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GAIA-X 4 AGEDA*

Requirements and applications of GAIA-X for the automotive edge

Prof. Dr. Achim Rettberg



*AGEDA = Anforderungen und Anwendung von GAIA-X im Edge-Device Automobil

Several mobility-related Use-Cases were addressed by different R&D Initiatives throughout last years ...



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Figure: acatech Studie – Neue autoMobilität II

... So far: Huge Effort and few practically relevant Results

Huge investments in 'one trick ponies'

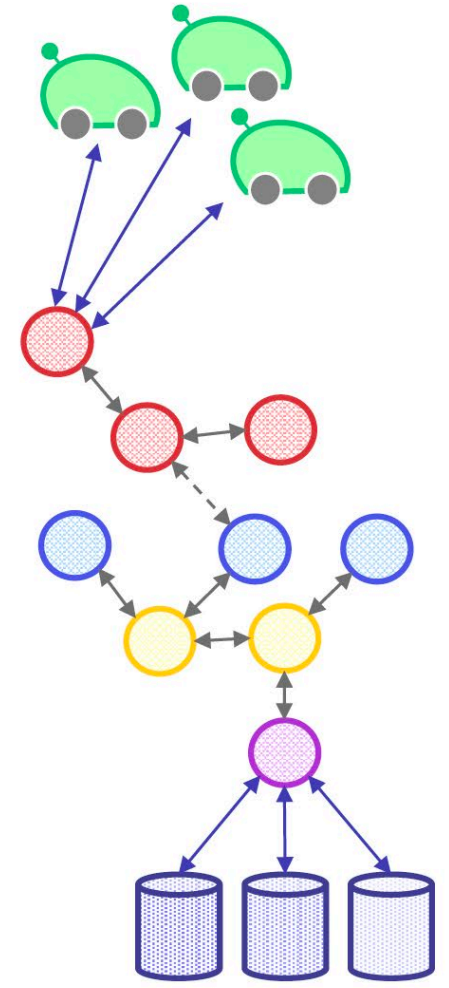
No concepts for scalability – functional as well as regarding market reach

Limited reuse of components / services

No market preparation

No joint or mashed business models

No foundation for system innovations



GAIA-X 4 Future Mobility – Family of Projects



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Overview – currently established projects (Q3/2022)

GAIA-X 4 AMS

Connected & Automated Vehicles and Intelligent Traffic Infrastructures as well as **Reliable & Safe Corridors** – e.g. Rescue Corridors

GAIA-X 4 ROMS

Management (e.g. Remote Operation) of Connected & Automated Vehicles and Fleets with respect to the status of the Traffic System

GAIA-X 4 PLC-AAD

Decentralized and open Data Ecosystem based on Digital Twins intended to support Product Development, Manufacturing and After Sales – with a focus on automated driving

GAIA-X 4 AGEDA

Integration of GAIA-X with future in-vehicle Architectures for safety-critical Applications in connected and automated Vehicles

GAIA-X 4 moveID

Decentralized Digital Identities and Trustworthy Data Exchange for various Use-Cases (e.g. Zoning, Traffic Infrastructure Management, Smart Parking and Collection of Vehicle Data)

GAIA-X 4 KI

Data and Service Ecosystem for **Training and Validation of AI-based Components/Applications** with a focus on the Automotive Sector.

