20 YEARS

virtual vehicle

virtual vehicle

ENABLING **FUTURE VEHICLE** TECHNOLOGIES

De-risking future railway technologies

Applied Research in times of increasing capacity

www.v2c2.at

Dr. Peter Perstel

- Introduction - Virtual Vehicle (ViF)
- Rail @ ViF
- **Applied Research in times of increasing capacity**
- Summary
- Q&A

OVERVIEW

From the initial spark to a global player

2002-2007
Foundation

Initiation of a research center for **virtual vehicle development**

2008-2017
Structure & Growth

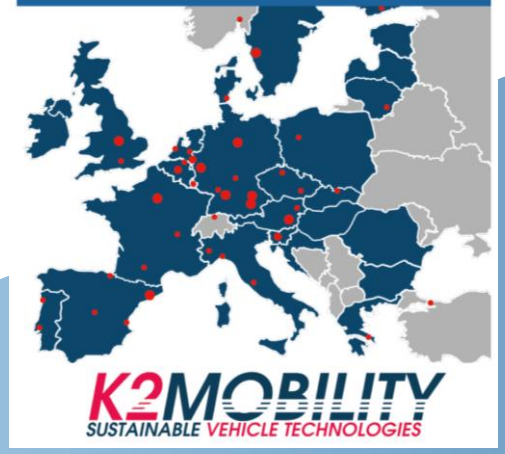
- R&D center for **sustainable mobility**
- pillars EU projects and contract research established

2018-2026
Long-term establishment & stability

- Recognized international player,
- Strategic Partners Road & Rail,
- Putting innovations into practice

