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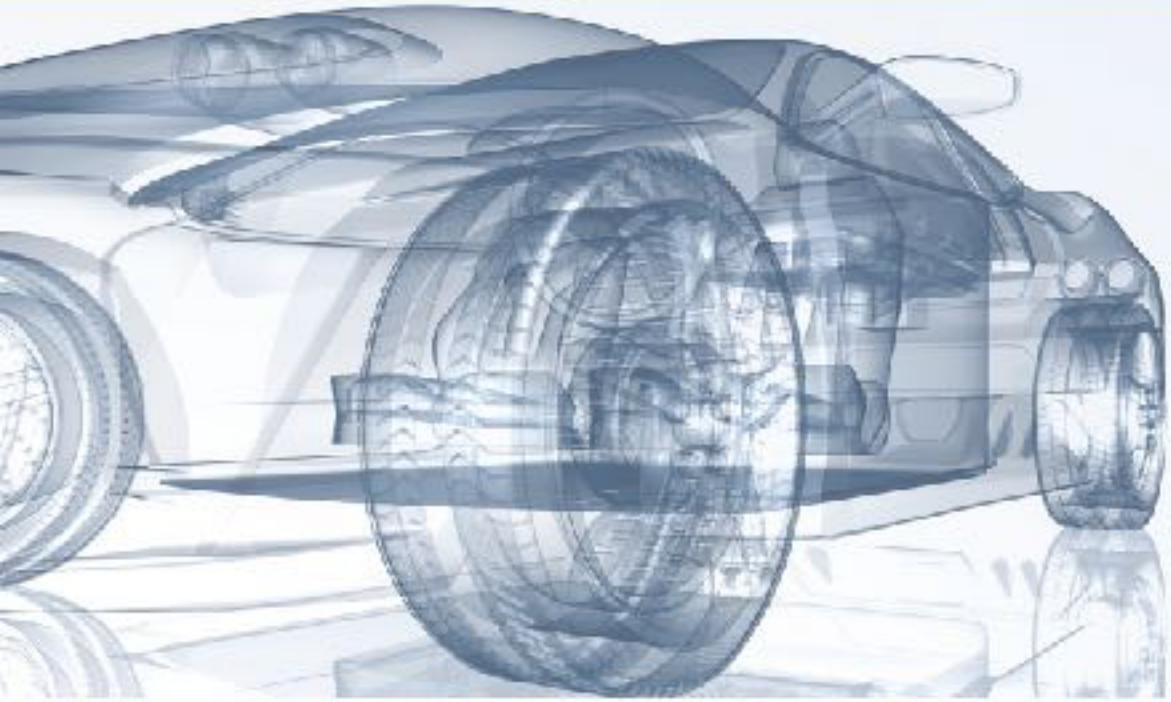

The 30th International
Electric Vehicle
Symposium & Exhibition

October 9–11, 2017

Messe Stuttgart, Germany

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ARENA2036

Active Research Environment for the Next Generation of Automobiles

–

Agile production and lightweight construction for electric mobility

Max Hossfeld, Peter Froeschle

Agenda

Research Campus Concept

Initial Projects

Open Innovation

Targets of ARENA2036

ARENA2036

Active Research Environment for the Next Generation of Automobiles in 2036

ARENA2036 is the **internationally leading research campus,** where **excellent partners** in scientific and industrial research focus on **production and lightweight engineering in the context of Industry 4.0.**

- Development of disruptive projects & Innovations
  a whole new thinking of mobility and its creation
- Research along the entire value chain
  from product to production, from design to recycling
- Interdisciplinary cluster of excellent partners
  automotive, mechanical & aircraft engineering, IT, plastics, production, social sciences …
- "Industry on Campus"
  Establishing a new collaboration platform
- Campus concept with shared, project and science spaces
  employees from scientific institutions & enterprises work together for at least 3 days a week

Implementation of the research campus concept in ARENA2036:

ARENA2036 building

Leading technology enterprises and research institutes as partners

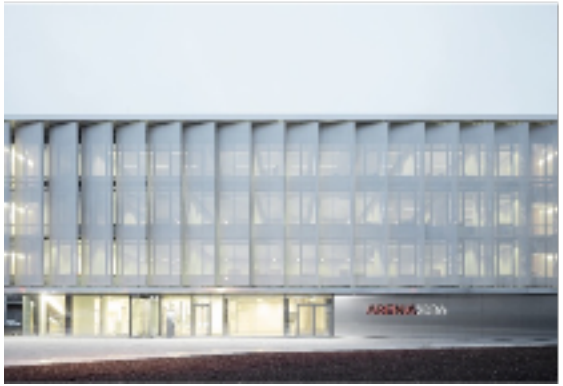
FARO, EWS, DITF, BOSCH, SCHUNK, pilz, Constellium, FESTO, SIEMENS, Fraunhofer, KUKA, BÄR, DAIMLER, Altair, Hewlett Packard Enterprise, PUBLIC PLAN

Multi-material lightweight design and value chain systems (Industry 4.0)

ARENA2036 – Germany's Largest Research Factory

ARENA2036 Building

- Research space of about **10.000 m²**
- Up to **160 fulltime** employees
- 1 year construction time
- Funded with more than € 30 Mio. of state- and EU-Funding (EFRE)
- Build on the campus of the University of Stuttgart
- Cutting edge building technology



Concepts of cooperation

- Industry and research institutes develop products and production together
- Flexible environment for a hardware-based knowledge work of the future
- Short distances and fast loops for agile development processes
- Interdisciplinary transfer of knowledge for the employees of the future
- Modern, attractive and model-like working environment for the Factory 4.0
- Versatile and adaptable infrastructure

The ARENA2036-Vision

The demand for sustainability and individuality radically changes the products and the production environment of tomorrow. ARENA2036 focuses on two research fields:

Mobility2036:

- Multi-Material lightweight design by way of functional integration
- New materials and joining technologies
- Continuous digitalization of all parts and processes
- New concepts for autonomous and crashless cars

Production2036:

- Versatile production
- Industry 4.0 research and implementation
- Humans in the factory of the future
- Micro-factories

Industry 4.0 from development to production

Automobile research meets the demand of the mobility of the future – but not only. Besides mobility itself, its whole creation is about to be changed.

Initial Projects – Content and Partners

Mobility2036		Production2036	
intelligent lightweight construction with functional integration (LeFu)	**Digital production: new materials and processes (DigitPro)**	**Production of the future (ForschFab)**	**Creativity, cooperation, transfer of skills (Khoch3)**
Materials and Design	Simulation and Digital Prototype	Production and Research Factory	New types of Cooperation
Weight reduction by means of functional integraton and new materials **New manufacturing methods** of lightweight components **Cost reduction** by means of a decrease of logistics and installation costs and by reducing the number of parts	**Reduction of the simulation time and weight** – 50% faster simulations and 10% lighter designs by way of improved component optimization **Cost savings** by way of Computer Aided Manufacuring (CAM): faster development process, fewer scrap parts, prototypes, and development loops	**Adaptability** of production Setup of new revolutionary procuction concepts **Hybrid production concept** Adaptation of lightweight and manufacturing processes to production related requirements **Innovative robots as agile basic components**	**Creativity-focused work environment** innovative, interdisciplinary, and interinstitutional **cooperation model** Innovative approach for the **transfer of skills**

The projects in the value chain are interlinked to increase the learning speed and to reduce research time. This research area offers an excellent basis for new ideas and projects.

LeiFu – Lightweight Design with Functional Integration

Vision: Integration of several functionalities in existing automotive parts and manufacturing processes

CFK-Sandwich

- Improving mechanical properties
- Thermal Isolation

Flexible Fuel Tank

- New load paths based on an integrated fuel tank

Integrated Sensor Technology for Condition Monitoring

- Fiber-based temperature and humidity monitoring
- PVDF-fiber

Printed Active Heat Control

- Temperature control of the battery

HV-Battery

- Partly integrated battery casing
- Integrative HV-battery module with cooling and heating function

Inductive Charging Unit

- Textile loading coil with integrated damage sensoring

ForschFab – The Agile Production of the Future Automobile

Vision: Continuous production at optimal operating point due to versatile production systems

Reducing Complexity of Pruduction

- Reconfiguration of production facilities
- Compatible operating supplies

Collaboratve IT-Platform

- Integration of logistic partners
- Management of heterogeneous software architecture and interfaces

