

Collaborative data-driven business models

Collaborative Condition Monitoring
How cross-company collaboration can generate added value

Webinar

9th Sept 2020

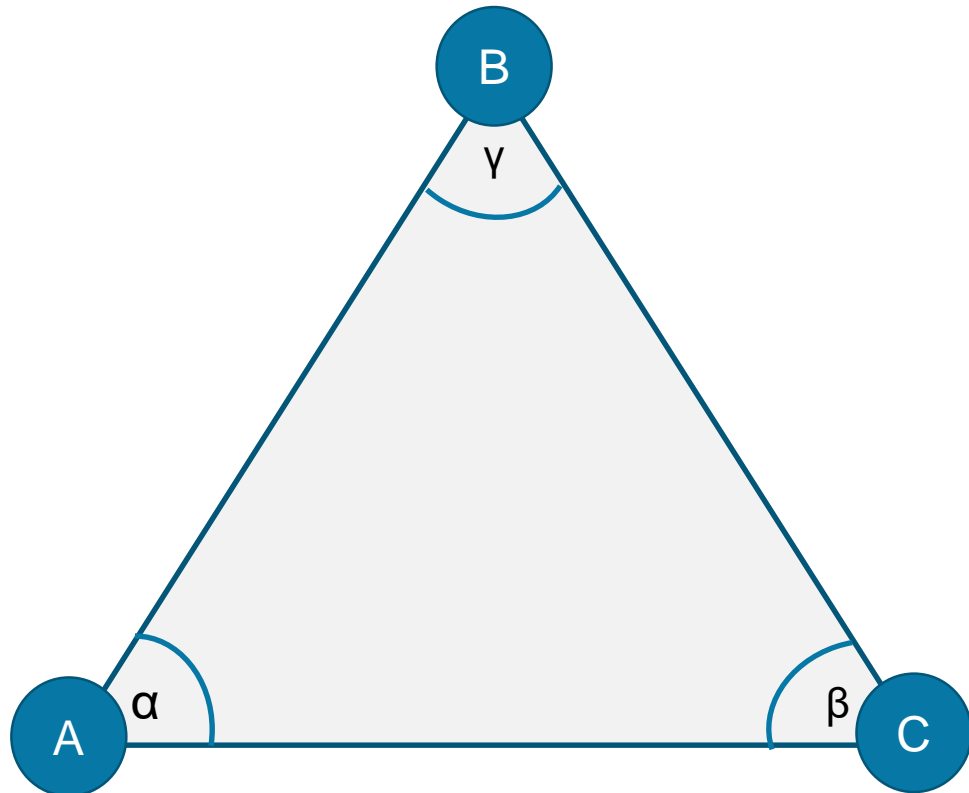
Collaborative data-driven business models