AUSTRIA & GERMANY

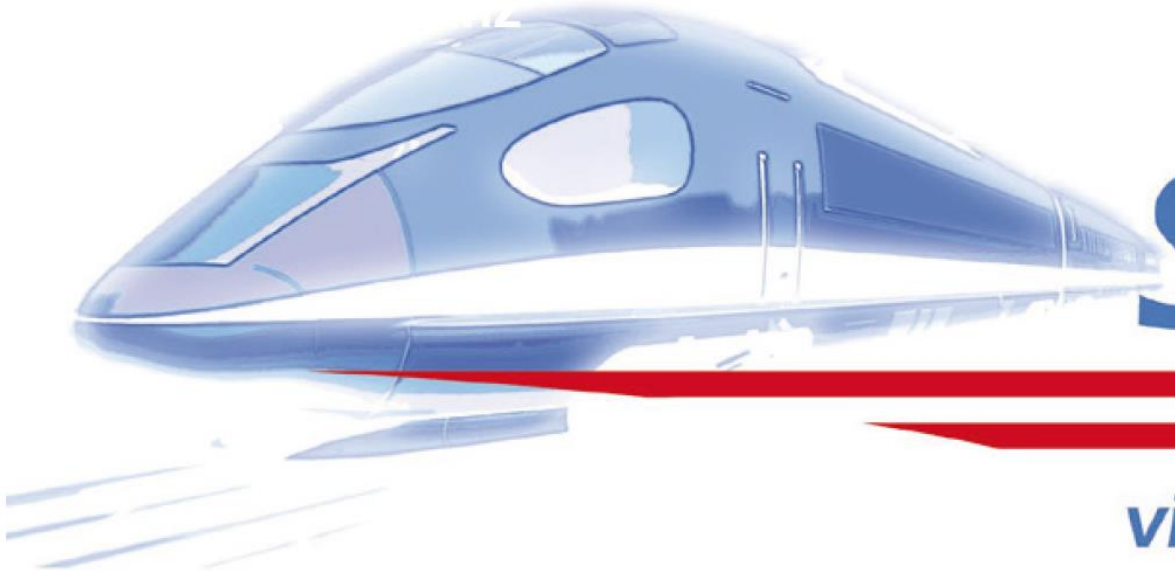
EUROPA+



WORLD-WIDE NETWORK

2015: First Autonomous Drive Demonstrator in Austria

First Joint Undertaking initiated in Austria



SHIFT²RAIL

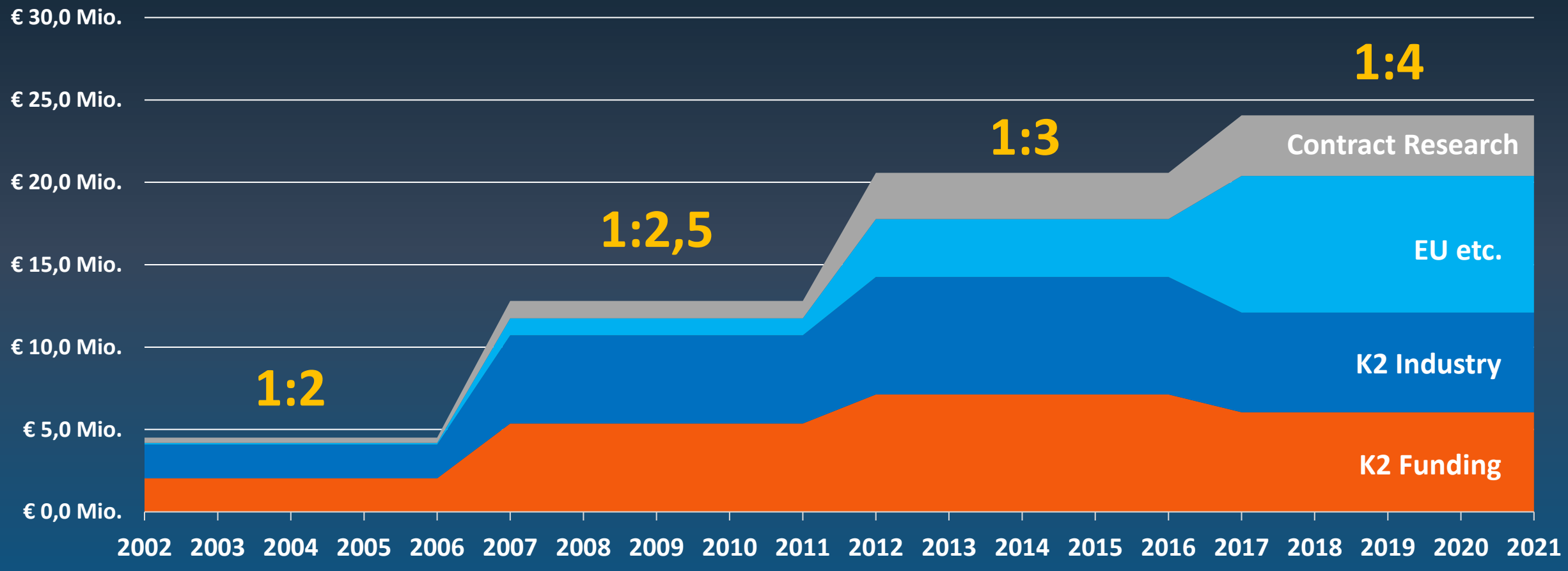
virtual vehicle austria consortium+

virtual vehicle · voestalpine EINEN SCHRITT VORAUS. · AVL · KIRCHDORFER CONCRETE SOLUTIONS · WIENER LINIEN · mcl

Plasser & Theurer · FCP · ACT research · TATRAVAGÓNKA POPRAD · getzner engineering a quiet future · PJM

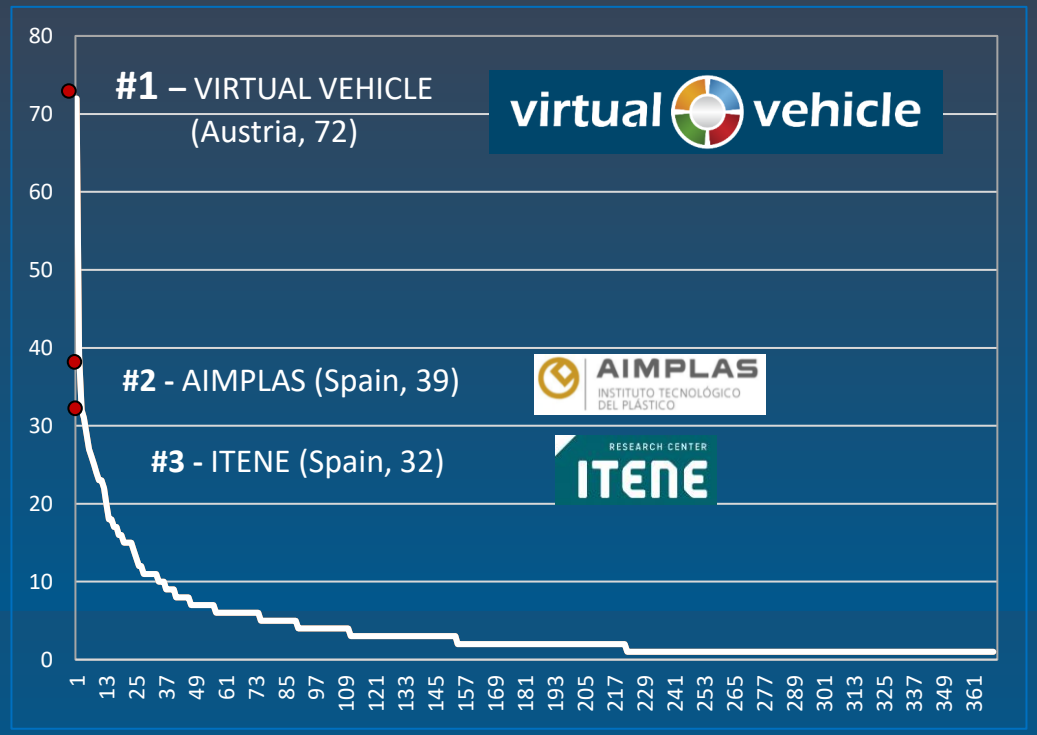
Success Story: 4 x #1 – Huge funding lever

COMET K2 Added Value: Huge funding lever 1:4 (FFG/SFG combinded)



