Transformation Hub for the value chain of the automotive wiring harness

Bordnetzkongress Ludwigsburg, 10. May 2023
Georg Schnauffer, ARENA2036

Gefördert durch:
Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages
Finanziert von der Europäischen Union
NextGenerationEU

TransformationsHub LEITUNGSSATZ

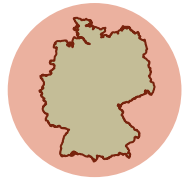
Funding program of the federal ministry of economics (Bundesministerium für Wirtschaft und Klimaschutz, BMWK): Establishment of Transformation Hubs

Transformations-Hub LEITUNGSSATZ

Characteristics of Transformation Hubs :

- **nationwide**
- **thematically oriented**
- are set up along **relevant value chains** in the automotive and supplier industry
- support the necessary **transformation process** throughout Germany, quickly and effectively

Objectives of the funding



- **Knowledge transfer on transformation-relevant topics**
- **Knowledge transfer on resource and energy efficiency**
- **Scaling of application-related R&D solutions**
- **Networking of relevant actors and initiation of implementation steps**

Funding program of the BMWK : The Transformation Hubs in numbers

Transformations-Hub LEITUNGSSATZ

Overview of the Transformation Hubs

11 thematically diverse hubs are being funded for the Germany-wide knowledge transfer.
The BMWK grants amount to **€47,9 Mio.**

TraWeBe Battery	**cH2ance** H_2 Hydrogen	**ScaleUp eDrive** el. Drivetrain	**Transfer-X** Digi. Ecosyst.	**DiSerHub** Buisness mod
MIAMy Autom.Driving	**TuWaS** Forming	**InSuM** Interior	**Taste** Software Eng.	**CyberJoin** Joining techn.

Transformation Hub Wiring Harness
Wiring harness

Consortium partner of Transformation Hub Wiring Harness

ARENA2036

AREANA2036 is a research-campus of BMBF at the University of Stuttgart

- >30 **academic partners** of the university, Fraunhofer, DLR, etc.
- "Industry on Campus": **>40 companies**
- **Real Use Cases**, prototypes, products ...
- Cooperation with **Startup Autobahn** (Plug&Play)
- Co-innovation platform for **future technologies**
- Legal form association (membership)
- **New building 2016: 10,000 m², thereof 6,000 m² shop floor**

bayern innovativ
Innovation leben.

Bayern Innovativ is the „Society for Innovation and Knowledge Transfer“

- > 300 employees in cross-industry and cross-technology expert teams
- Network covers more than **32,000 customers**
- **1(n):n services - business area "Networks and Thinknet.Bayern"**: digitization, mobility, energy, health, materials & production
- **1:1 Services - Business Area "Consulting and Funding"**: Funding Pilot & Project Sponsor, Patents & Standards, Technology and Innovation Management, Cultural and Creative Industries

OHLF OPEN HYBRID LABFACTORY

Reasearch-campus for Circular Economy and sustainable lightweight construction

- **> 40 partners** from industry and science work on solutions for the mobility of tomorrow
- Main areas of activity:
  - **Design for Circular Economy**
  - **Circular material concepts**
  - **Processes for Reverse Production**
  - **Overall system analysis and design**
- Opening of the **Open Hybrid LabFactory in 2016 in Wolfsburg site**

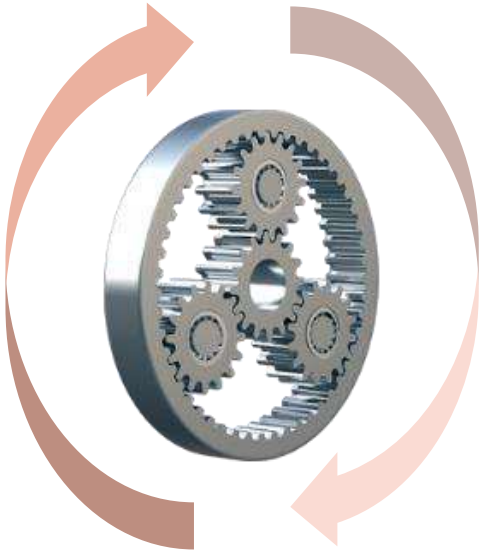
The biggest challenges facing the industry

Quelle: Online survey at launch event Transformations Hub Wiring Harness on 9.3.2023

Hub function: The Transformation Hub transports industry requirements

Transformations-Hub LEITUNGSSATZ

Pre-competitive research & development



Utilization through new products and processes

Stimuli for transformation solutions

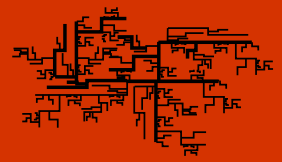
- **KoPa 35c-Projects (approx. 30)**
- **Foreign industries**
- **Research Landscape Germany**

Stimuli for research topics

Collection of innovations and approaches

Transformation Hub Wiring Harness

Information, translation, hub, networking, scaling



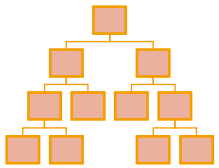
ARENA2036 bayern innovativ OHLF OPEN HYBRID LABFACTORY

Active return channel of challenges

Information about new innovations and approaches

Transformation wiring harness industry

- OEMs
- Tier 1
- Tier 2
- Tier n



Other Transformation Hubs

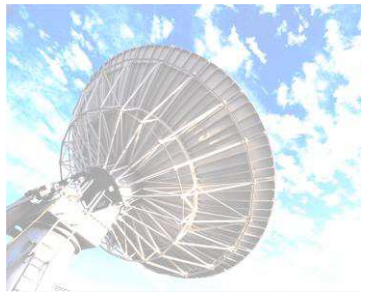
(currently 11 hubs in total)

Regional transformation networks
(currently 27 Trafo Networks).

Regional innovation cluster
(currently 4 innovation clusters)

Gefördert durch: Bundesministerium für Wirtschaft und Klimaschutz aufgrund eines Beschlusses des Deutschen Bundestages

Bridge function: The Transformation Hub Wiring Harness selects, validates and promotes innovation impulses

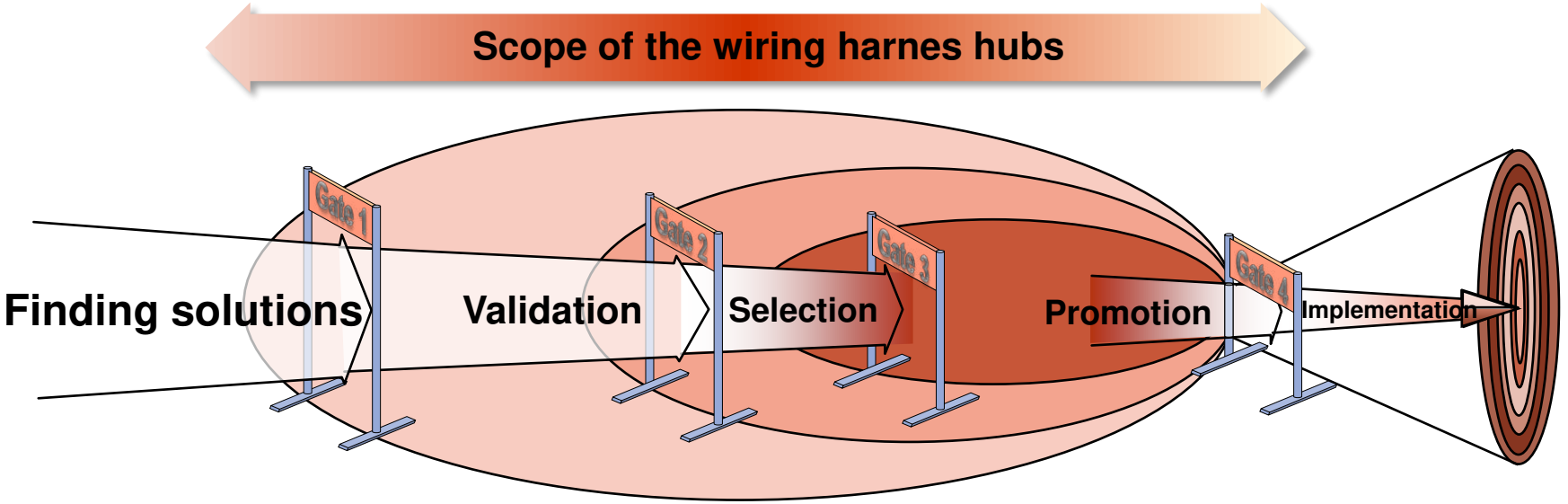


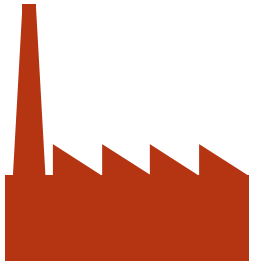
Input:

- Funding projects (publicly available innovation knowledge)
- Wiring harness industry
- Other industries
- Active references to innovations
- Science

Out of Scope:

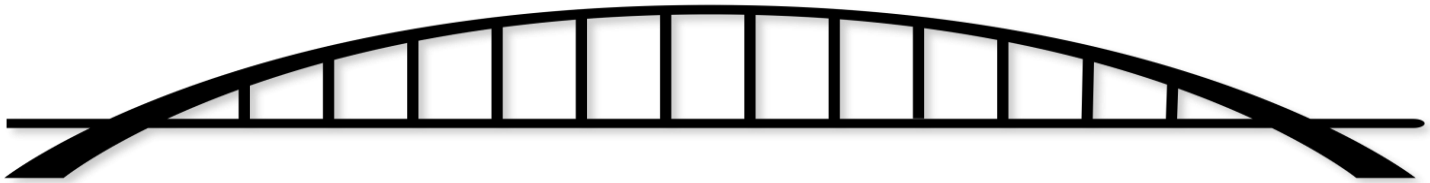
- In-house R&D





Target:

Impulses for implementation



Brückenfunktion

Out of Scope:

- Roll-out in companies
- Scaling in companies

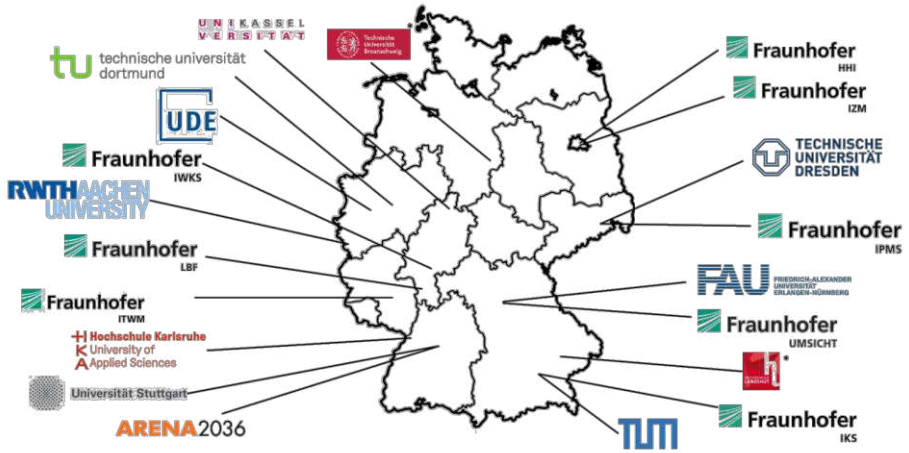
Task of the Transformation Hub Wiring Harness: Scouting

The Wiring Harness Hub scouts interesting Trends and Technologies

From other industries and academia as well.

Trendradar:

Research map:



Example: Project map „KoPa35c“

Federal Government's economic stimulus package of 2021, Paragraph 35c "Investments in the future for vehicle manufacturers and supplier industry".

Contribution of Transformation Hub Wiring Harness

- Identification of projects related to the wiring harness
- Initial assessment of relevance and potential for WH-Industry
- Target group (industry or value chain level)
- Implementation potentials of the topic in the WH industry
- Technology Readiness Level (TRL)

Task of the Transformation Hub Wiring Harness: Information

The Wiring Harness Hub informs about news:

“Find good and talk about it”

With our events and publications, we set impulses and create perspectives for the implementation of innovations.

Events of the Wiring Harness Hub

- An annual main event with an "innovation show“
- Semi-annual virtual information events
- Technical presence events

Webseite www.leitungssatz-hub.de

- Public knowledge of the solution portfolio
- Presentation of the transfer module

Fairs and congresses (Examples)

- Cooperation Forum on Wire Harness
- Int. Conference Automotive Wire Harness, Ludwigsburg
- Automotive Wire Harness Conference, Landshut
- Hannover Messe

Articles in specialized media (Examples)

VDI nachrichten TECHNIK WIRTSCHAFT GESELLSCHAFT

elektroniknet.de

WEKA FACHMEDIEN

Elektronik automotive

Task of the Transformation Hub Wiring Harness: Networking

Transformations-Hub LEITUNGSSATZ

The Wiring Harness-Hub networks experts:

We create access to the developers and leaders behind the trends and technologies.

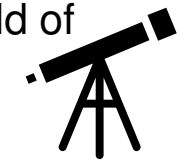
Take the opportunity to present your approaches to the wiring harness community in our event series

- „Trends Outlook“ and
- „Innovation Show“

Approach us with your topic!

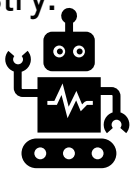
Wiring Harness-Hub Trends Outlook

Presentation of technical approaches and technological trends that are related to or could potentially be applied in the field of wiring harnesses



Wiring Harness-Hub Innovation Show

Announcing identified highlight innovations - from the perspective and in the language of the industry.



Wiring Harness-Hub Webseite

The website as a central contact and information point. Provision of a newsletter for regular updates.

In-depth discussions

In-depth events for small groups

Discussions in person at the showcase location or at the company's premises

Task of the Transformation Hub Wiring Harness: Transformation projects

The Wiring Harness-Hub supports the transformation:

We initiate exploratory processes and feasibility studies.

From the OEM to the cable and component manufacturer to the machine builder.

From corporate groups to medium-sized companies.

The Transformation Hub Wiring Harness generates **implementation impulses** in companies

Exchange with interested companies that want to better understand individual solution modules and apply them in perspective.

Transformation projects in bilateral or multilateral collaboration (outside of the Lead Set Hub).

The advisory board represents the requirements of the wiring harness industry

Task of the advisory board:

- **Industry perspective:**
  Defines requirements and relevance of innovation impulses for the wiring harness industry **(Agenda-Setting**).

Members of the advisory board are company representatives:

- Company representatives in leading management positions with focus on R&D & innovation in product and production**.**
- The aim is to integrate representatives from many **stages of the value chain** into the advisory board.

Note: The working basis is strictly **pre-competitive** information, which is prepared by the hub team. The cooperation is based on cartel law compliance.

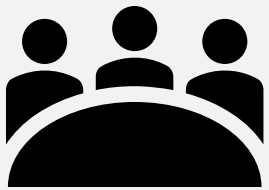
First members of the advisory board:


Dr. Rainer König
Mercedes-Benz


Dr. Jens Haun
Kostal


Dr. Götz Roderer
Hochschule Landshut


Martin Döring
Volkswagen




Frank Gronau
Aptiv


Hans-Jürgen Mantsch
Siemens EDA

n.n.

n.n.

Wiring Harness Hub: Delimitation of our activities

WHAT WE DO:

- **Research and evaluation** of innovation potential for the industry as a whole and also for individual "industry clusters" (subsectors)
- **Promotion** of interesting approaches
- **Contacts** to the corresponding know-how providers
- **Networking** of companies to explore these approaches
- **Accompaniment** of transformation projects, if neded
- **Feedback** of requirements into the projects

WHAT WE DO **NOT**:

- Offering of **consulting scopes** (consulting)
- Carrying out **contract research**
- Organizing and leading **working groups**
- Setting up **standardization**
- **Own** developments

Overview of 35c-Project (currently 27)

Quelle: Zukunftsinvestitionen Fahrzeughersteller und Zulieferindustrie – Das Konjunktur- und Zukunftspaket der Bundesregierung – Digitalisierung der Fahrzeughersteller und Zulieferindustrie (Modul a2)
https://www.bmwk.de/Redaktion/DE/Publikationen/Industrie/zukunftsinvestitionen-fahrzeughersteller-und-zulieferindustrie.html

35-c Project map: Excerpt Catena-X

Catena-X is developing a collaborative, open data network for the German and European automotive industry and is implementing ten prototype use cases.

Catena-X Automotive Network

Potential: Implementation of Catena-X in companies in the wiring harness industry

Project target

The aim is to achieve common standards for data and information flows throughout the automotive value chain.

As a permeable ecosystem for manufacturers, suppliers, dealer associations and equipment suppliers including application, platform and infrastructure providers (IT sector), Catena-X aims to increase the competitiveness of the vehicle industry and create new data-based business models.

In addition to efficiency benefits, the partners are hoping for more efficient quality and logistics processes, transparency with regard to CO2 reduction, and improvements in product development. With "SME-ready" solutions, SMEs are to be integrated into the network in a technically simple and efficient manner and thus at reasonable cost.