GAIA-X 4 Future Mobility

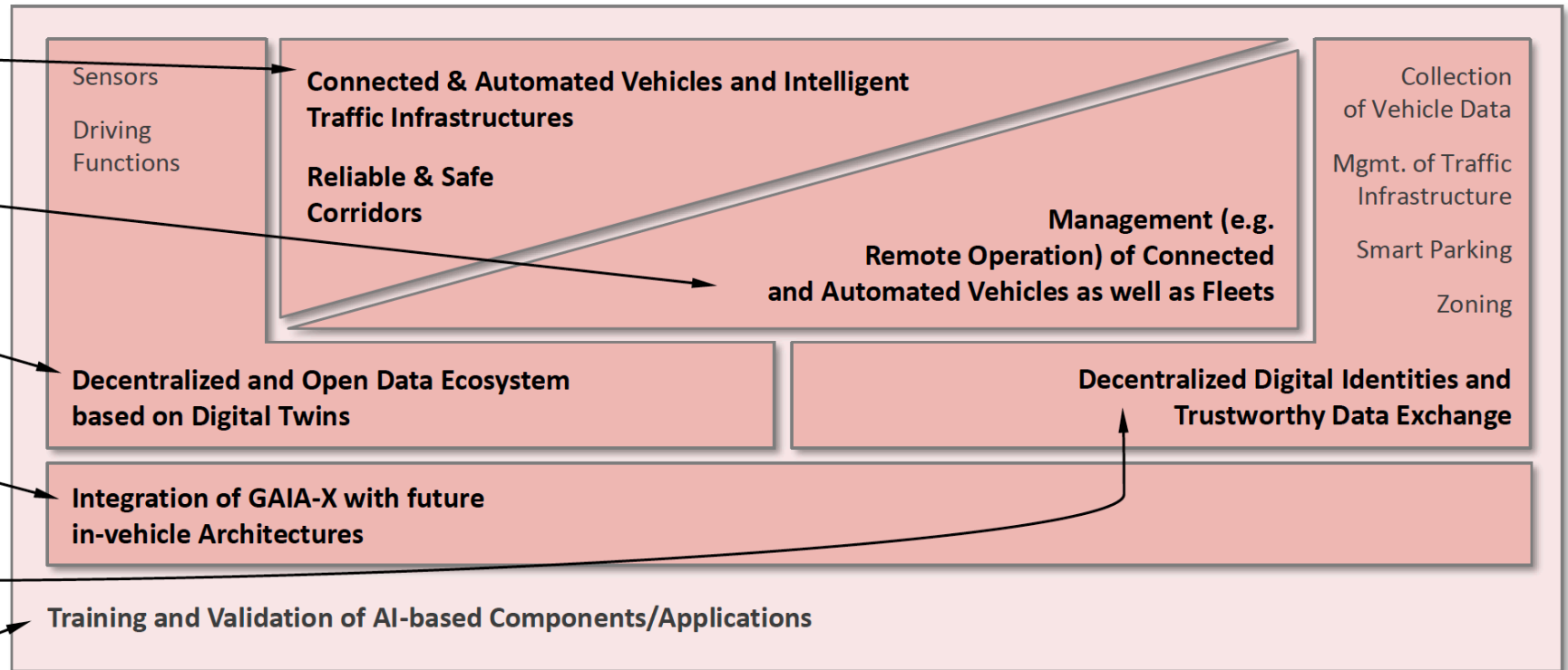


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- Overview – currently established projects (Q3/2022)

- GAIA-X 4 AMS
- GAIA-X 4 ROMS
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- GAIA-X 4 AGEDA
- GAIA-X 4 moveID
- GAIA-X 4 KI



Project „GAIA-X4AGEDA“

Situation today



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New demands on vehicle architecture due to the megatrends of networking, mobility services and electrification

- › New value chains require seamless networking of vehicles, infrastructure and cloud
- › Development of new applications and services in the cloud introduces new requirements for maintainability, updates and upgrades over the complete vehicle lifecycle (after SOP)

SOP = Start of production

Data-driven applications with high dynamics

- › Digitalization leads to growing data volumes and increasing importance of **data-driven engineering** which requires new technologies for seamless integration into the vehicle to shorten development cycles
- › Digitization enables broad availability of data (e.g., in the city) and infrastructure, whose advantages cannot be used in the vehicle yet

Massively rising costs & risks in system and software development

- › Increasing complexity requires large development teams for the implementation of centralized computing units in the vehicle
- › High requirement for vehicle functions (e.g., real-time capability) prevents direct adoption of modern cloud technologies into the vehicle

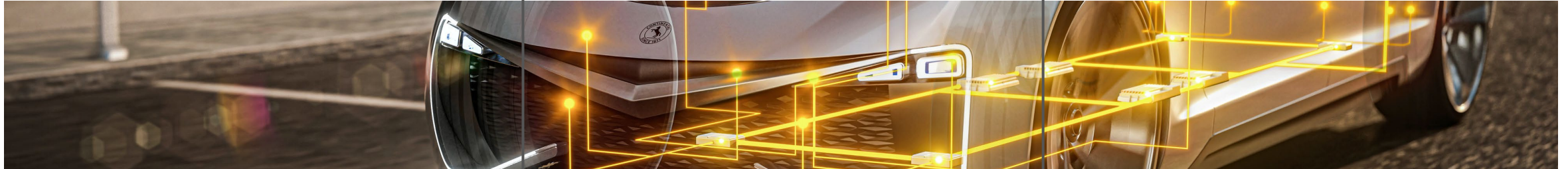
Enable new opportunities by merging vehicle and cloud

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Targets - The vehicles as part of the cloud ecosystem GAIA-X



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Vehicle as application platform

- › Enabling seamless connectivity of the vehicle with the cloud through
 - › Cloud based development methods
 - › Safety compliant distributed computing
- › Pilot new cooperation models in practice and establish methodologies for sustainable development over the vehicle life cycle

GAIA-X compliant implementation of data-driven applications

- › Harmonize data-driven approaches and established methods of distributed computing, including data protection requirements, and implement them consistently from vehicle to cloud
- › Build concrete applications to identify missing components and implement them in a reusable way while making them openly available

Competitive advantage through cooperation: increase efficiency and added value

- › Enabling new value chains
- › Joining forces & tapping new competencies - bringing together best practices for non-differentiating system and SW parts