virtual vehicle #1

HORIZON 2020



72 Projects, > 25.6 Mio €

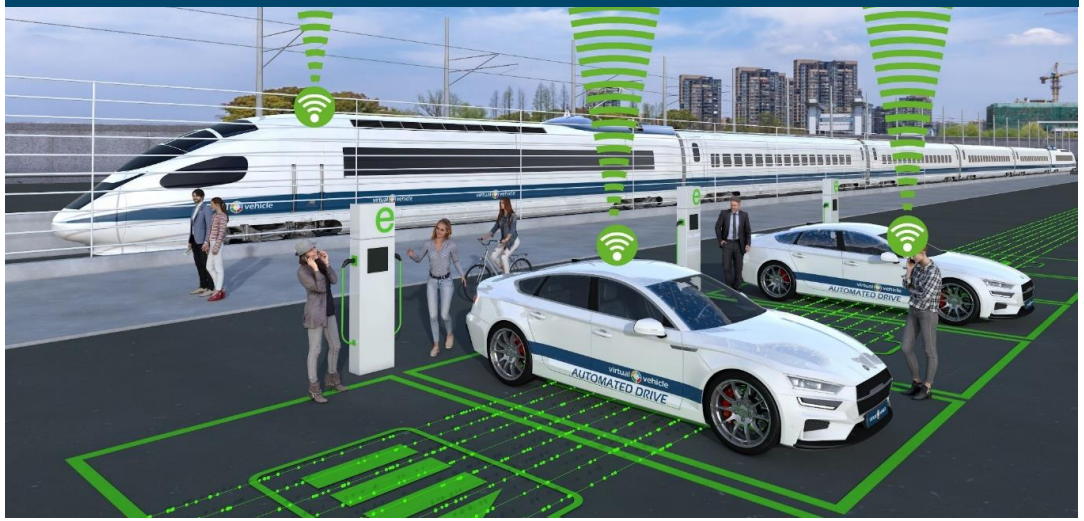
1st place among all 306 Research-SMEs

3rd place among all 13,500 SMEs in total

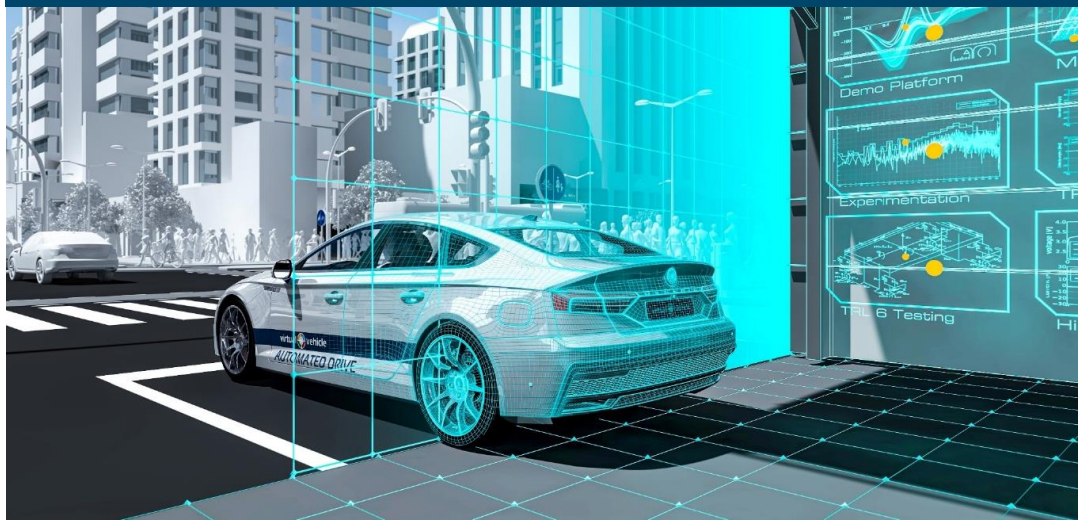
>50% in "Smart, Green and Integrated Transport"