Vision of the Plattform Industrie 4.0

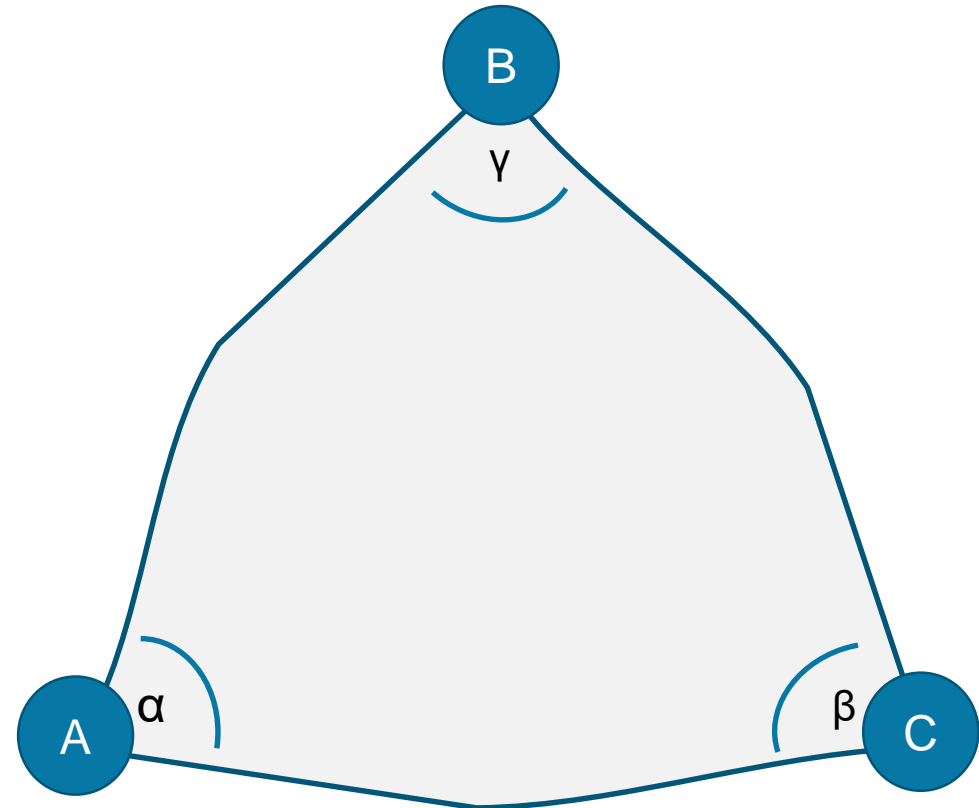


Collaborative data-driven business models

Hypothesis: Multilateral data sharing bends the triangle



$$\alpha + \beta + \gamma = 180$$

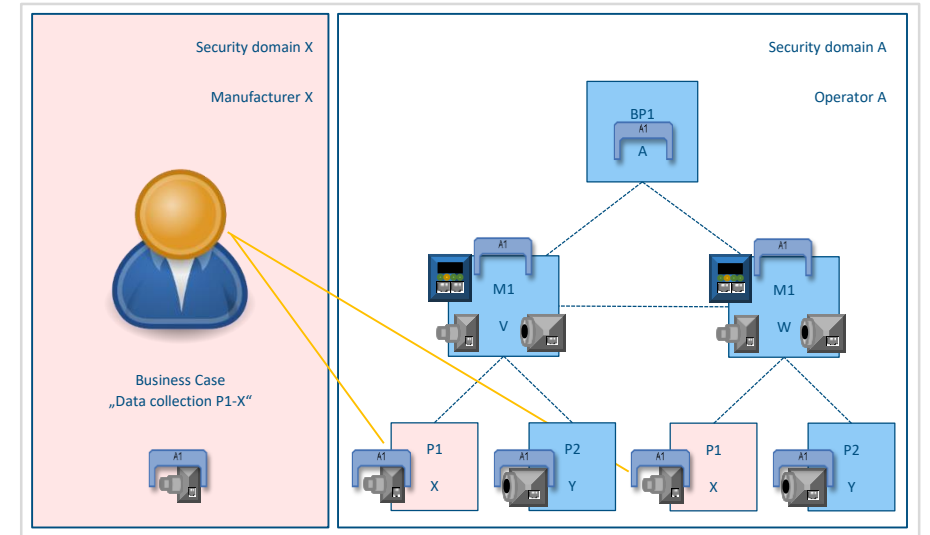


$$\alpha + \beta + \gamma > 180$$

Collaborative Condition Monitoring

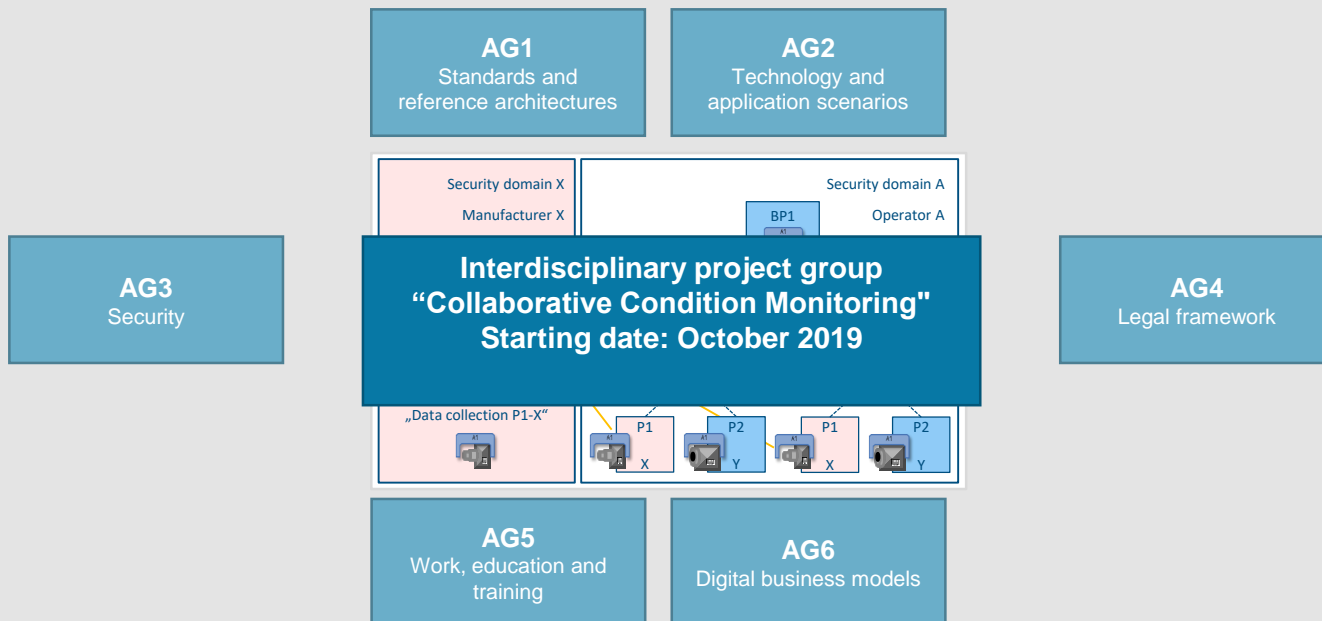
Use Case „Collaborative Condition Monitoring“ (CCM)