Flexible Logistics

- Autonomous material transportation
- Modular manufacturing equipment

Replacing Inflexible Assembly Lines with Versatile Structures

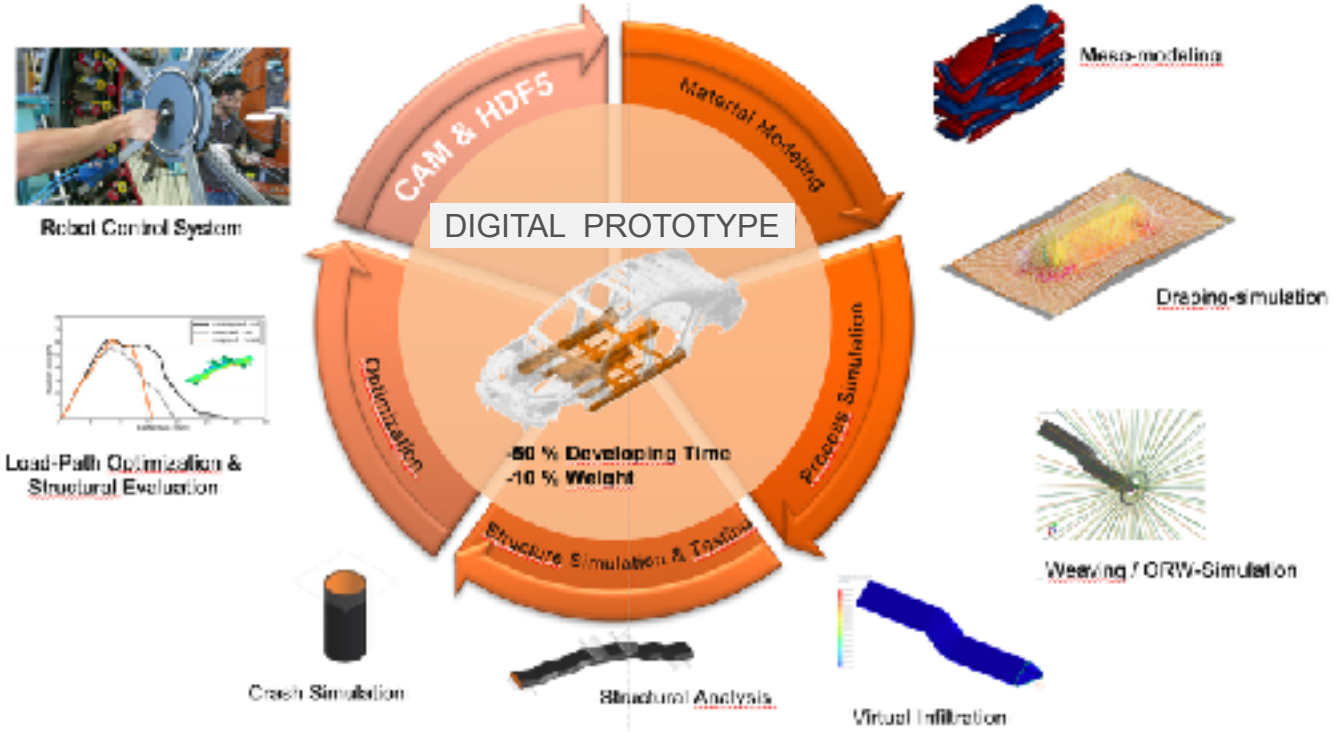
- Rethinking physical and logical structures
- Advanced simulation of production scenarios