Fields of Expertise - General

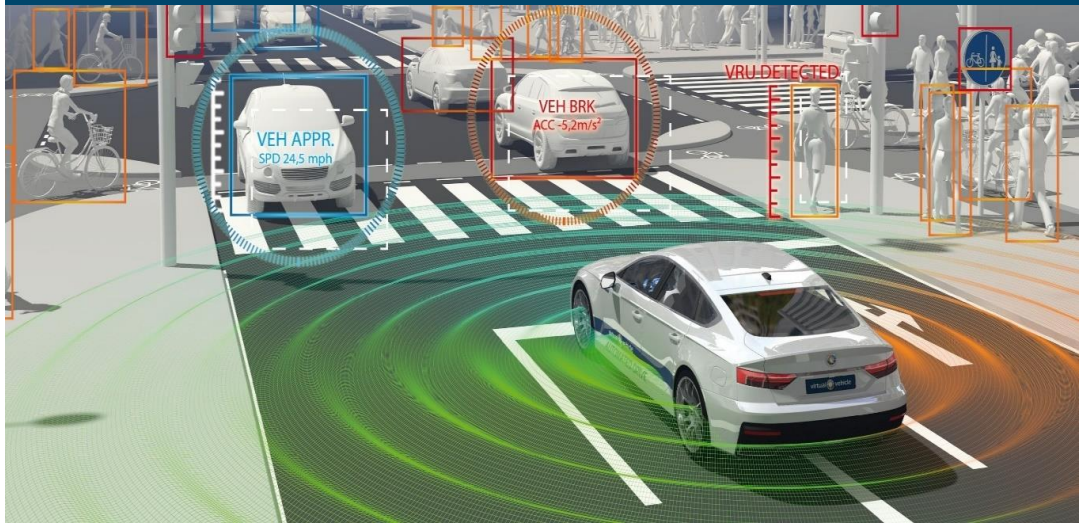
GREEN MOBILITY & TRANSPORT



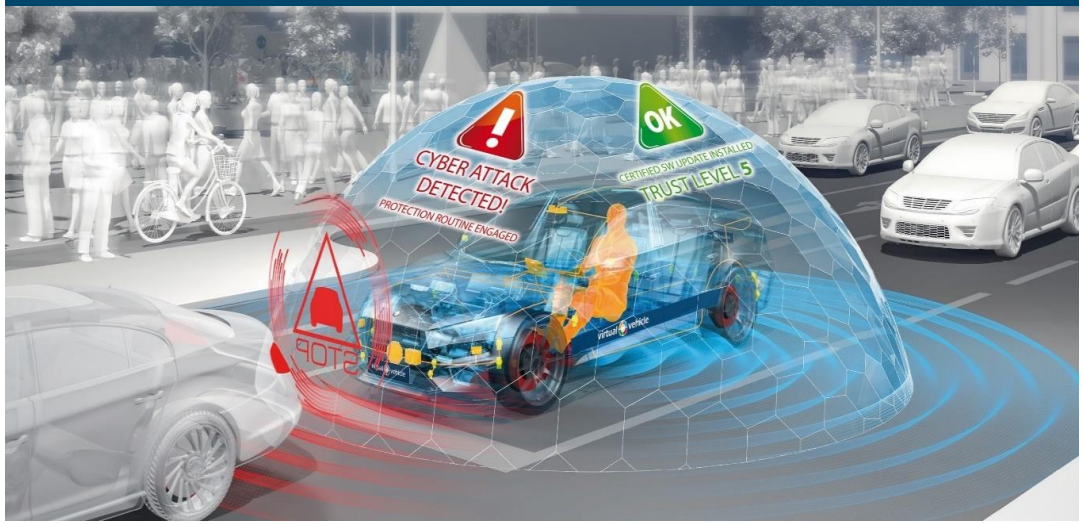
VIRTUAL VALIDATION & HOMOLOGATION



AUTOMATED/ADAS SYSTEMS



SAFETY & SECURITY



RAIL@VIF

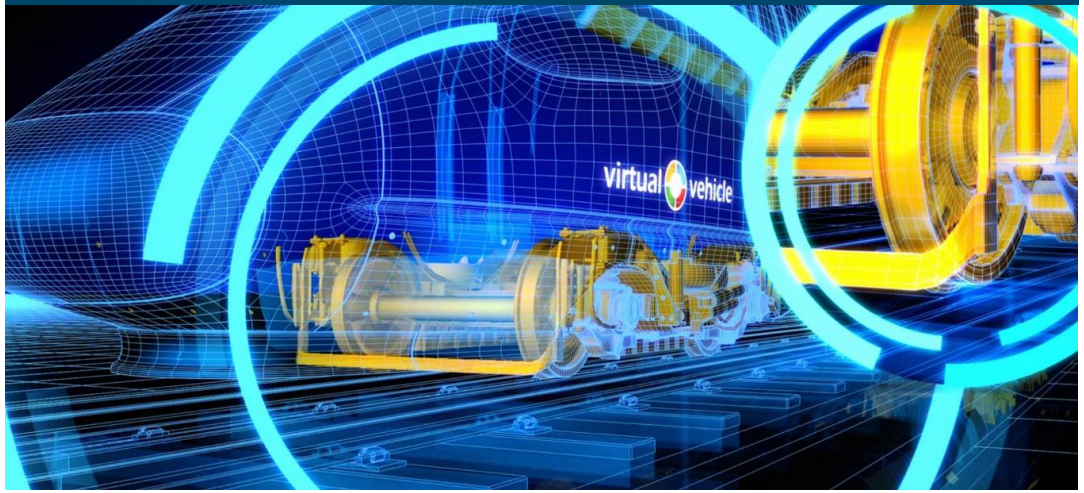
Fields of Expertise – Rail Systems

GREEN MOBILITY & TRANSPORT

VIRTUAL VALIDATION & HOMOLOGATION

DIGITAL TWIN NETWORKS

OPTIMIZATION OF VEHICLE AND INFRASTRUCTURE COMPONENTS



De-risking future railway technologies

Applied Research in times of increasing capacity

Fields of Expertise – Rail Systems

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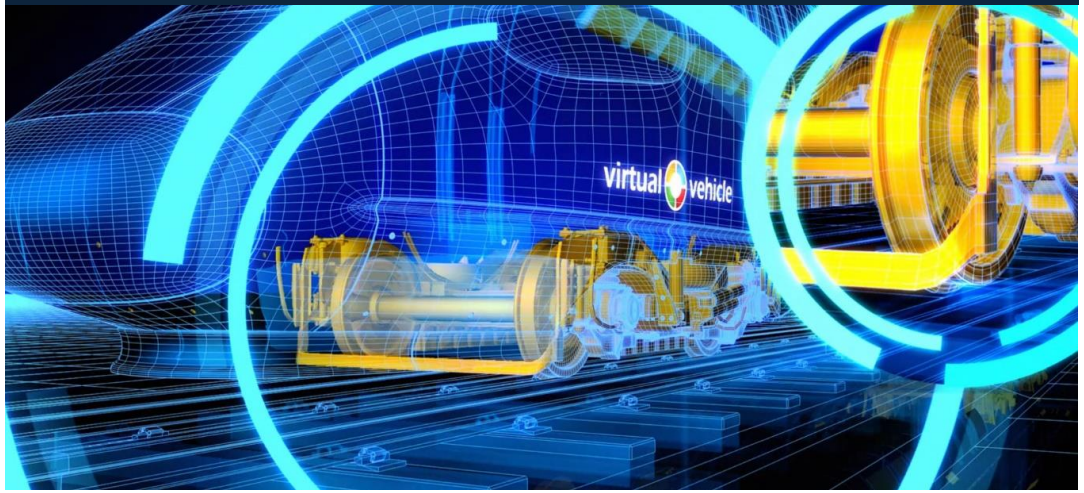


VIRTUAL VEHICLE Partner Network

International Industry- and Scientific Partner Network

INDUSTRY

Audi, BMW, Volkswagen, MAN, ŠKODA, Mercedes-Benz, Peugeot, Porsche, Volvo, Liebherr, Jaguar, Land Rover, Renault (Passion for life)