- The UseCase "Collaborative Condition Monitoring" (CCM for short) deals with the collection and use of operating data to optimize the reliability and service life of machines and their components during operation
- In the real world, installed machines come from different machine suppliers that are equipped with different products from different component suppliers
 - Challenge for manufacturer X (component supplier) to access the data of his delivered product X.
- CCM supplements the classic version with the aspect of multilateral cooperation
 - Cross-company and cross-competition sharing of data
 - Classification of the data, including in data that does not differentiate between brands and products



Collaborative Condition Monitoring

An interdisciplinary task for all working groups of Plattform Industrie 4.0



Initiation of a cross-workgroup project group "Collaborative Condition Monitoring"

- Development of a **common description** for the use case
- Merging of existing partial approaches in a **holistic, integrative implementation model** as an exemplary illustration of the mission statement of the Plattform Industrie 4.0

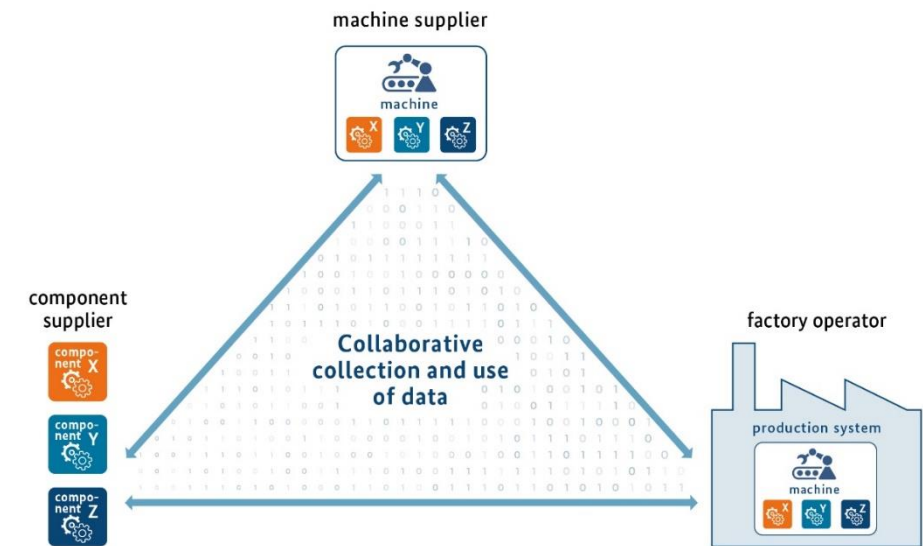
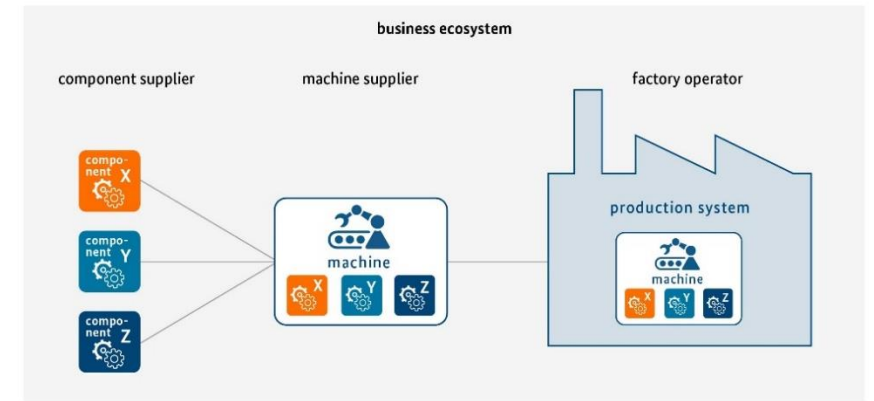
Collaborative Condition Monitoring