Coordinator

Oliver Ganser BMW AG

Project volume

244,2 Mio. €

Project runtime

01.08.2021 – 31.07.2024

Project website

www.catena-x.net/de

Project partner:

ADAC, BMW, Mercedes-Benz, Volkswagen, Bosch, ZF Group, DLR, ARENA2036, GRIS, LRP Autorecycling, BASF, Henkel, Schaeffler, SAP, Siemens, tec4U, fetch.ai, BIGCHAIN, CCT, SUPPLYON, Telekom, ISTOS, Fraunhofer, mipart, TRUMPF, up2parts

SDM4FZI (Software-defined Manufacturing for the Automotive and Supplier Industry) is developing a transformable, highly adaptable production system that is controlled across all levels of manufacturing by a seamless virtual representation.

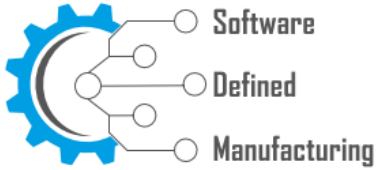
Potential: Application of software-defined production in wiring harness assembly plants

Project target

The focus of the project is to create a unified framework for factories that allows new products to be manufactured in existing operating environments without major retrofitting times.

An ecosystem for software-defined production is intended to bring the advantages of cloud technology to manufacturing: Automation technology and IT systems are to be made usable individually and application-related thanks to software, without having to build hardware from scratch for this purpose.

Individual components or even entire factories can then be flexibly planned, controlled and modified by software, thus making complexity and diversity of variants manageable.



Coordinator

Dr. Johannes Fisel
Robert Bosch GmbH

Project volume

73,1 Mio. €

Project runtime

01.10.2021 – 30.09.2024

Project website

www.sdm4fzi.de

Project partner

35-c Project map: Excerpt VWS4LS

VWS4LS implements the asset administration shell as a digital twin over the entire product lifecycle of the wiring harness - from cross-company collaborative development to disassembly.

Potential: Implementation of the WH specific asset administration shell in all stages of the WH value chain.

Project target

The goal of VWS4LS is the prototypical implementation of the asset administration shell in development, production and assembly of the wiring harness in the vehicle along 5 use cases, including collaborative development, automation of change management and traceability. This is based on the work of the Industrie 4.0 platform, the IDTA and various associated projects, in particular for the development of:

- Integration of established data standards (KBL and VEC)
- Development of wiring harness specific information models
- Investigation of scenarios for automated negotiation processes
- Integration respectively connection to Catena-X and illustration of the benefits of the combination with the asset administration shell

VWS4LS

Coordinator

Georg Schnauffer, Christian Kosel
ARENA2036 e.V.

Project volume

10,3 Mio. €

Project runtime

01.12.2021 – 30.11.2024

Project website

www.arena2036.de/vws4ls

Project partner

ARENA2036, Croplast, DI.IT, DRAXLMAIER, FESTO, komax, KOSTAL, KROMBERG & SCHUBERT, WEZAG

35-c Project map: Excerpt TWIN4TRUCKS

Twin4Trucks plans to use Digital Twins, Artificial Intelligence and innovative tracking technology to meet the demands of the growing complexity in the production process of the commercial vehicle industry.

Potential: Overarching use of the digital twin starting from the OEM and covering all stages of the WH value chain

Project target

The aim of this project is to provide end-to-end digitization solutions for the commercial vehicle industry. This is to be achieved through the use of a digital twin and the linking and overarching use of data in software services for production, intralogistics and quality assurance.

Technologies such as 5G and UWB as well as artificial intelligence methods are used. The aim by using these technologies is to implement application-oriented solutions that can be used to locate operating resources, route vehicles and load carriers, provide smart support for employees and ensure production quality.

TWIN4TRUCKS

Coordinator

Dr. Ekkehard Brümmer
Daimler Truck AG

Project volume

25,6 Mio. €

Project runtime

01.09.2022 – 31.08.2025

Project website

https://www.twin4trucks.de

Project partner

DAIMLER TRUCK
DFKI Deutsches Forschungszentrum für Künstliche Intelligenz GmbH
Atos
PFALZKOM
smartFactory
Infosys Automotive and Mobility

Industrial Computer Vision (ICV) strives for a holistic solute-ion to establish computer vision in the automotive industry. The prerequisite for this is a comprehensive conception and research of the necessary aspects of the ICV ecosystem under practical conditions.

Potential: Use of computer vision in the automation of wiring harness assembly with robots.

Project target

The scaled industrial application of computer vision in production has been a long time coming, although the potential is great. Hurdles include changing environmental conditions and lighting conditions in production and unresolved legalities. A holistic approach to solutions is needed.

For this purpose, the ICV ecosystem is to be structured in a problem-oriented manner to enable a high degree of user-friendliness and a consistent solution to the technically similar challenges. For this purpose, the four use cases surface inspection, assembly inspection, anomaly detection as well as tire and rim inspection will be implemented. In addition, basic enablers for the use cases are being researched, enabling employees to implement use cases themselves or to develop solutions for legal requirements, for example.

Coordinator

Jakob Engelmann
Volkswagen Aktiengesellschaft

Project volume

13,5 Mio. €

Project runtime

01.12.2022 – 30.11.2025

Project partner

Audi
brighter AI
Fraunhofer IPT
HTW Dresden
Volkswagen
ZEISS

Next2OEM is developing a highly automated and sustainable value-added system for the production of wiring harnesses in Germany.

Potential: Use of findings to reduce automation barriers in the assembly of wiring harnesses.

Project target

The goal of the Next2OEM project is to develop a digitized and automated value chain from wiring harness development to wiring harness production and assembly into the car body.

The aim is to reshore wiring harness production back to Germany and to optimize all process steps. The dynamic integration of data infrastructures, new manufacturing technologies and design rules into the production process will also enable a more sustainable and resource-efficient process chain.

Coordinator

Dr. Ingo Busche
Audi AG

Project volume

23,1 Mio. €

Project runtime

01.02.2023 – 31.01.2026

Project partner

35-c Project map: Excerpt NuMA 4.X

NuMA 4.X develops and tests a modular and AI-based assistance system for vehicle production employees based on transparent data acquisition and utilization using three automotive use cases as examples.

Potential: Use of AI-based assistance functions in the manual production of wiring harnesses.

Project target

The NuMA 4.X project aims to align digitalization in the factory in a human-centric and sustainable way.

For this purpose, a framework for an operator empowerment system is to be developed using three automotive use cases as examples, by making networked production processes transparent through a digital twin and AI-based assistance functions as well as user-oriented visualizations. In this way, employees are provided with a large information space for creative solution finding with regard to resource-efficient production.

The effectiveness of the developed solution is to be proven directly under real practical conditions.

Coordinator

Ferat Özkan
Ford-Werke GmbH

Project volume

11,6 Mio. €

Project runtime

01.01.2023 – 31.12.2025

Project partner

35-c Project map: Excerpt REPLAKI

REPLAKI makes artificial intelligence usable for production planning by analyzing past production data, identifying effective relationships between the influencing variables and integrating them into the future planning process.

Potential: Increased forecasting and planning accuracy through AI for flexible action in production

Project target

The aim is to increase the prediction accuracy of production plans and to make statements about the effect of influencing variables on the production plan.
Based on these findings, predictions about potential deviations are to be made, which in turn are to be incorporated into the planning.
REPLAKI raises the transparency and the cross-linking of production to a new level and improves processes through automated deviation detection and flexible processing. It is possible to analyze production data across the various IT systems with the aim of achieving greater predictive accuracy and thus increasing planning reliability. REPLAKI therefore contributes to an increase in the resilience of production systems in the automotive and supplier industry.

REPLAKI

Coordinator

Heike Wilson
DUALIS GmbH IT Solution

Project volume

4,2 Mio. €

Project runtime

01.01.2023 – 31.12.2025

Project partner

DUALIS, HIW, Fraunhofer IPT, Volkswagen, FFZ, galfa, Herbrig & Co., Klaeger, TOPCON, frauenthal automotive, ZECHER

- You want to **stay up to date** about all events?
- You would like to be **informed about current results**?
- You would like to **present your technology** to the wiring harness community ?
- You would like to **present the results of your research project** in the context of the wiring harness?
- You have **relevant solutions from another industry**?

Contact us!

Find out more and
subscribe to our newsletter
on our website
www.leitungssatz-hub.de

Thank you for your attention!