Human-Machine-Interaction

- Developing collaborative assembly systems
- Natural man-machine communication

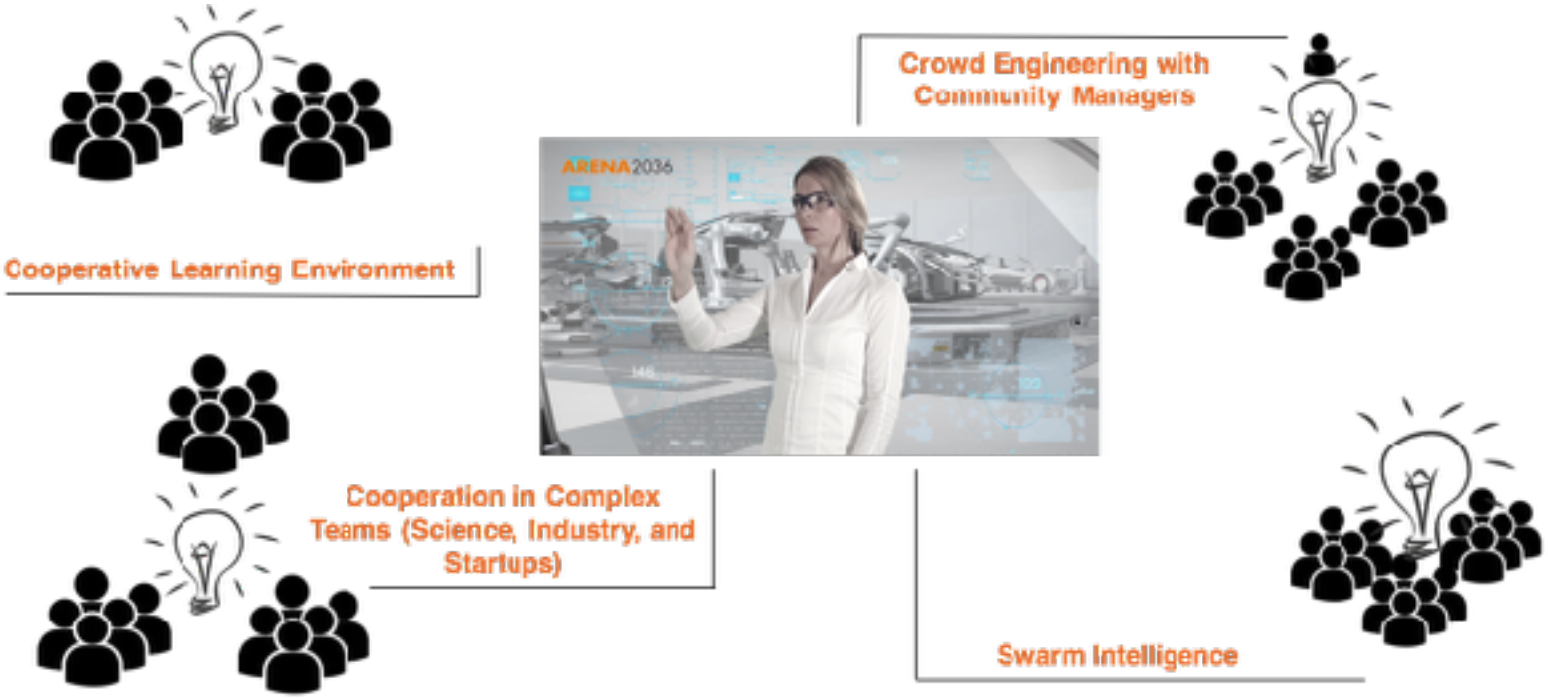
DigitPro – Integral Digital Prototype for Serial Production

Vision: Simulating a holistic production process along the entire value chain



Khoch3 – Creativity, Cooperation, and Competence Transfer

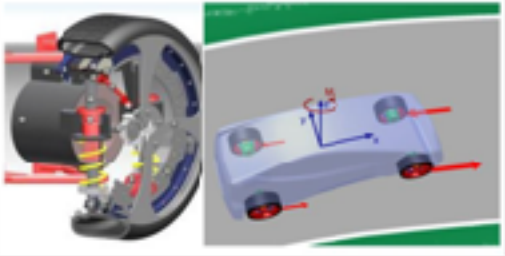
Vision: An integrative and agile workplace that allows actualizing interdisciplinary potentials



Associated Research

MFW-LEICHT

Lighweight Energy Effieciert Innovative Chassis with Hubmotor Technology



Goals:

- Prototypical realization of a chassis
- Developing an efficient control system
- à MFW-LEICHT is the successor of the project *CLR@Uni* and aims at validating and building on the results of the latter.

PuVerSand

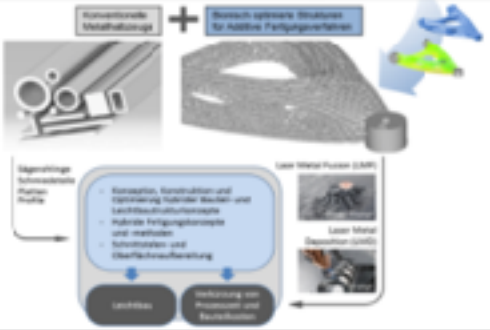
Spot Joining of Structurally Load-Bearing Sandwich-Structures

Goals:

- Transfer appropriate joining technologies / links to sandwich structures
- Optimization of the entire compound system
- à enabling the exploitation of the lightweight potential