Key questions

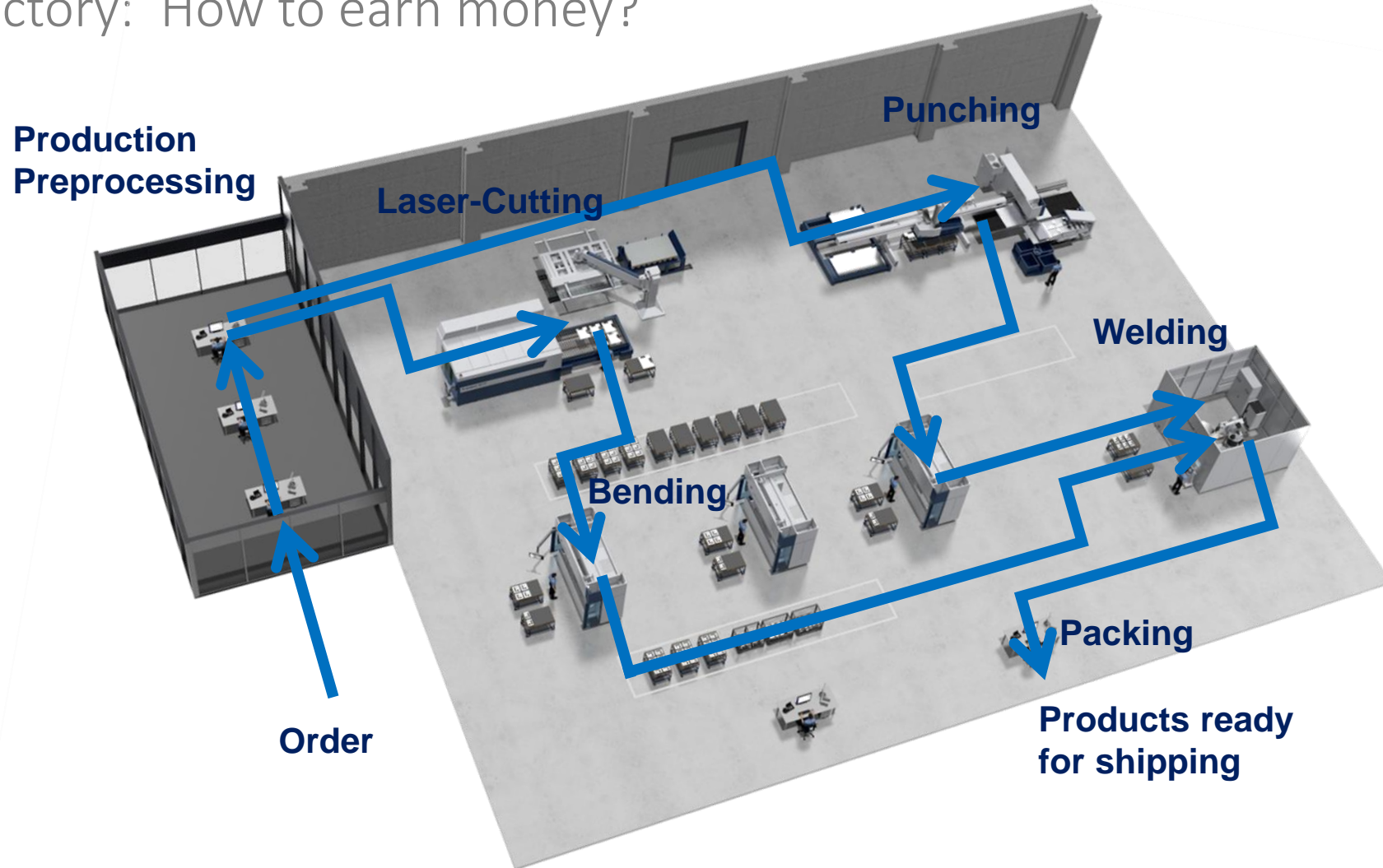
1. How can **data be monetized** (including shared data)? Who receives what share of the benefits generated by collective data provision?
2. How does the **use of AI** expand the application options?
3. How is **flexible communication** made possible between all partners across all instances?
4. How are **security and trust** in data usage and access guaranteed?
5. How can we achieve a **legally use** of the data?
6. How do we ensure usability in the **application by people** down to the shop floor?