Transformations-Hub LEITUNGSSATZ

ARENA2036

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90402 Nürnberg

AAS4WH – Asset Administration Shell for the Wiring Harness

The vision of the end-to-end and interoperable value chain of the wiring harness in 2024

Bordnetzkongress Ludwigsburg 10.5.2023, Christian Kosel

ARENA2036

VWS4LS

Finanziert von der Europäischen Union
NextGenerationEU

Gefördert durch:
Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages

AAS4WH: Scope and Motivation of AAS4WH

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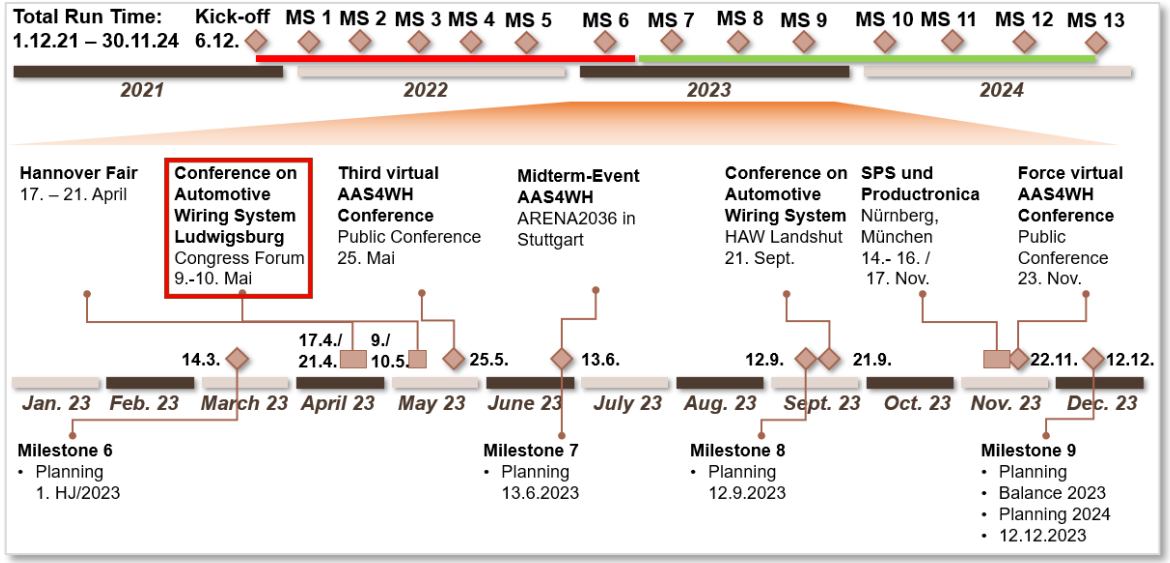
Key facts

- Participant of “35c-Konjunkturpaket”
- 10 Project partners over the hole value chain
- Total funding about 10 Mio.€
- 10 Subprojects with different scope
- Goal by using the Asset Administration Shell:
  - Interoperability
  - End-to-end digitization
  - Process automation

Tier 3 Maschinen	Tier 2 Komponenten	Tier 1 Konfektionäre
FESTO	Coroplast group	DRÄXLMAIER
komax	KOSTAL	KROMBERG & SCHUBERT
WEZAG WERKZEUGE · TOOLS		
Software-Toolhersteller	DI.IT Member of the Schleuniger Group	SIEMENS (*)



	TP 2 Development Process of the Wire Harness	TP 3 Production Process of the Wire Harness	TP 4 Assembly Process of the Wire Harness
TP 1	Concept, Information model and Product description		
TP 5	Integration of the Composite Component		
TP 6	Automated Negotiation Processes		
TP 7	Data Business Policy, Data Governance and Monetization		
TP 8	Data Storage Policy, Security and Connection to Catena-X		

TP 9 Piloting, Testing, Demonstration

TP 10 Transfer and coordination

VWS4LS: 2030 Vision for Industrie 4.0

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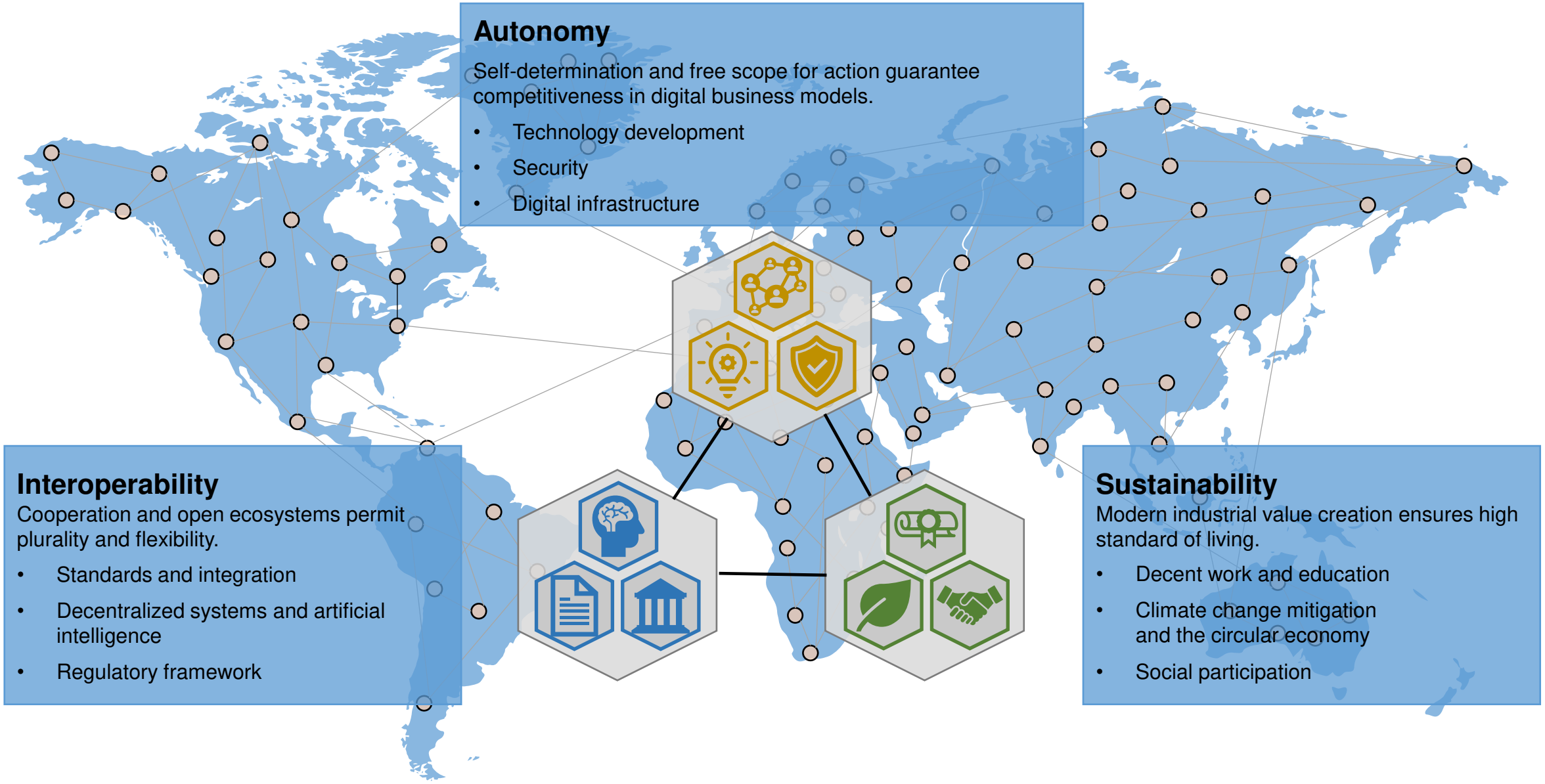


Autonomy

Self-determination and free scope for action guarantee competitiveness in digital business models.

- Technology development
- Security
- Digital infrastructure

Interoperability

Cooperation and open ecosystems permit plurality and flexibility.

- Standards and integration
- Decentralized systems and artificial intelligence
- Regulatory framework

Sustainability

Modern industrial value creation ensures high standard of living.