SerAddMeHa

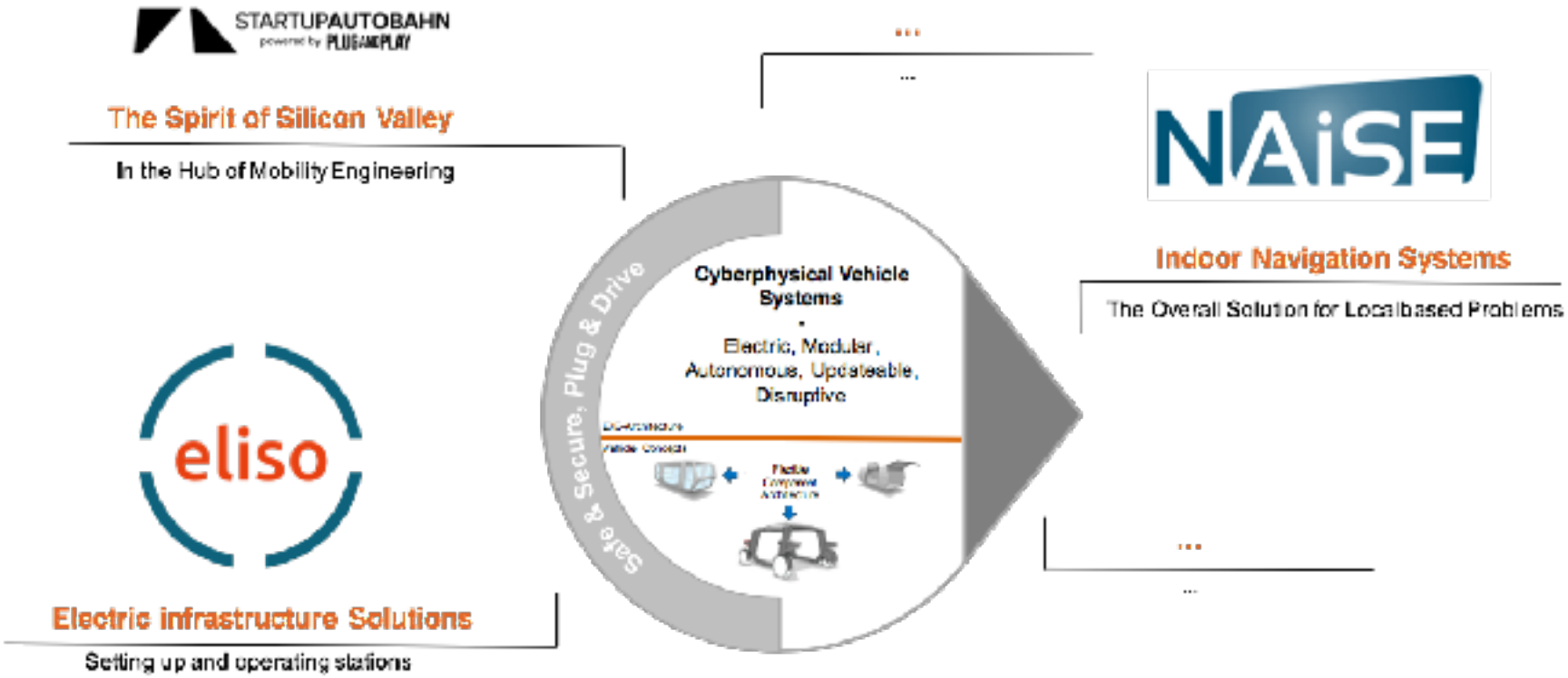
Series-Production Readiness of Additive Print-Technologies by Means of Metallic Semi-Finished Products



Goals:

- Reduction of process times and manufacturing costs
- Developping a method that allows for hybrid structural and production concepts
- à individualized components