A joint ecosystem - vehicle and cloud
Creating the basis for new value chains in the networked mobility of the future

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Solutions & targets

gaia-x



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future mobility



Uniting Cloud & Automotive Ecosystems

- › Software and data-driven development known from e.g. IT also used for automotive systems
- › Linking and offering vehicle resources (sensor data, computing power) and driver data in the shared ecosystem
- › Reuse previous results from system/ E/E projects as basis and incorporate solutions and standards from other industries
- › Use established development and test processes consistently (across domains) in the distributed system of vehicle and cloud
- › Standardized technologies, open and defined interfaces as the basis for efficient collaboration with a systemic view

Continuous validation of the results with demonstrator setups

- › Collaborative working - show conception and exemplary implementation of applications incl. identified components

GAIA-X 4 AGEDA will build a unified development ecosystem, which will be certified and serve as "the" standard for the automotive industry to prevent vendor specific proprietary solutions.

Gaia-X 4 AGEDA will facilitate the vehicle's connection to cloud-based services with ease, thereby allowing users to access services that adhere to European standards.



Participation in marketplaces for future data- & service-business

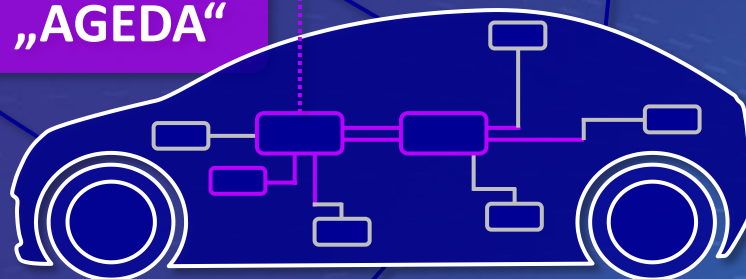


Data-sharing in a trustworthy way based on EU legal conditions

Application of Gaia-X Trust Framework



„AGEDA“



Cloud-native software architecture



Dynamic function deployment during the whole vehicle lifetime

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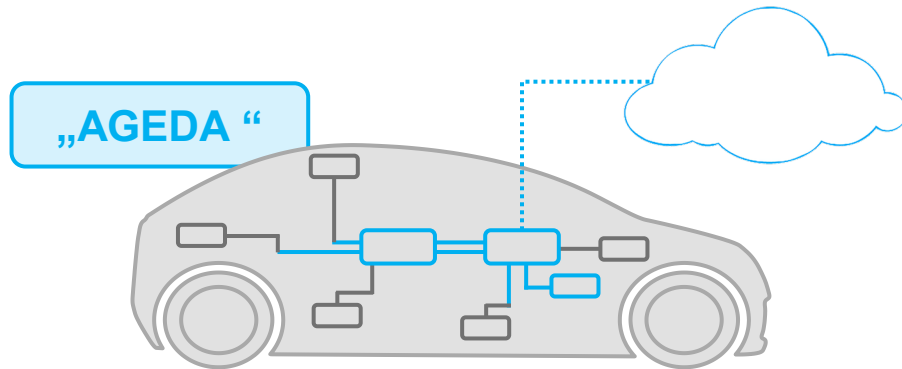
Use Cases & side effect scenarios



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Vehicle in the Cloud Ecosystem GAIA-X



Enable continuous design throughout the
life cycle

Collective Vision

This use case complex addresses the possibility of shared perception of the environment, traffic situation and road condition by different vehicles, the infrastructure in combination with cloud-based services to significantly increase efficiency and safety in road traffic and enables entirely new functions in the context of smart city applications

Physical Internet

The second use case complex involves connecting vehicles as edge components in a multi-vendor cloud-based data ecosystem to implement the concept of a Physical Internet (PI)

Secure & safe distributed computing

Function distribution infrastructure for safety-critical functions and their deterministic execution.

Multi-Cloud applications

Provision of the infrastructure, interfaces, middleware and a design methodology

Vehicle as application platform

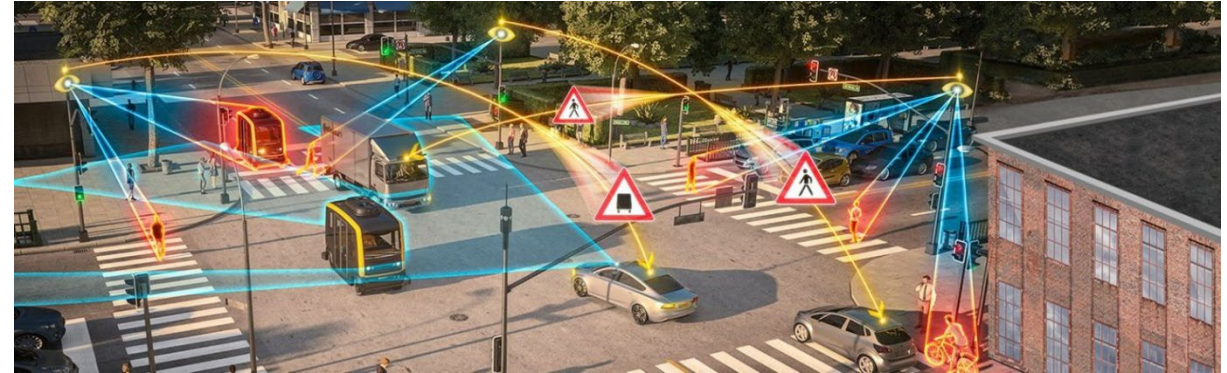
Simplified and fast development for IT developers for dynamic updates in the vehicle as instant updates