- Decent work and education
- Climate change mitigation and the circular economy
- Social participation

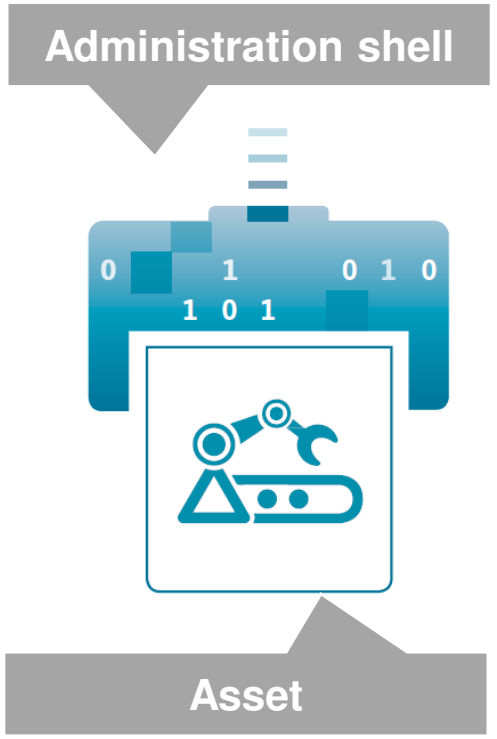
Quelle: https://www.plattform-i40.de/IP/Navigation/DE/Industrie40/Leitbild2030/leitbild-2030.html

ARENA2036

Asset + **Asset Administration Shell (AAS)** = **Industry 4.0 Component**

- Products, machines, components, supply material
- Documents that are exchanged (plans, orders)
- Orders
- Contracts
- …

- Unique ID & nesting possibility
- Standardised product features, capabilities of the object
- Free manufacturer-specific features
- References to external data sources or files, as well as other asset administration shells
- Process variables and parameters, telemetry data
- …



AAS4WH: Asset Administration Shell at AASX-Package Explorer

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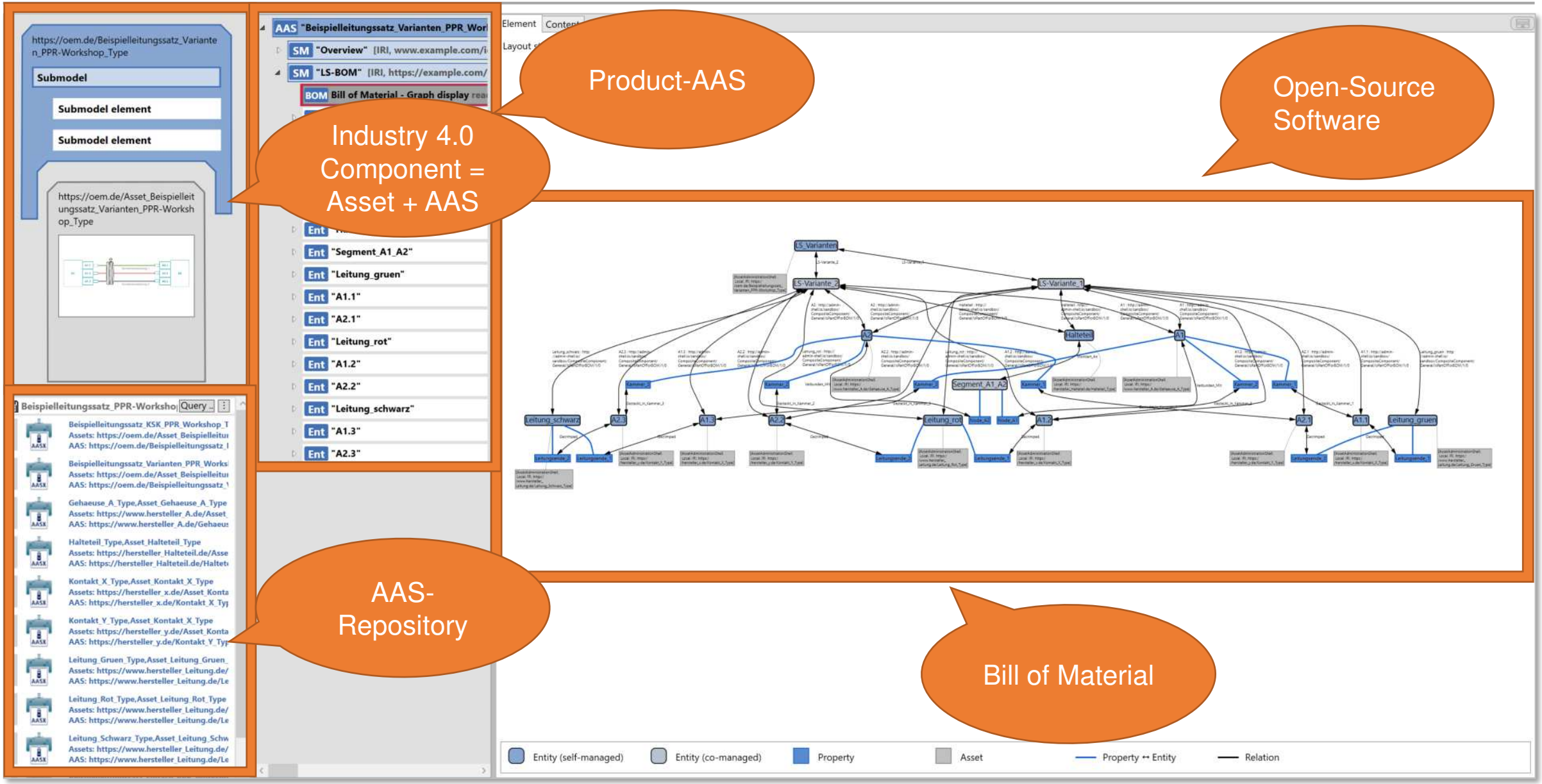