Collaborative Condition Monitoring Three-point fractal

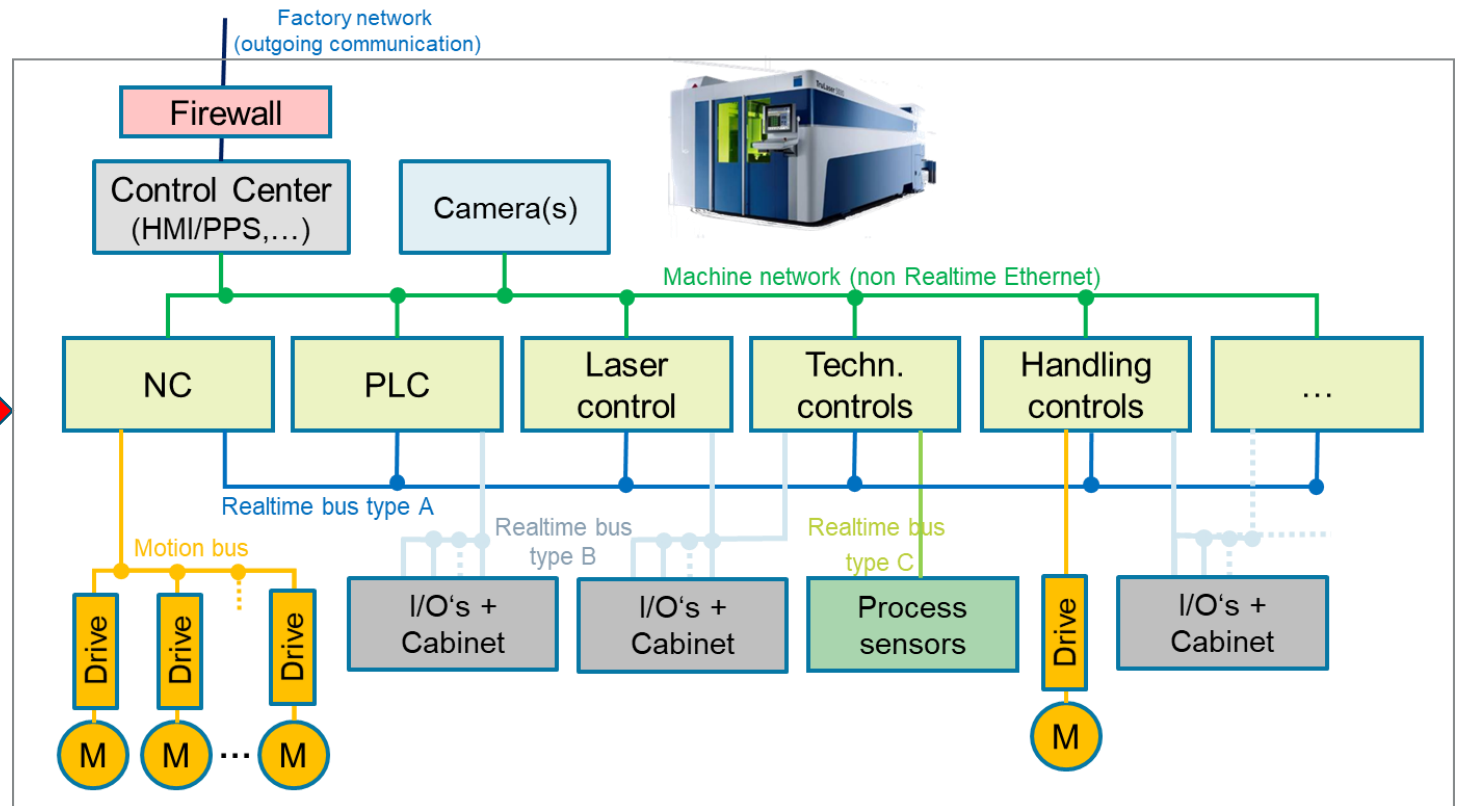
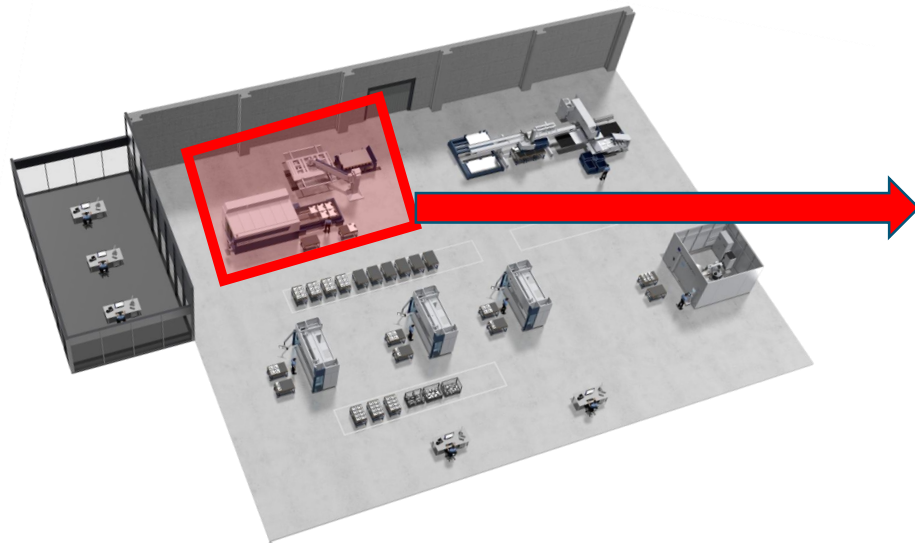
- A three-stage value chain with various actors is considered as an exemplary, simplified process of an operational ecosystem
- The smallest possible fractal of a multilateral structure is a three-point structure, shown here as a component supplier, machine supplier and factory operator
- Hypothesis:
 - An economic advantage can be generated within the digital ecosystem (“digital business model”) by increasing the reliability and service life of components and machines.
 - **Prerequisite:** Collaboration between all those involved in the value chain
 - **Main requirement:** Access to the data depending on the authorizations



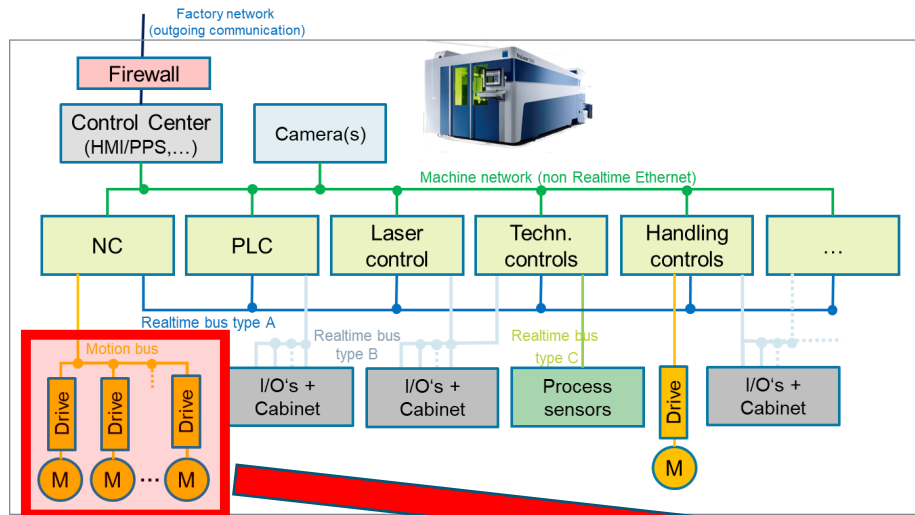
Smart Factory: How to earn money?