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Use Case Collective Vision

Collective Vision

Shared perception of the environment, traffic situation and road condition by different vehicles, the infrastructure in combination with cloud-based services to significantly increase efficiency and safety in road traffic and also enable completely new functions in the context of smart city applications.



Enhancement stages:

1. **Collective information collection**
2. **Collective warning**
3. **Limited Remote Control**
4. **Remote Control**



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Use Case Physical Internet

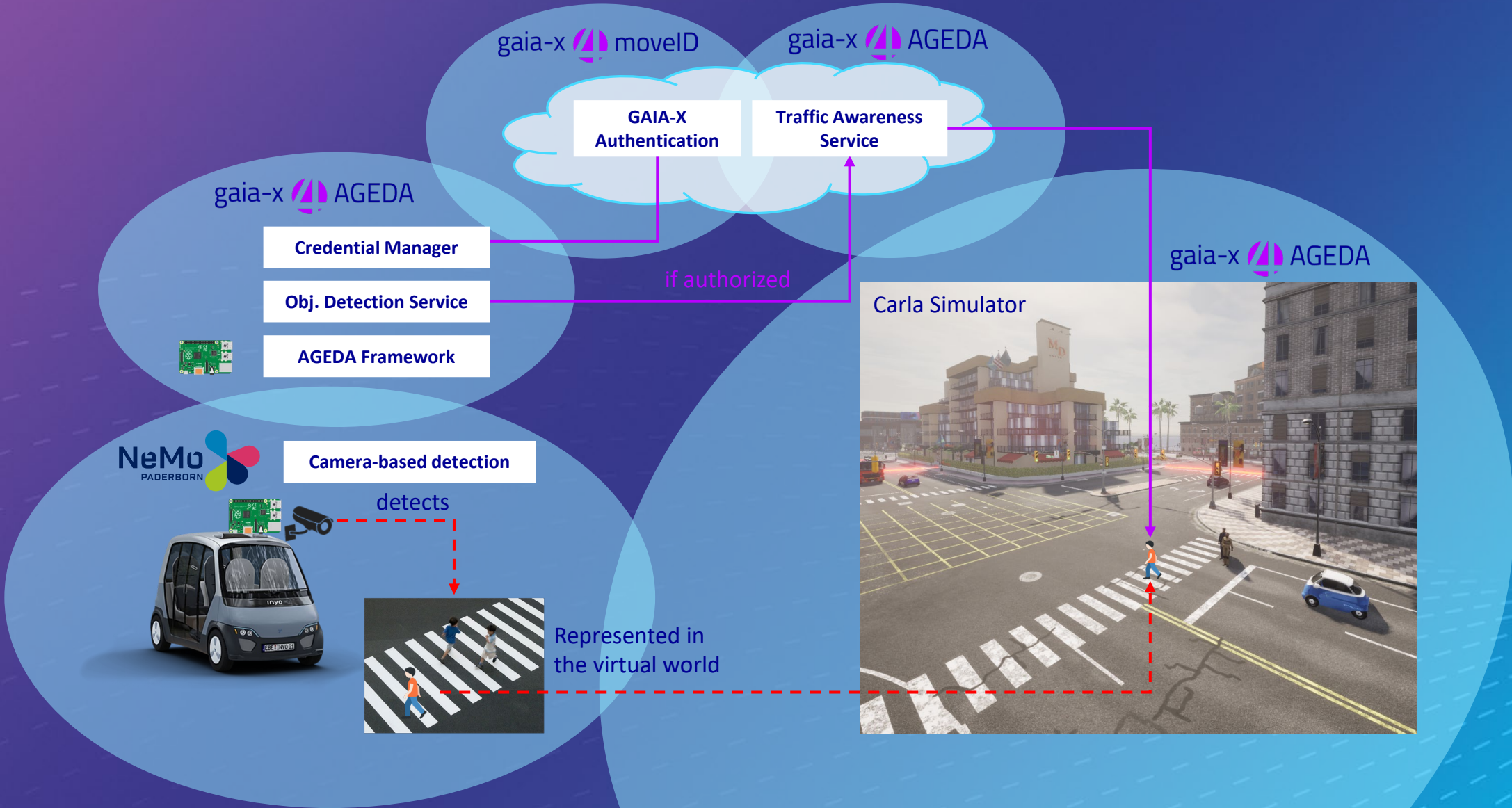
Physical Internet

Route of goods through a logistics network is dynamically adapted during the transport of goods by an inter-/sychromodal and cloud-based routing algorithm to the current volume of goods, the currently available transport capacities, the current traffic situation, and possibly other parameters, such as the lane quality recommended for the transport of goods.