AAS4WH: Implementation of the AAS in the Value Chain of the Wiring Harness

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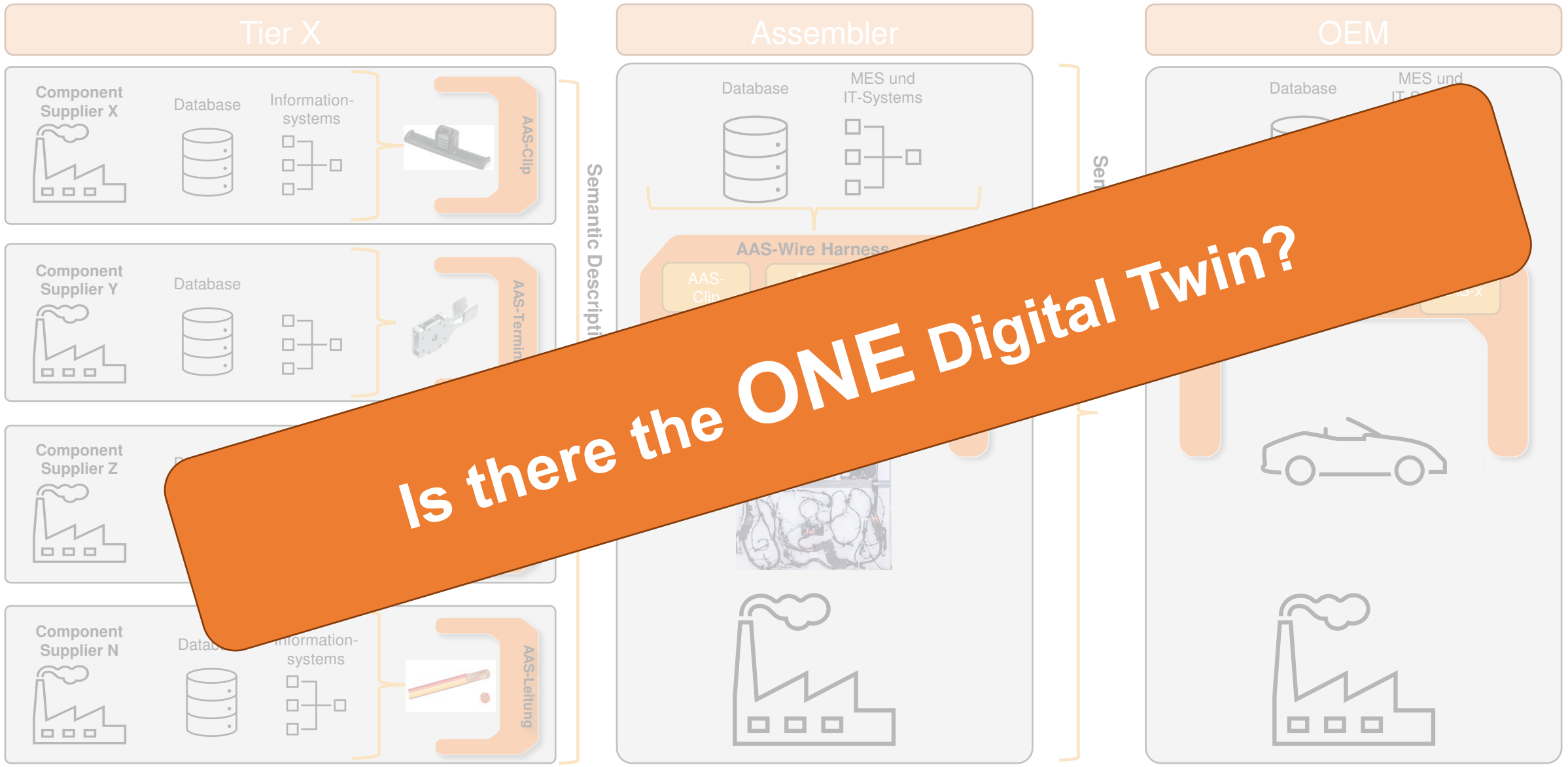
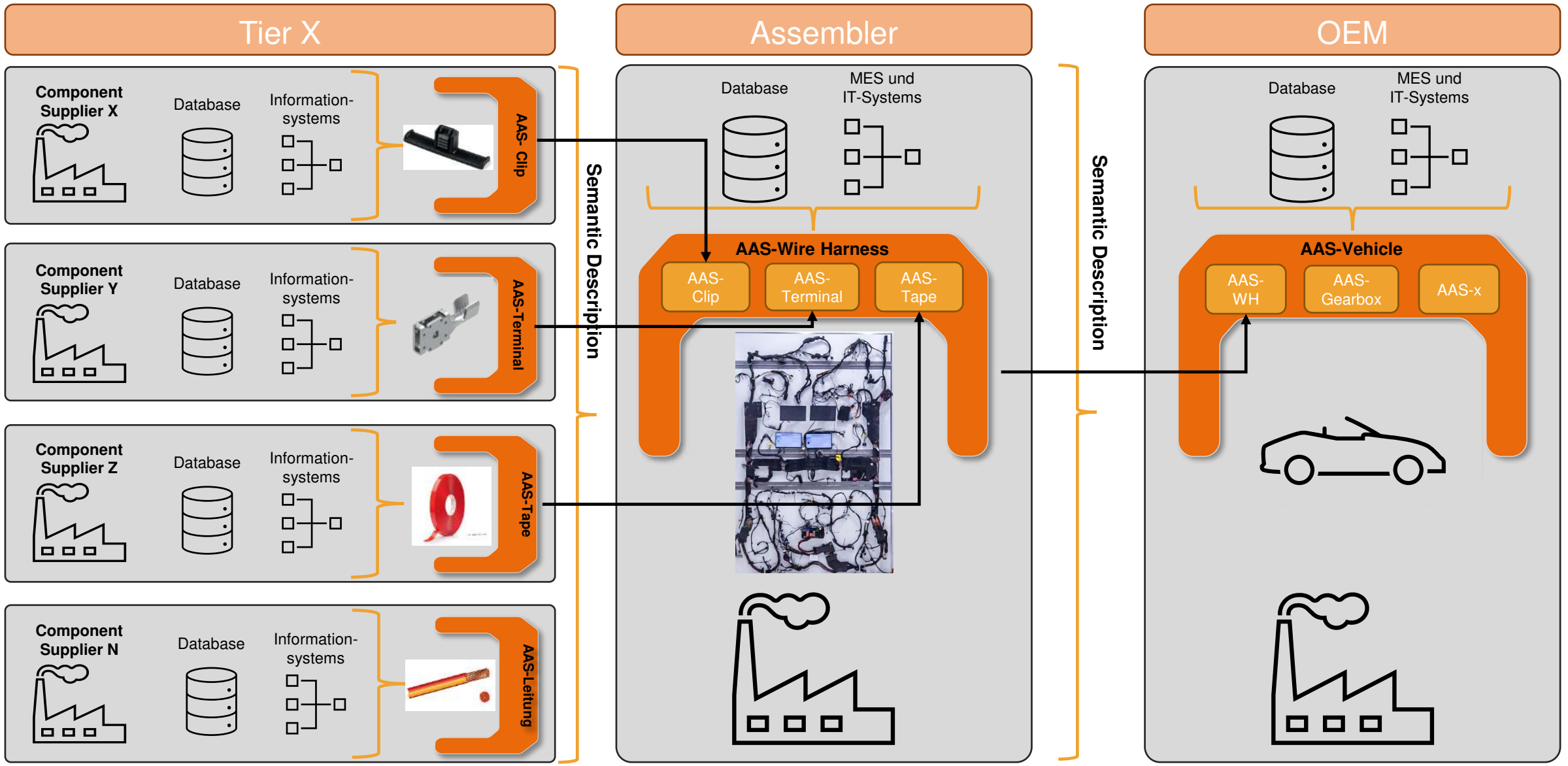


AAS4WH: Implementation of the AAS in the Value Chain of the Wiring Harness

ARENA2036



AAS4WH: Challenges and main Topics at AAS4WH

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- Cross-company Interoperability
- Digital provision of information (data generation, storage and provision)
- Semantic Description
- Standardized exchange formats (reduction of proprietary formats)
- Automation through digitalization

AAS4WH: Implementation of the AAS in the Value Chain of the Wiring Harness

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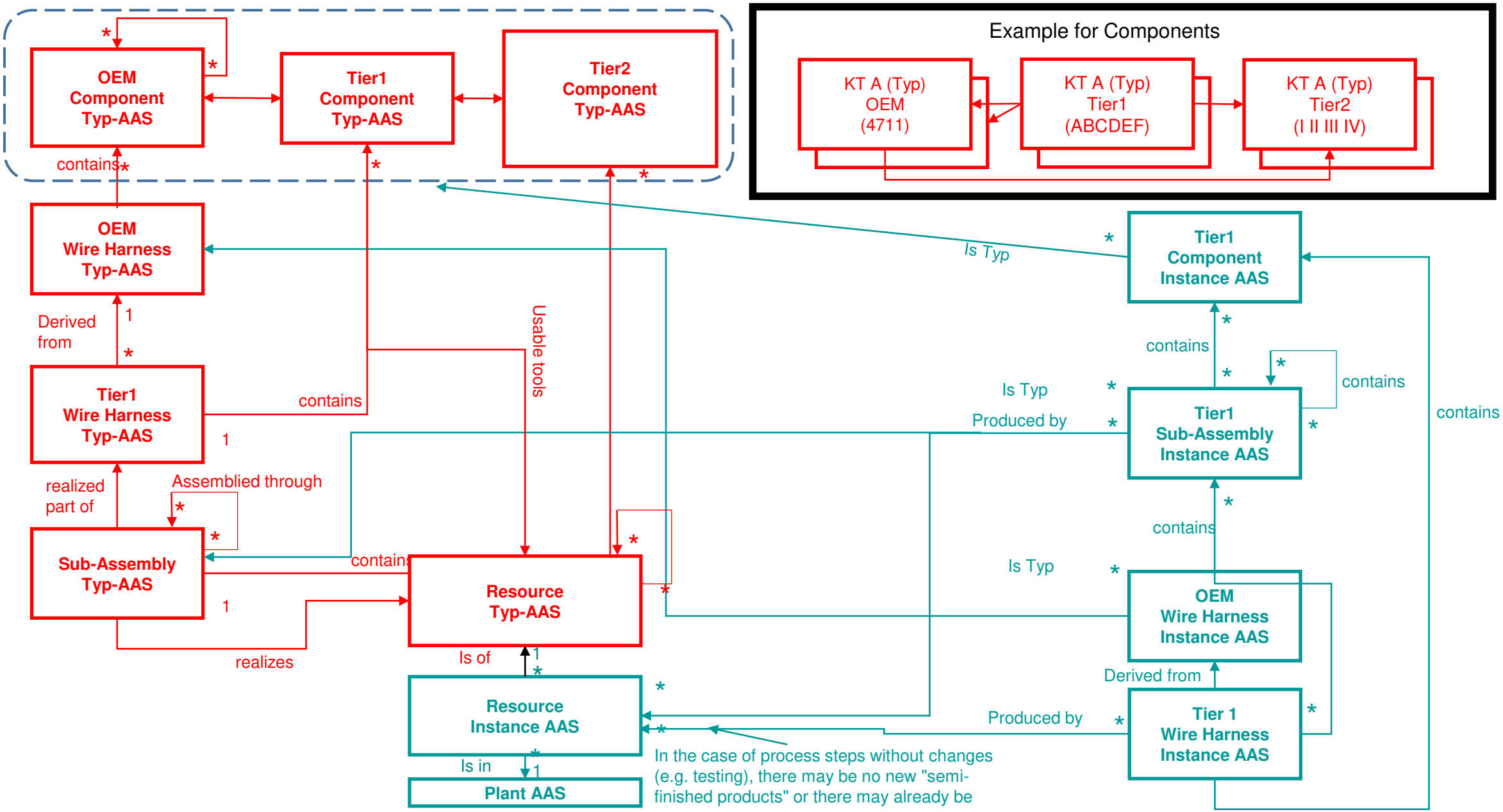
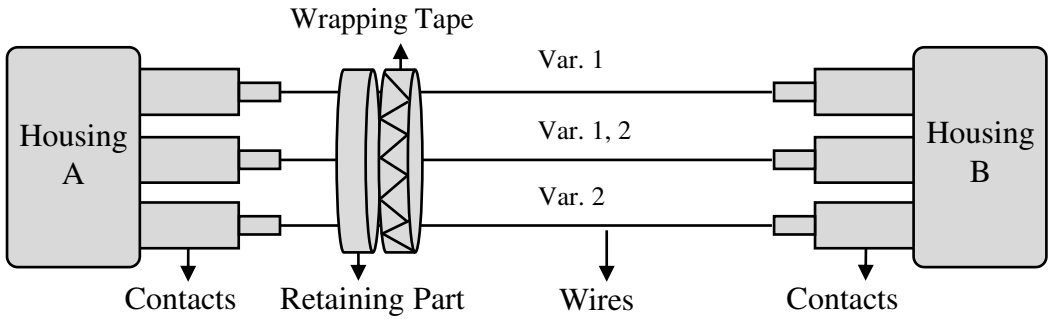
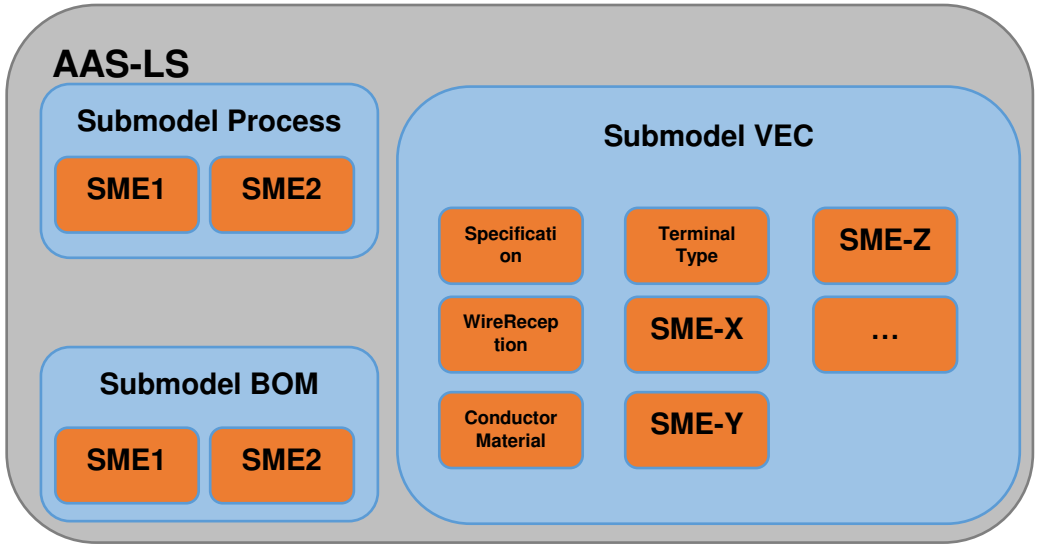