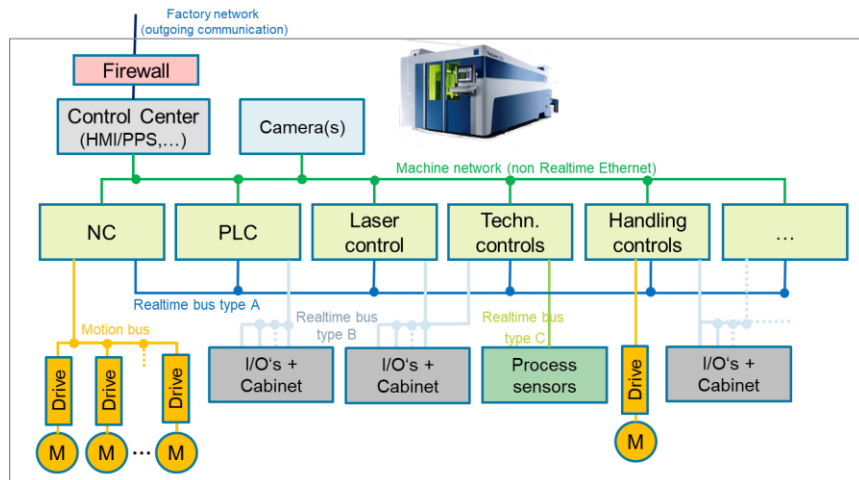
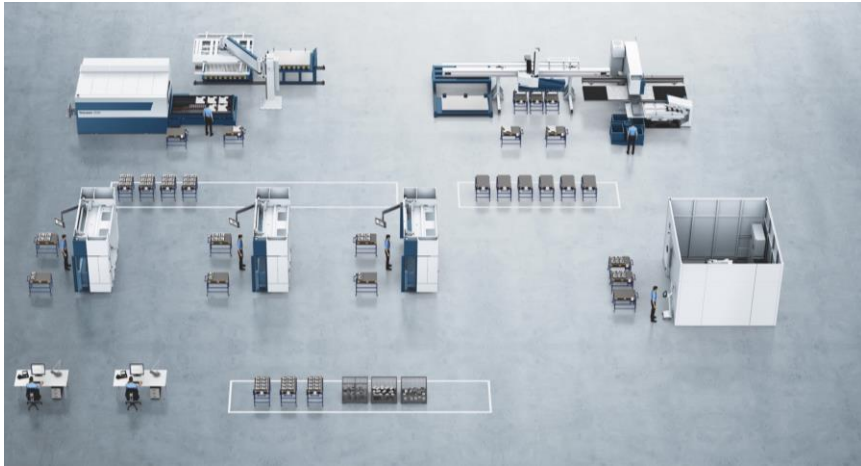
Who owns the data? Who is able to work with the data?