Enhancement stages:

1. Registration of transport goods by means of Auto-ID processes
2. In-Vehicle-Network
3. Data pre-processing and forwarding to the cloud
4. Dynamic routing of goods transport consignments
5. Vehicle-to-vehicle communication





Enabling the vehicle as edge device

- Orchestration
- Runtime environment
- Installation, Update & Upgrade
- Connectivity Management

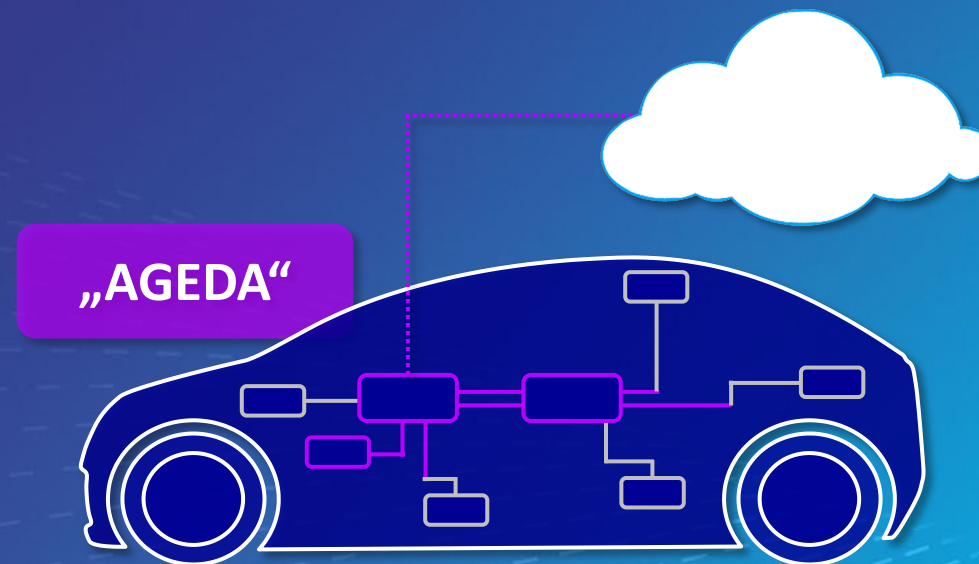
Connecting the vehicle to gaia-x digital eco-systems (Data Spaces)

- Application of **Gaia-X Trust Framework**
- Discover services, share data

Applicability to future vehicle software platforms

- Integration and Deployment
- Dynamic Adaption and Maintenance during the life cycle