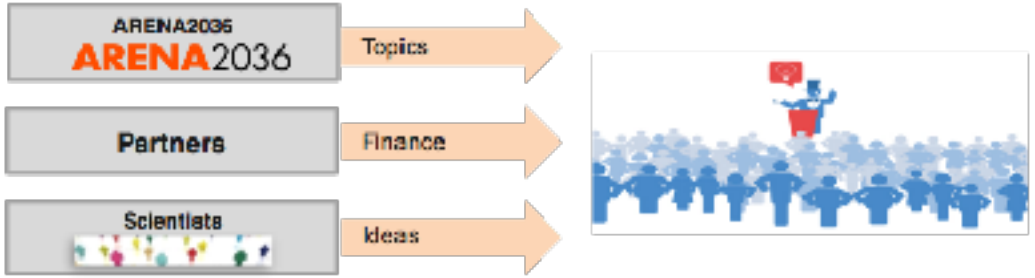
Open Innovation Platform



Methods for Innovative Project Ideas

Project pitches

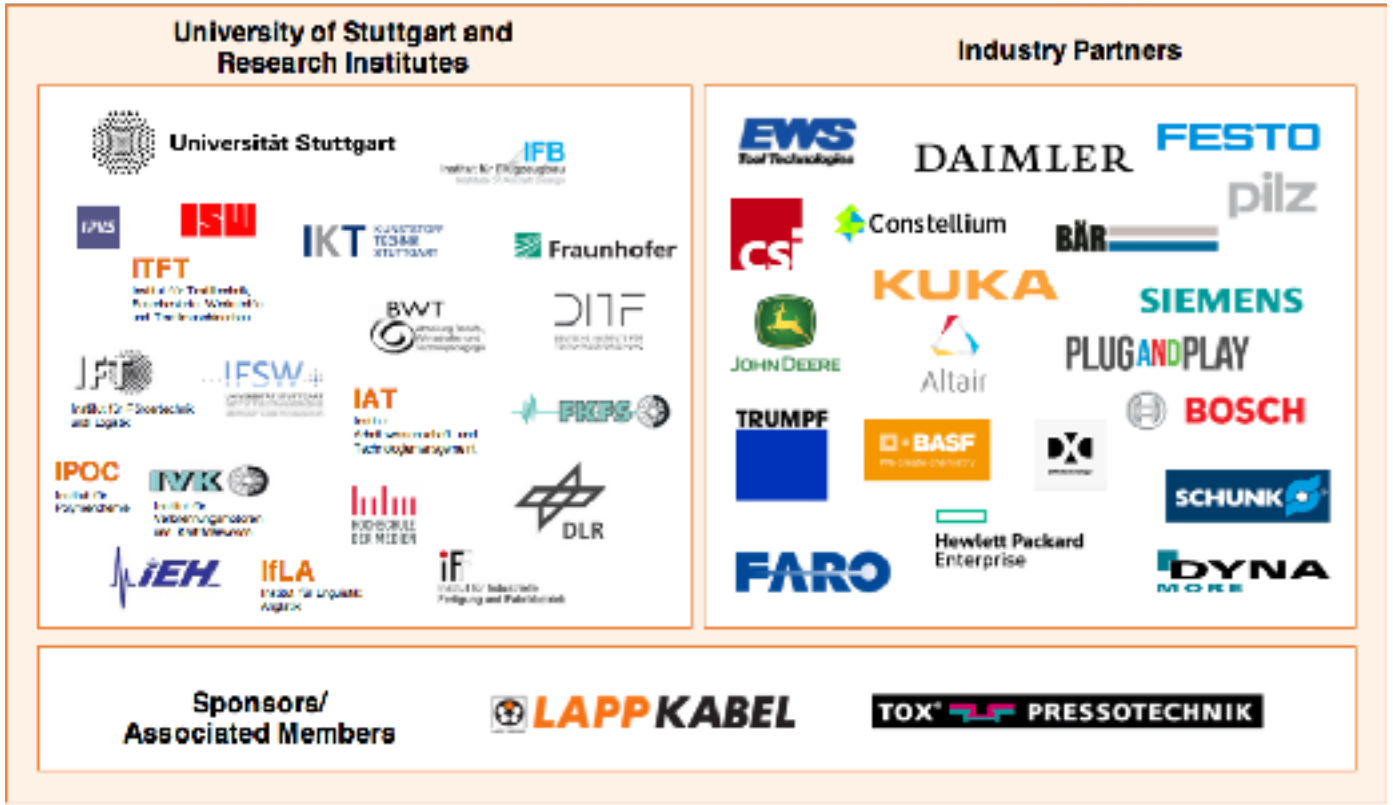
- Open platform for researchers
- Promote and bring in new disruptive ideas for the automotive industry
- Start of new projects which fit to ARENA2036 topics
- Presentation of topics in front of the research directors



Hackathons and Integration of Developer Communities

- Developer Communities provides a high speed innovation generation
- This advantage is also established in the production sector using production hardware

ARENA2036 – Members



Thank you for your attention!

Dipl.-Ing. Peter Froeschle
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