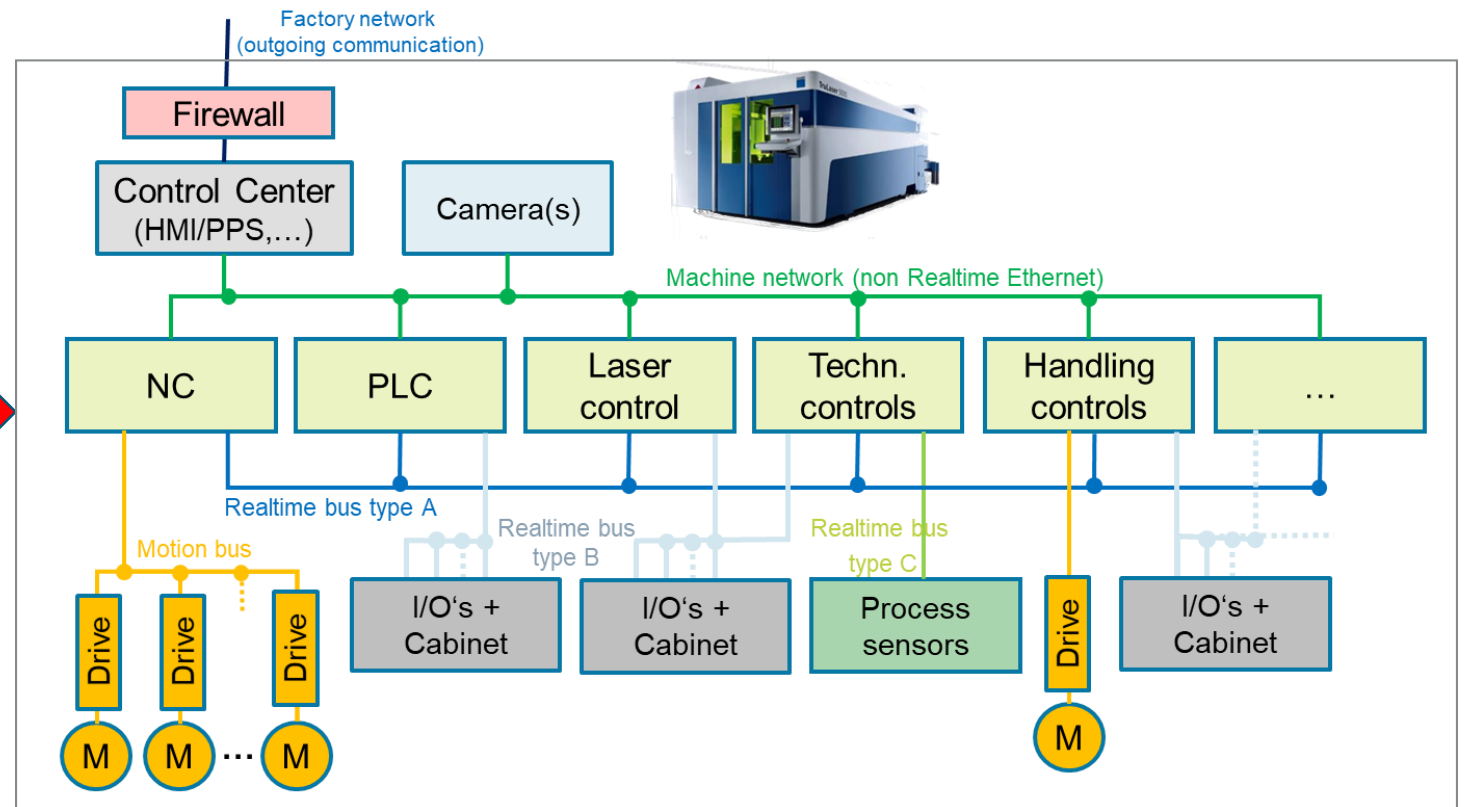
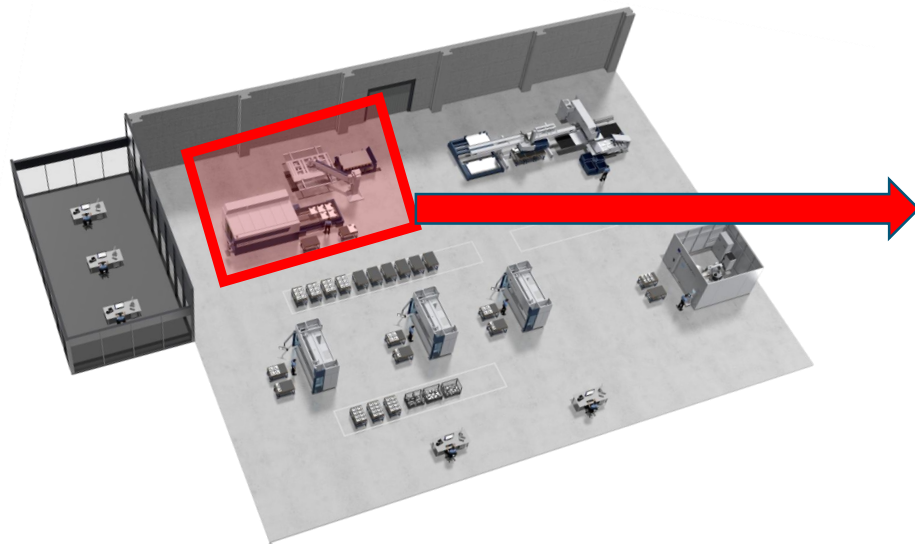
What about data from sensors and actors (with drives being actors and sensors)