The AGEDA Software



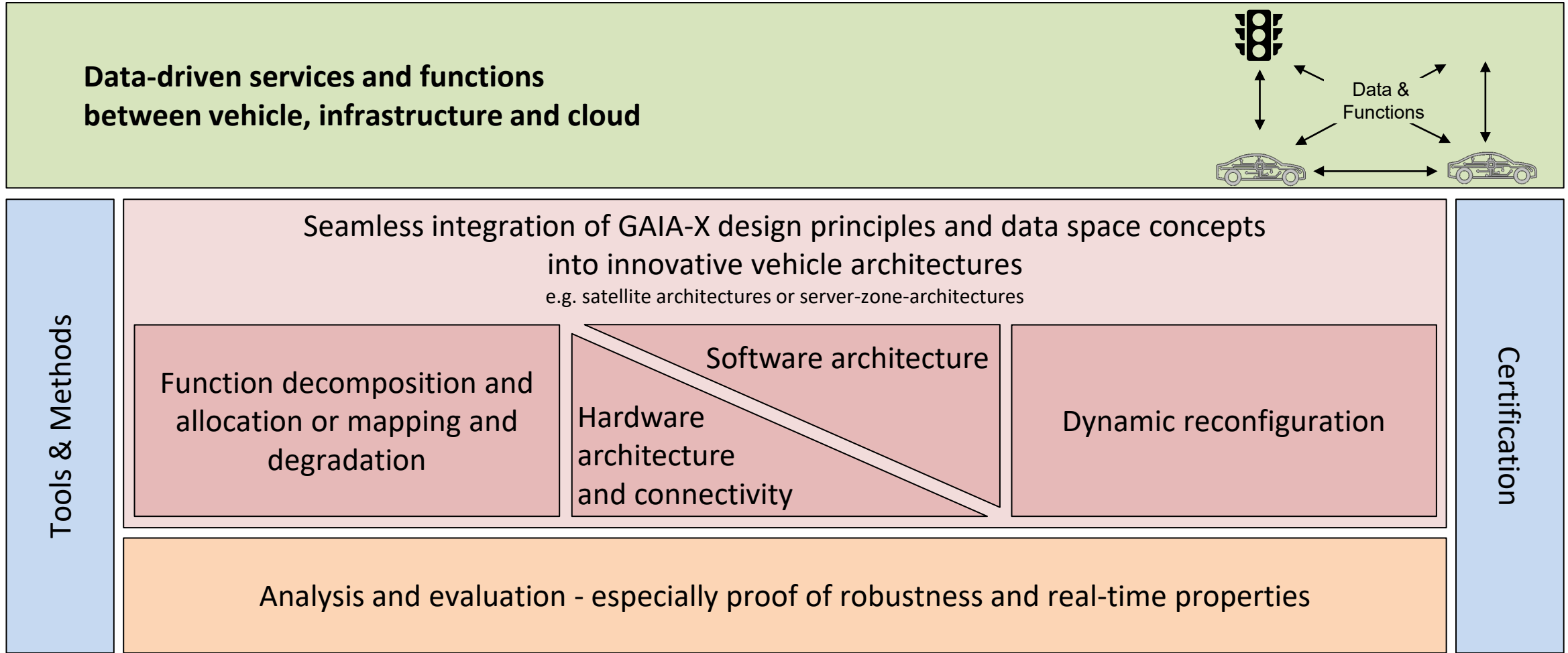
Project „GAIA-X 4 AGEDA“

Project structure



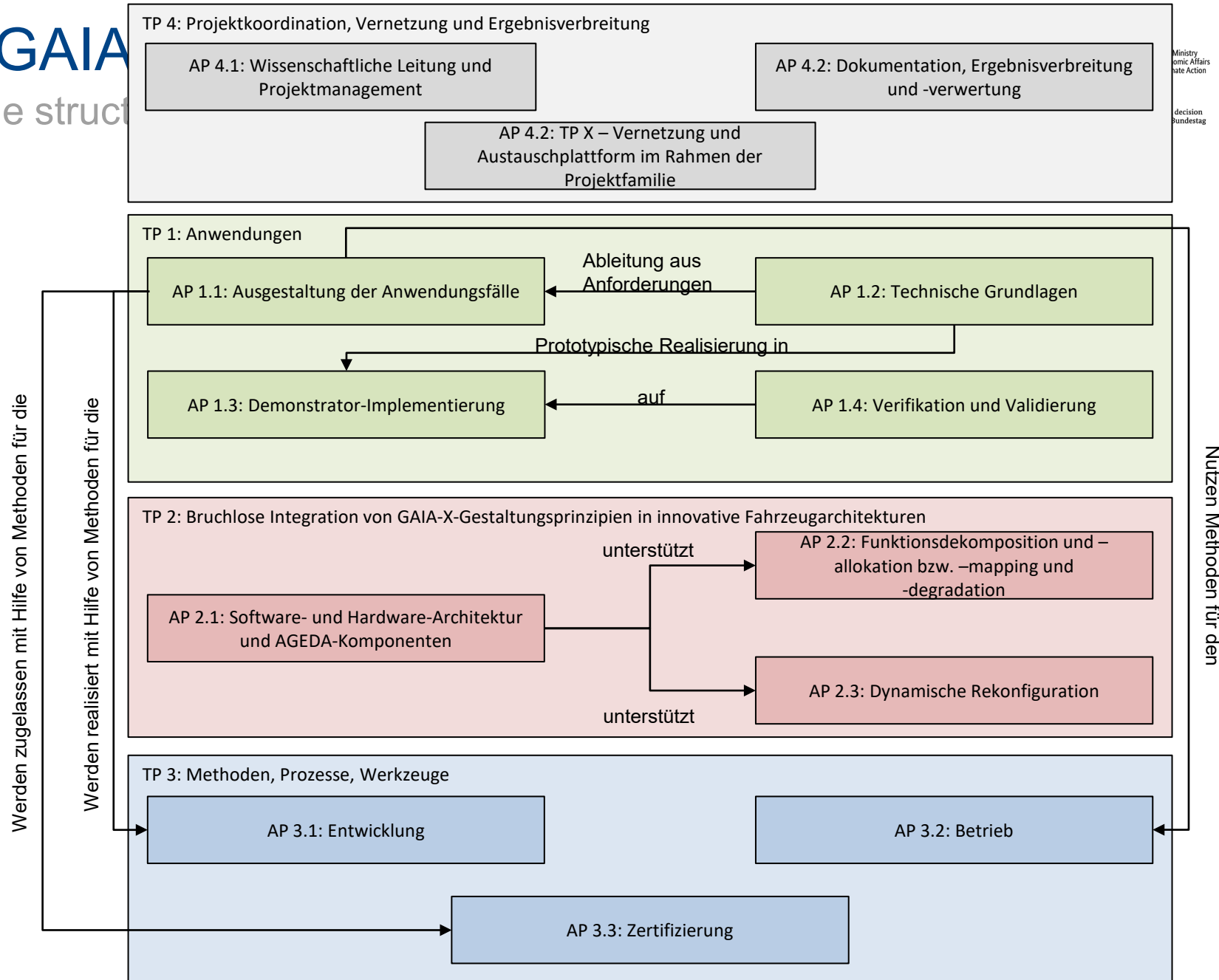
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Project „GAIA