Apex.AI, Autoliv, AVL, Bosch, DYNA MORE, NXP, NVIDIA, Continental, IBM, Infineon, MAGNA, Samsung, Siemens Healthineers, ZF, ZKW

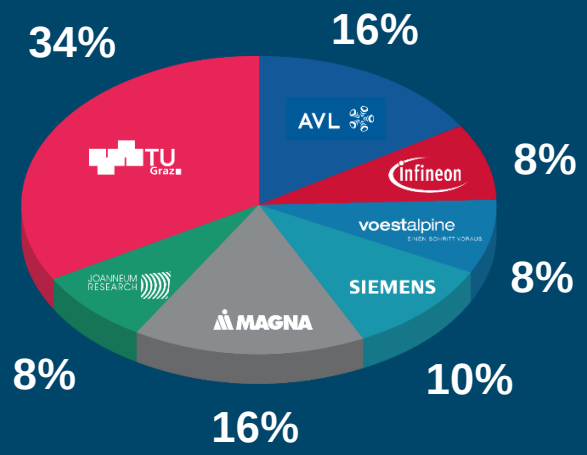
SCIENCE

TU Graz, DLR, Fraunhofer, Joanneum Research, TU Wien, Montan Universität, TNO innovation for life, Technische Universität Berlin, Universitat Politècnica de València, The University Of Sheffield., Massachusetts Institute of Technology, KTH Vetenskap och Konst, KU Leuven, Loughborough University, Stanford University, Berkeley University of California, Carnegie Mellon University

RAIL-SPECIFIC

ALSTOM, DB, Knorr-Bremse, LBFoster, ÖBB, CAF, SBB CFF FFS, Siemens, Stadler, Plasser&Theurer, Wiener Linien, voestalpine ONE STEP AHEAD.

Shareholder



100+ Industry Partners

40+ Scientific Partners

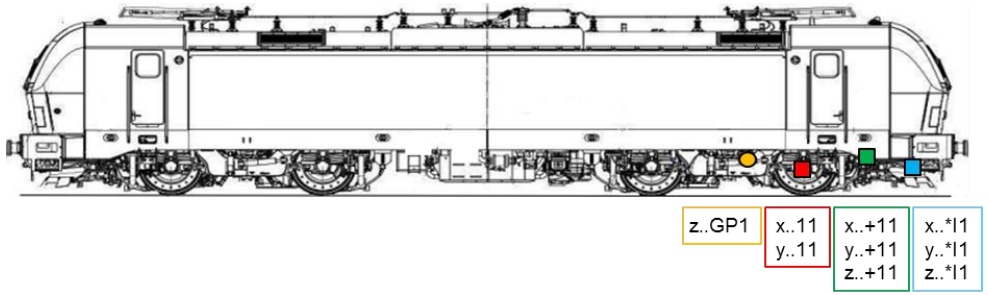
300+ Staff

Virtual vehicle development and approval → Roll out innovations with partners to support a *faster market uptake*

USE-CASE 1: Schätzung der Parameter mit Hilfe des Shaker-Tests

What is a shaker test and what are the objective of the test?

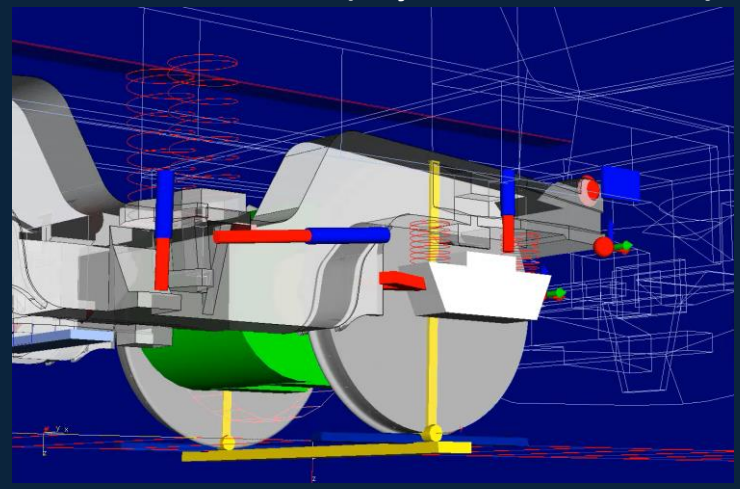
Validation of the vehicle model (without environment)
Actuation by the drive torque of an engine
or a group
Easy to calculate transmission behavior
Credible simulation for approval-relevant topics