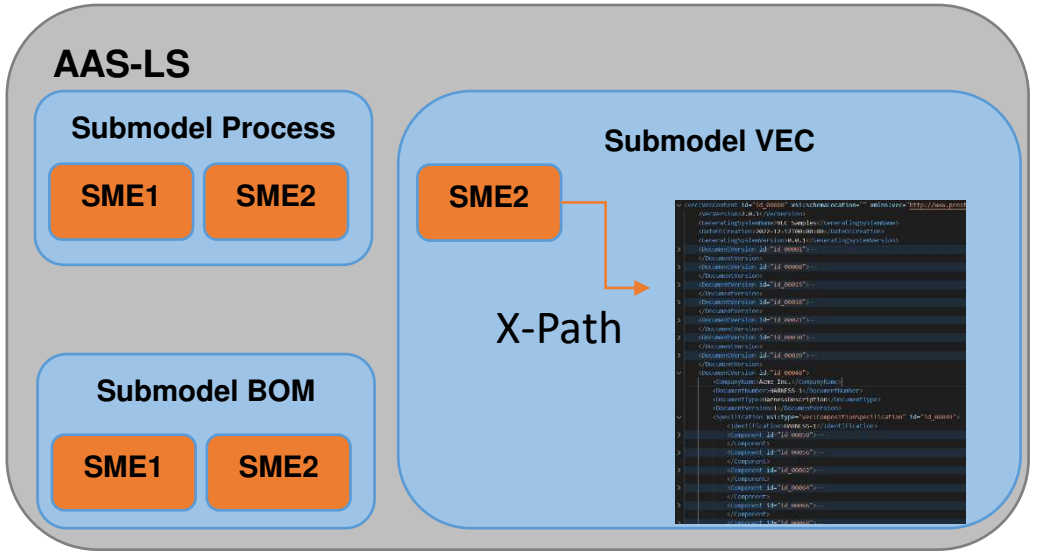
AAS4WH: Handling of established Data Standards (KBL, VEC and OPC-UA)



Variante 1 – Remodeling data model in AAS



Variante 2 – Reference in the data model



AAS4WH: Catena-X & AAS4WH

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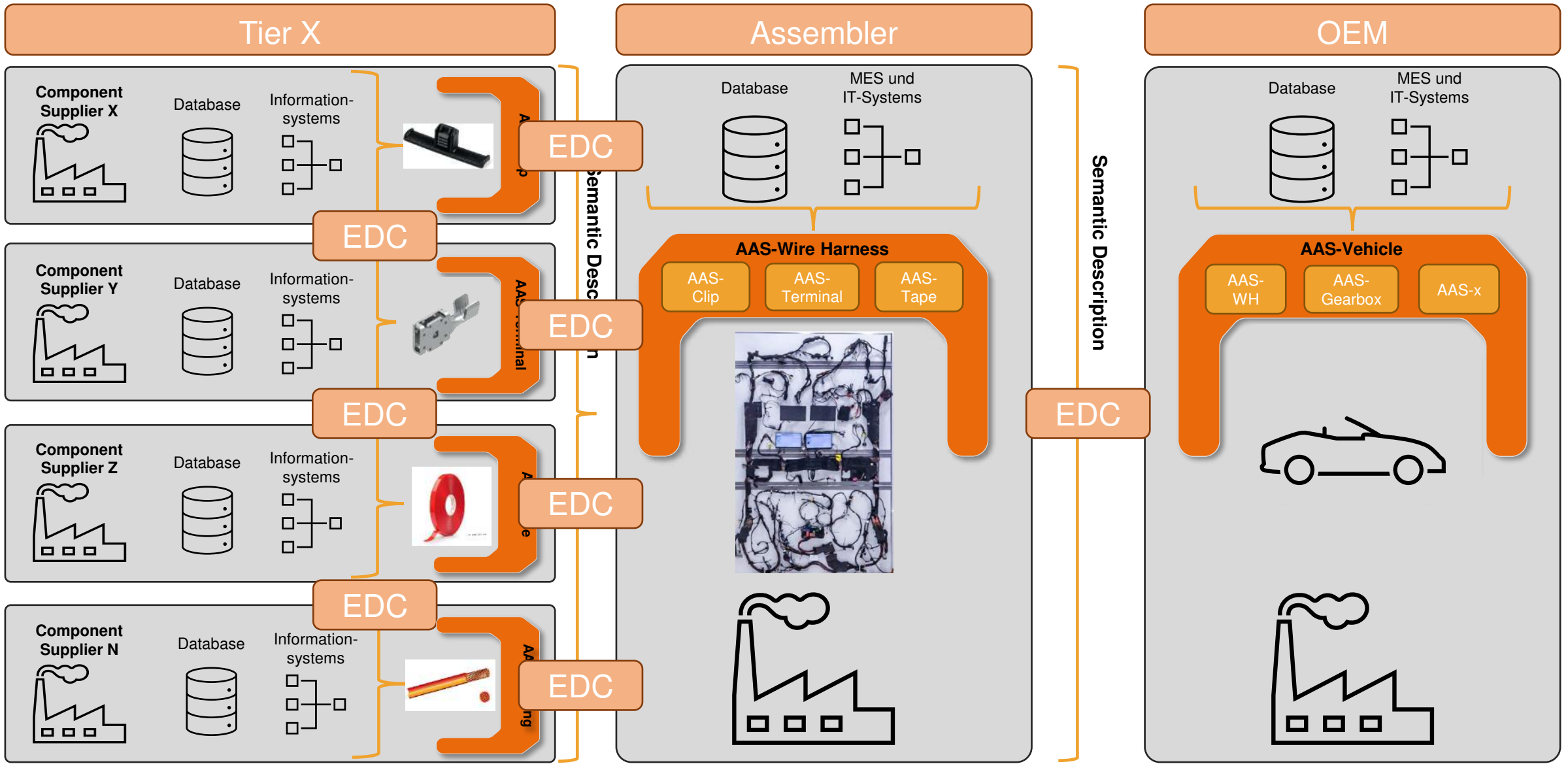

