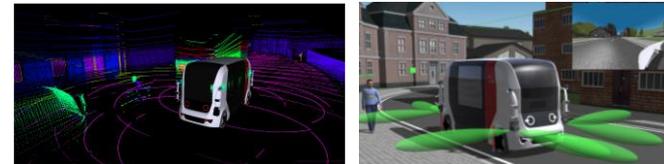
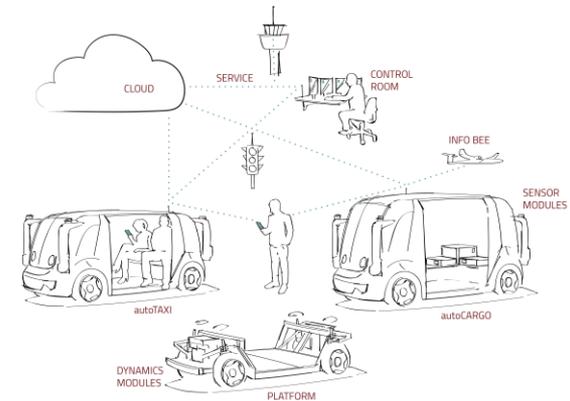
- University driven research project on fully automated, driverless, electric vehicles for cargo, public, transport and individual use
- Innovative hardware architectures for efficient and safe control units
- Automotive Service- oriented Software Architecture enables updates over-the-air
- First prototypes in test operation

### Project details:

- 16 partners coordinated by RWTH Aachen
- Total BMBF funding 26 Mio. €
- 01.02.2018 - 31.01.2022

Will be featured at

**33rd IEEE Intelligent Vehicles Symposium 2022 in Aachen.**



[www.unicaragil.de](http://www.unicaragil.de)





## Strategic cooperation on research topics in Europe

Cooperation in R&D for interfaces, norms and standards in Europe and internationally



### **ECSEL Joint Undertaking**

Electronic Components and Systems for European Leadership

and its follower **Key Digital Technologies Joint Undertaking** : trilateral funding between European Commission, EU member states and industry



and its follower EUREKA Clusters **Xecs** and **ITEA 4**: EU member states driven clusters for R&D Cooperation on Electronic Components and Systems and Software innovations

**ArchitectECA2030** - Trustable architectures with acceptable residual risk for the electric, connected and automated cars

- cover both safety assurance by design and safety assurance in-operation

**AI-SEE** - Artificial Intelligence enhancing vehicle vision in low visibility conditions

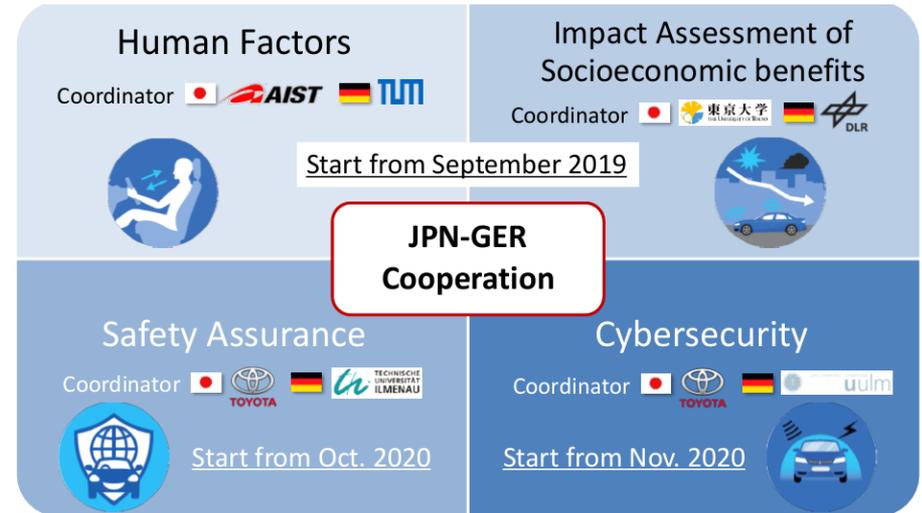
- supporting safe driving under poor weather and low visibility thus enabling level 4 automation



## Strategic international cooperation – Japanese - German research cooperation on connected and automated driving

### German-Japan joint virtual validation methodology for intelligent driving systems – VIVID

- Virtual verification and validation (V&V) indispensable for future drive automation
- V&V of functionality and underlying trustworthy electronics
- Establish joint German-Japanese topical task teams
- Contribute to global harmonization and standardization of virtual V&V for CAD





## National conference on research and technology for autonomous driving

- Yearly conference on 02./03. December 2021
- Focus in 2022 on research on technological sovereignty in key technologies and applications
- Platform for exchange between publically funded R&D projects on autonomous driving
- Discussion of research & technology trends

## 5<sup>th</sup> Expert workshop of Japanese-German research cooperation on connected and automated driving

- in December 2021
- Platform for exchange between projects funded in the research cooperation
- Participants from R&D and public authorities from Japan and Germany



Thank you for your attention!

## **Reinhold Friedrich**

Division for Electronic and Autonomous Driving; Supercomputing

Federal Ministry of Education and Research

Mail: [reinhold.friedrich@bmbf.bund.de](mailto:reinhold.friedrich@bmbf.bund.de)

[www.bmbf.de](http://www.bmbf.de) and [www.elektronikforschung.de](http://www.elektronikforschung.de)