Reales Testfahrzeug

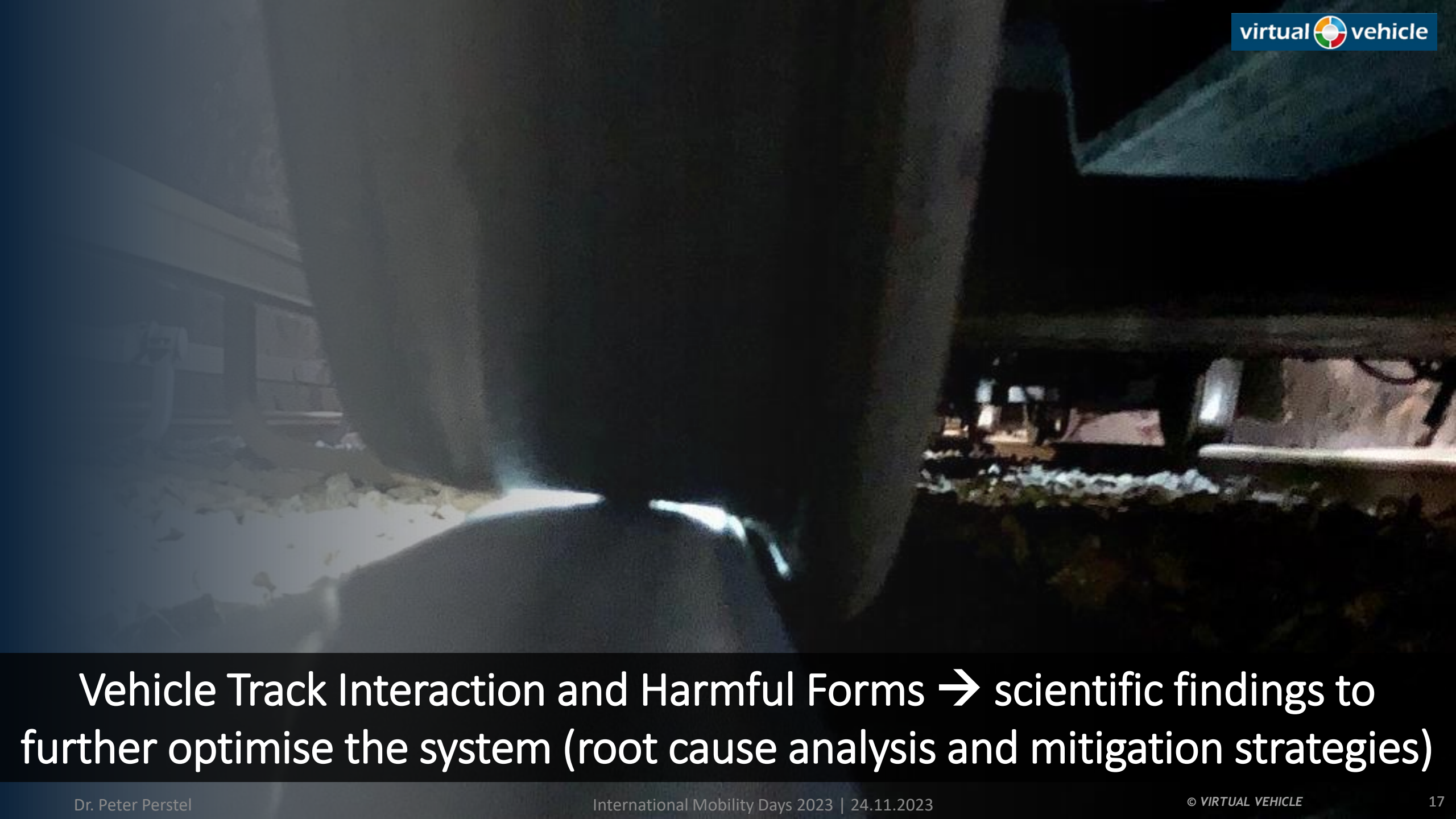
Ausführung des Tests

Simulation des Tests (Physikalisches Modell)



→ Estimation of the dynamic properties of the vehicle independent of the ambient conditions. ***Goal: Validated vehicle model***

Broad expertise in the development of methods → through combining broad system knowledge, sensor data, algorithms and simulation



Vehicle Track Interaction and Harmful Forms → scientific findings to further optimise the system (root cause analysis and mitigation strategies)

Significant efforts to understand unexplained phenomena
→ basic research in a first step (e.g. Theam Squats) with great potential for future de-risking the rail system ***Goal: Increase capacity***

DIGITAL TWIN

from Sensor Data to Prediction Basis

EXPLORE
enrich your data with context

virtual vehicle

EXPLORE Data Context Hub ®

Enterprise Data Integration & Knowledge Transformation

Conway's Law:

Organizations design systems which copy the organization structure

Melvin Edward Conway, 1968

Connected systems require network organisations and consistent data

Future Engineering – Key Enablers and Fields of Activities

Handling complexity

- Providing valuable context
- Single point of truth / source / access
- Simplification of IT architecture

Collaboration

- Flexible viewpoints on data and relations
- Context from any perspective
- Graph security layer

EXPLORE
enrich your data with context

Speed – Time to Market

Ability to adapt

- No proprietary data model
- Enterprise specific knowledge model
- Agile data modelling
- Brownfield & greenfield capability