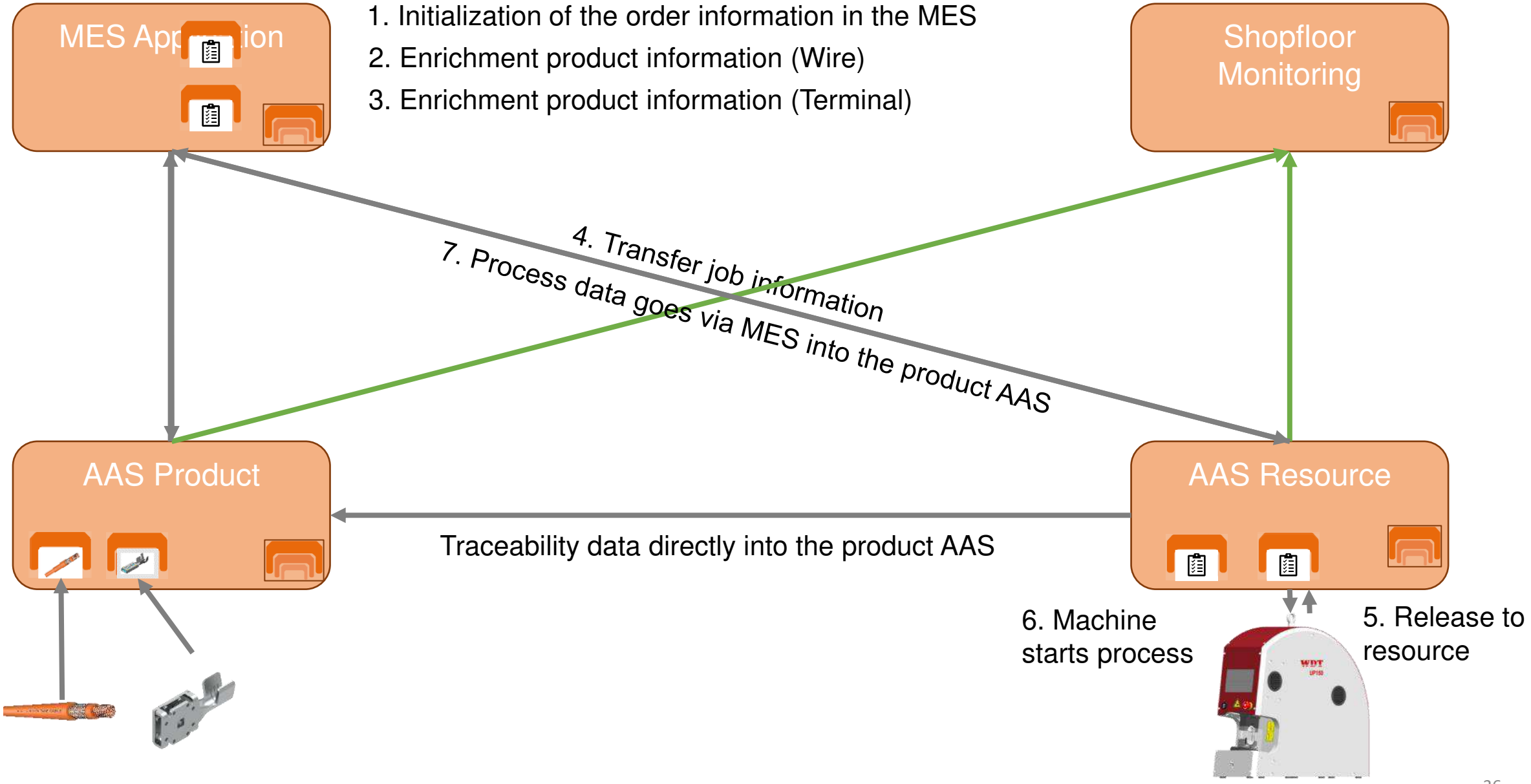
MES Application
1. Initialization of the order information in the MES
2. Enrichment product information (Wire)
3. Enrichment product information (Terminal)
Shopfloor Monitoring
4. Transfer job information
7. Process data goes via MES into the product AAS
AAS Product
AAS Resource
Traceability data directly into the product AAS
6. Machine starts process
5. Release to resource

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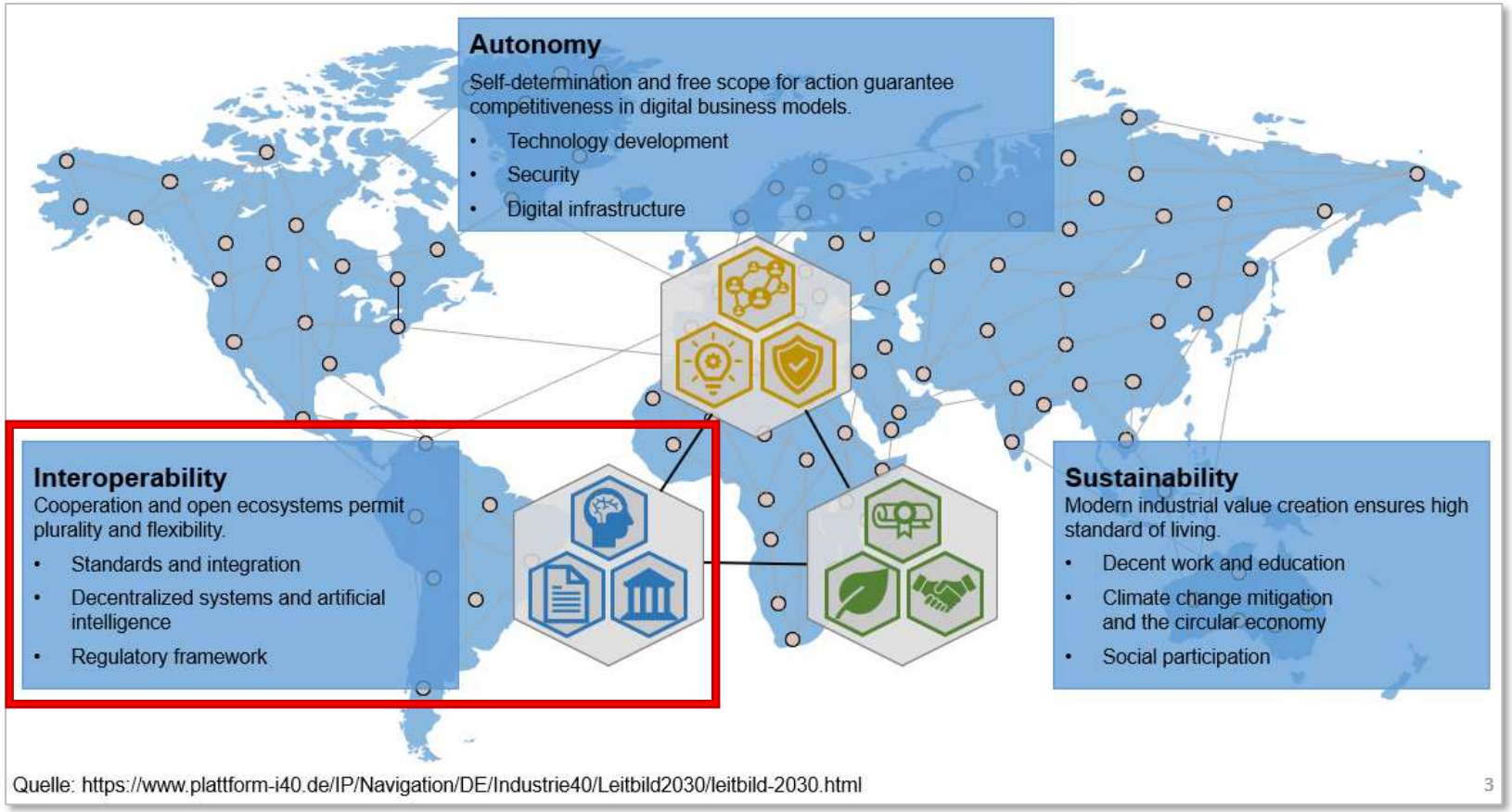
Advantages

- Rethought cross-company Interoperability
- Standardized digital provision of information
- Semantic description
- Standardized exchange format
- Handling of industry-established data standards (KBL, VEC and OPC-UA Comp. Spec)
- Standardized AAS-Submodels for Engineering, Production and Assembly



Interoperability is the enabler from intra-enterprise optimization, to value chain optimization.

If you want participate at the event!

Thank you for your attention!