Work package struct



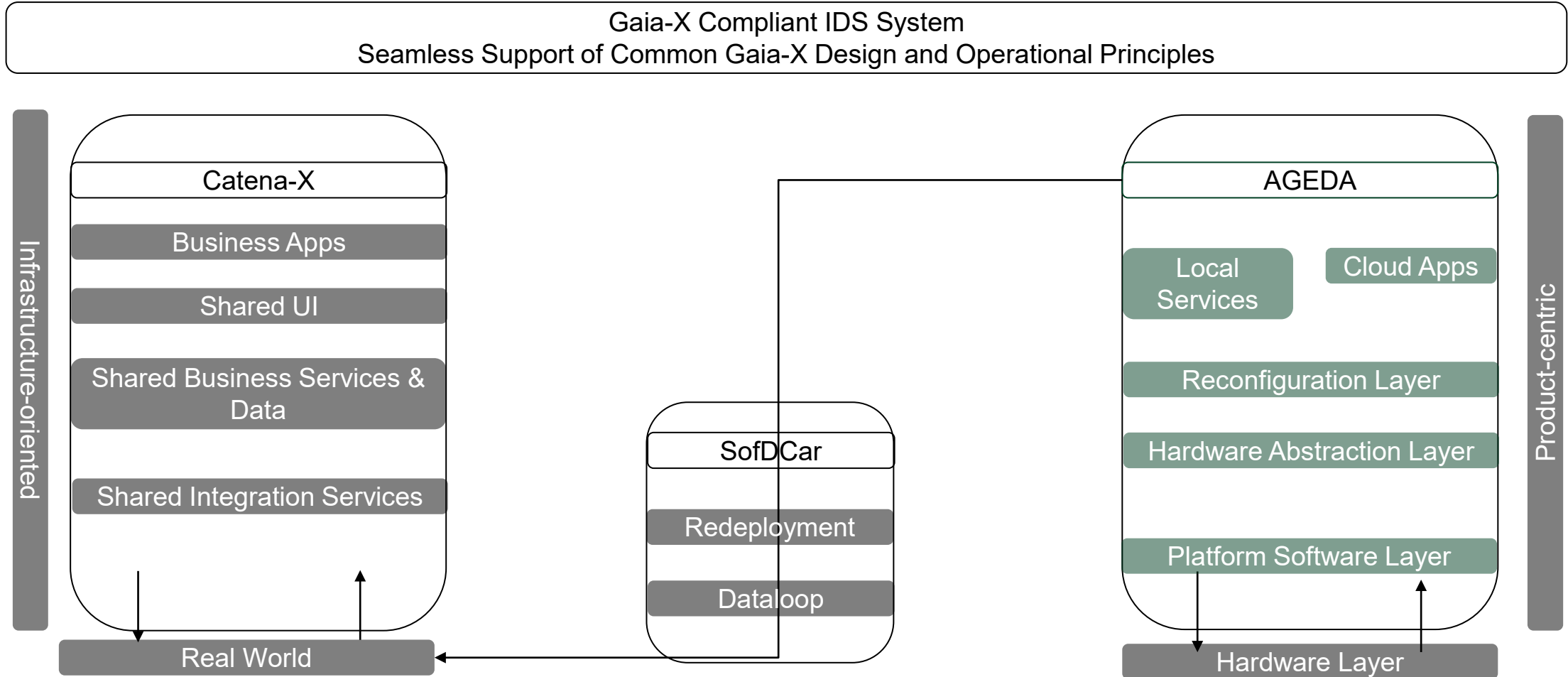
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Research landscape - alignment with other projects



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Outlook – Industrialization concept