Culture, mind-set

- Scalable from need2know to good2know
- Reliable and traceable data and context

RAIL SYSTEMS

Backbone for Green Digital Mobility

virtual vehicle

Virtuelle Entwicklung I Fast Market Uptake I Digitaler Betrieb

1. Broad domain knowledge combined with multi-disciplinary integration

2. Proven implementation strength over several development stages

3. Extensive partner network (industry & universities)

4. Attractive funding leverage and yet short-term project launch

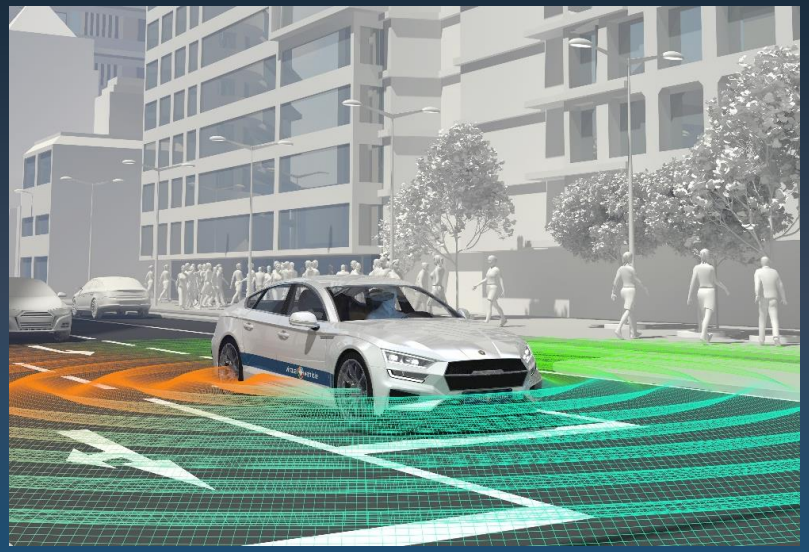
5. Clear and proven IPR regime


virtual vehicle
Q
A
virtual vehicle
AUTOMATED DRIVE
virtual vehicle
AUTOMATED DRIVE
THANK YOU!

BACK.UP

Bridge Between Science and Industry

COMET K2

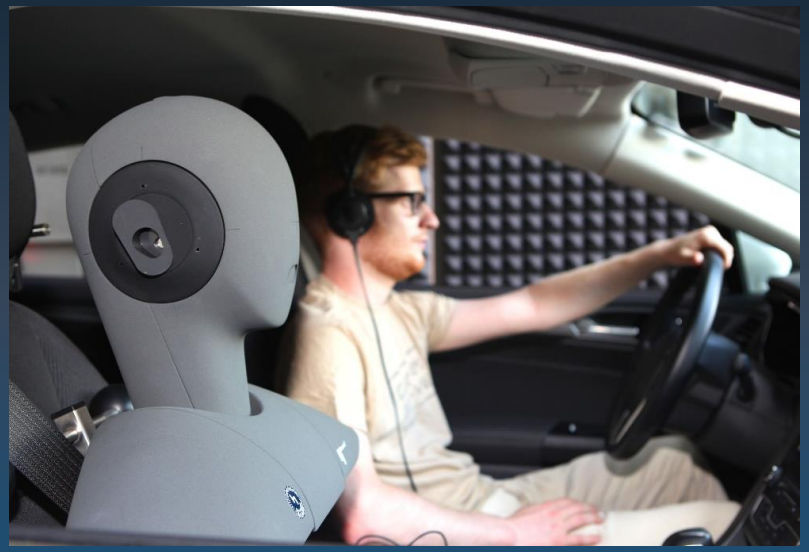


- Digital Mobility
- Long term co-operative research
- Leveraging of invest

FUNDED PROJECTS

- 40+ ongoing EU Projects
- 90+ successfully completed
- International visibility and reputation (Initiator, Coordinator)

CONTRACT WORK



- Research & Development
- Test Bed & Demonstrators
- Industry agreements

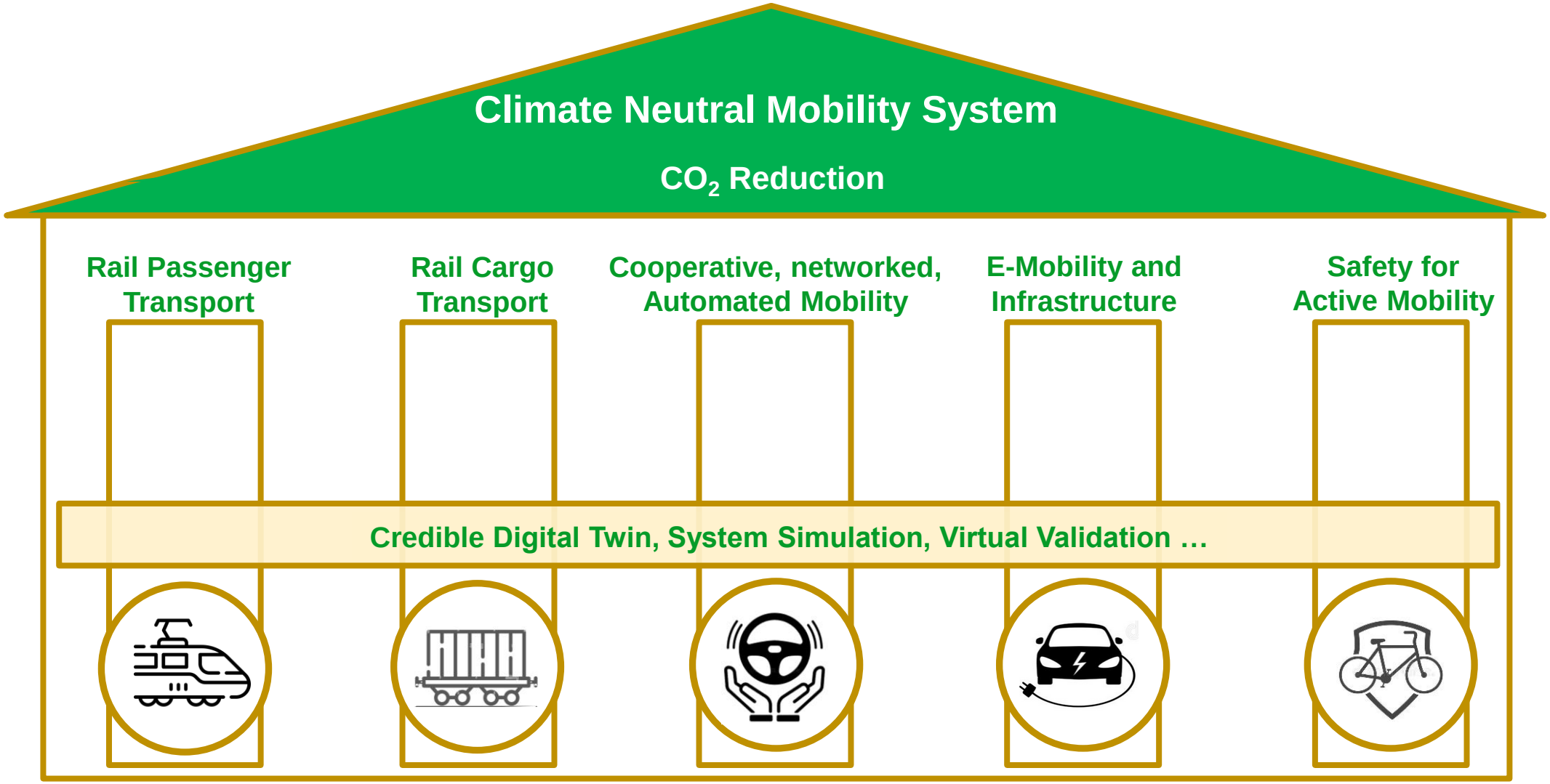
Comprehensive knowledge of

~320 in-house experts

Today, VIRTUAL VEHICLE is Europe's largest research center for virtual vehicle development

Internationally recognized USPs lead us into the future

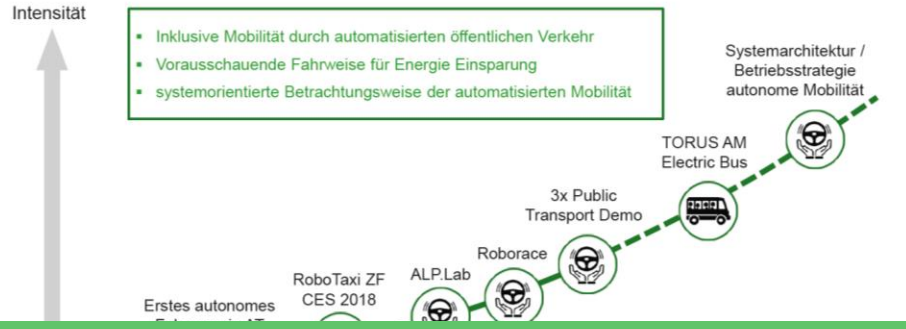
Climate Neutrality 2040: Five essential pillars



In a nutshell:

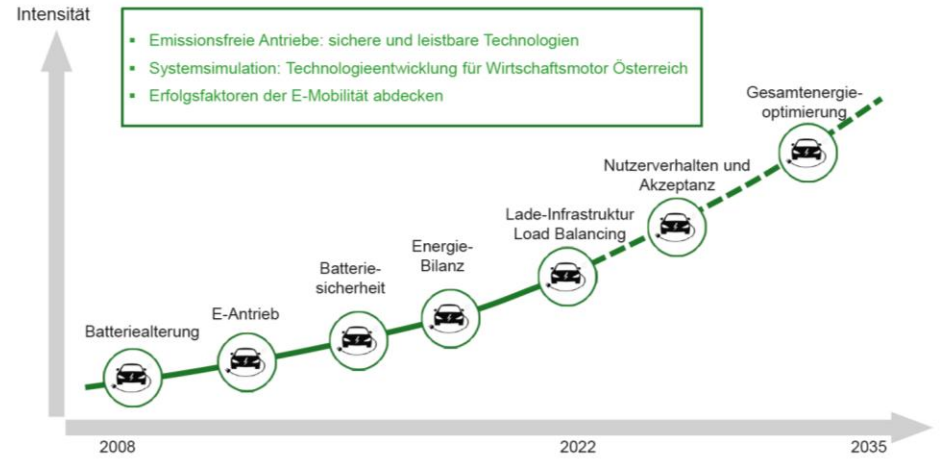
Rail: Passenger & Cargo Transport

Cooperative, networked, Automated Mobility

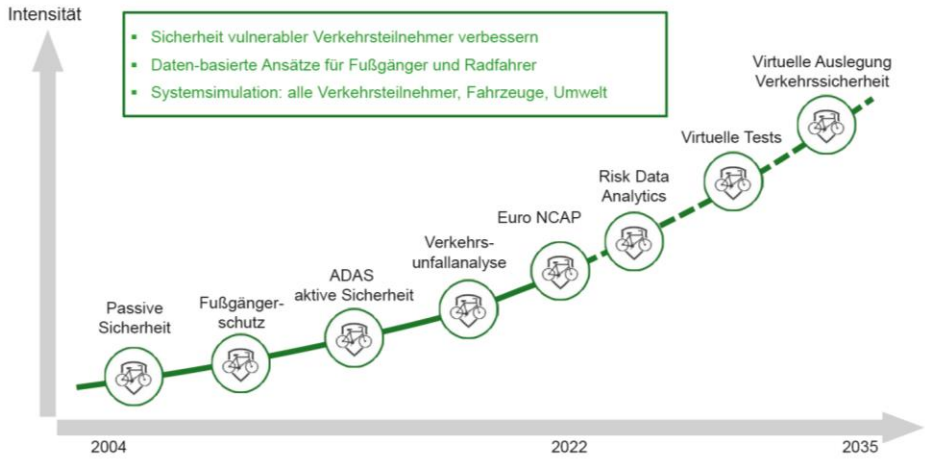


20 years of preparation now puts us in pole position for climate-neutral mobility

E-Mobility and Infrastructure



Safety for Active Mobility



Climate Neutrality 2040: Five essential pillars