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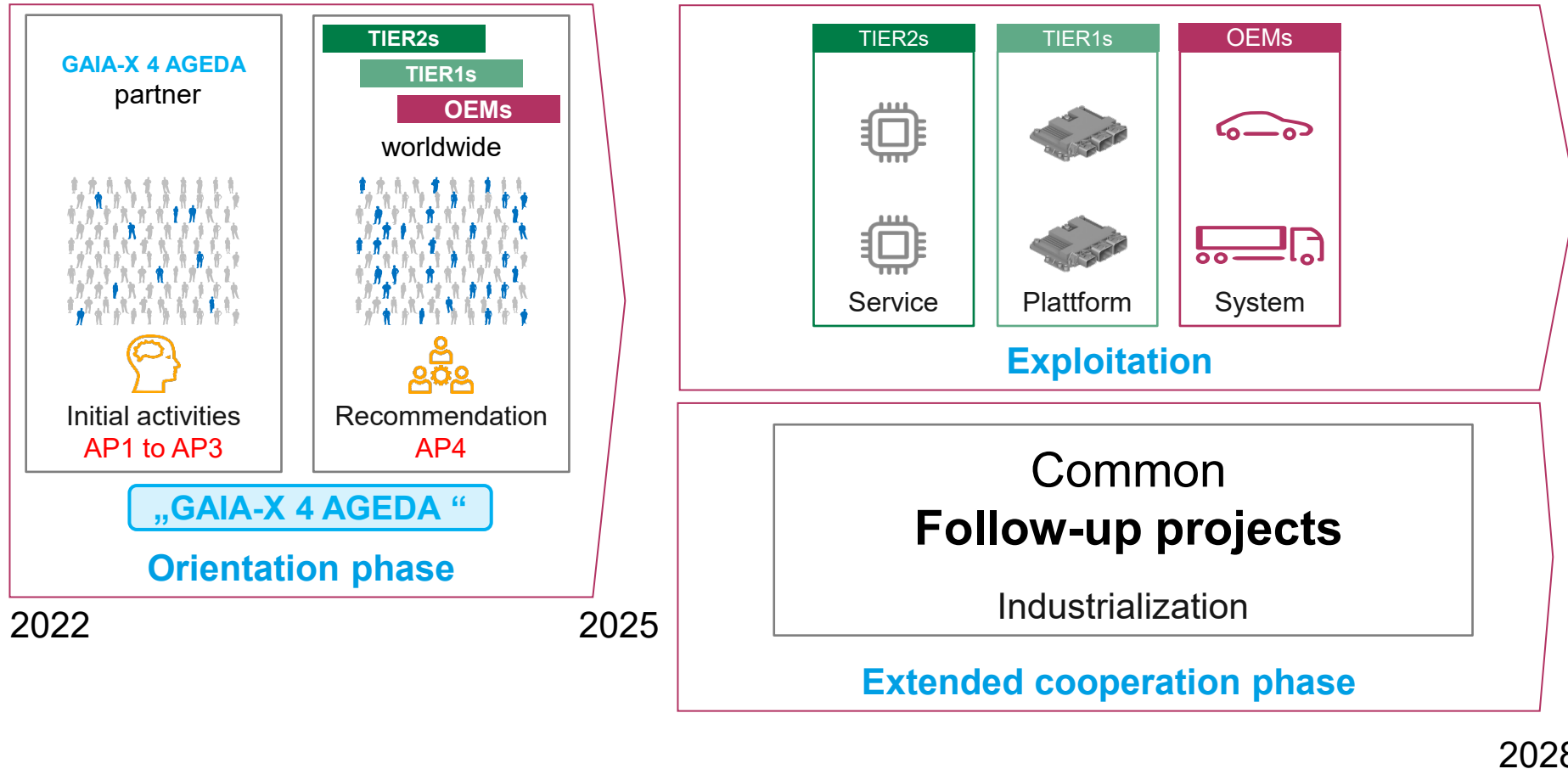
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gaia-x

future mobility

Produktreife



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Funding program & partner network



AGEDA coordinator



Mercedes-Benz



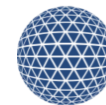
BOSCH

VDA

FAT | Forschungsvereinigung
Automobiltechnik



Continental



InfAI
Institut für Angewandte Informatik

Funding program

Neue Fahrzeug- und Systemtechnologien of Federal Ministry for Economic Affairs and Climate Action (Germany)

Project of the GAIA-X 4 Future Mobility project family

Duration 36 months
Overall cost 26,7 mio. €
Funding 16,2 mio. €

Funding program

Hella GmbH & Co. KGaA, Steffen Herz

Scientific coordination

HS Hamm Lippstadt, Prof. Rettberg

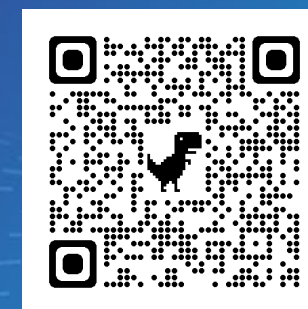
Coordination of project family

DLR, Prof. Köster

* Assoziierte Partner



<https://www.gaiax4ageda.de/>



LinkedIn Group



www.gaiax4ageda.de



- A decentralized digital network based on European values
- Standardized, open, and safe digital environment
- Free and secure exchange of data and services