Vision: Collaborative Condition Monitoring

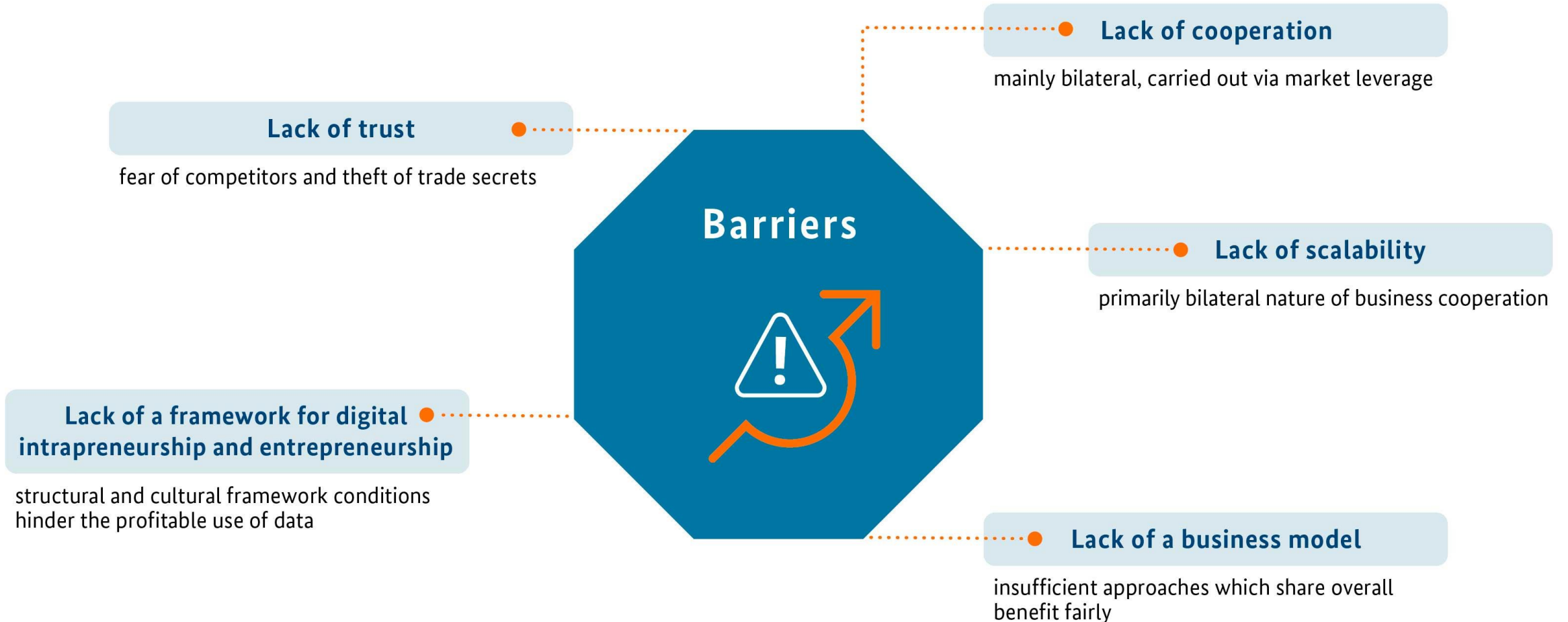


Why is this still a vision for factory owners, machine and component suppliers?

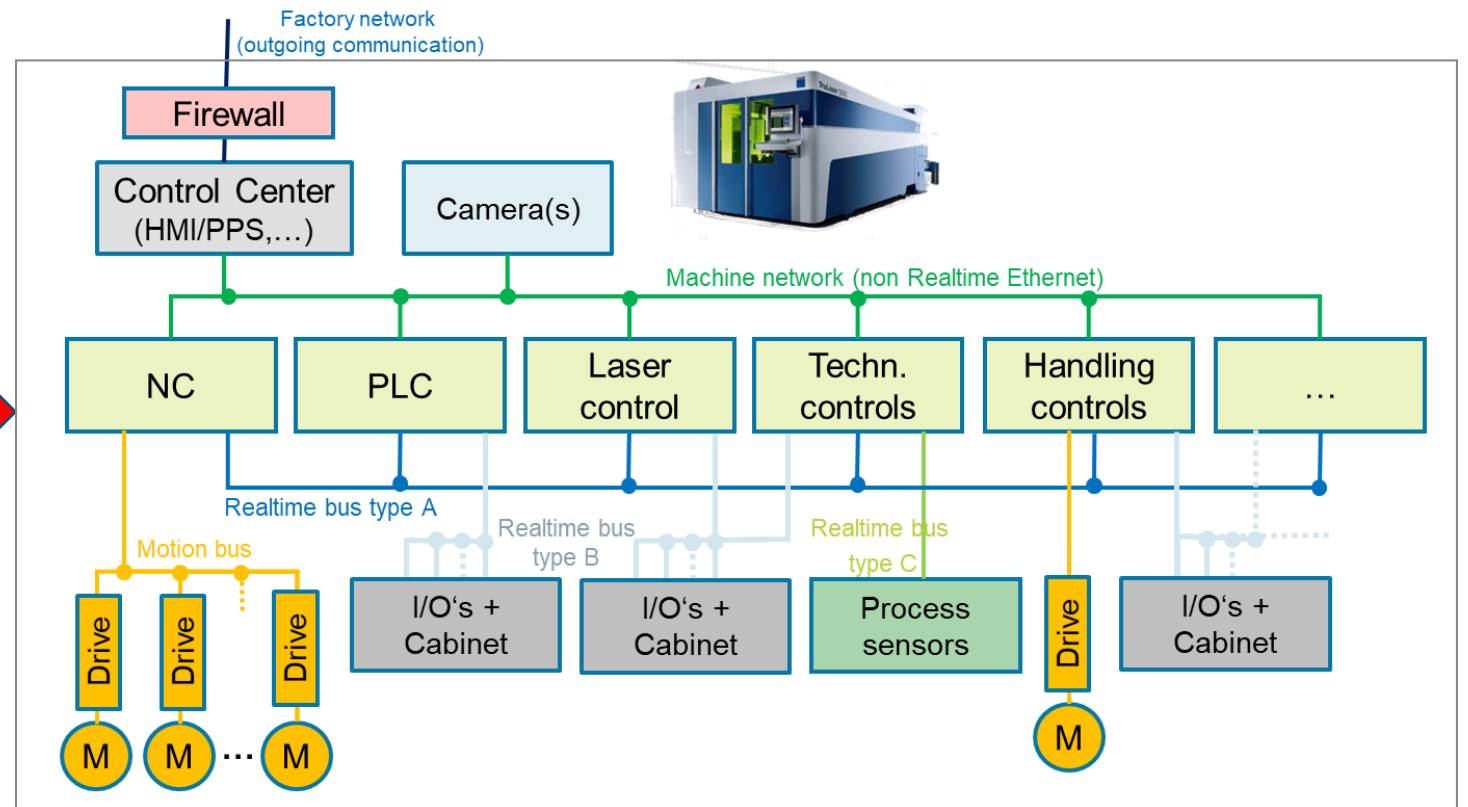
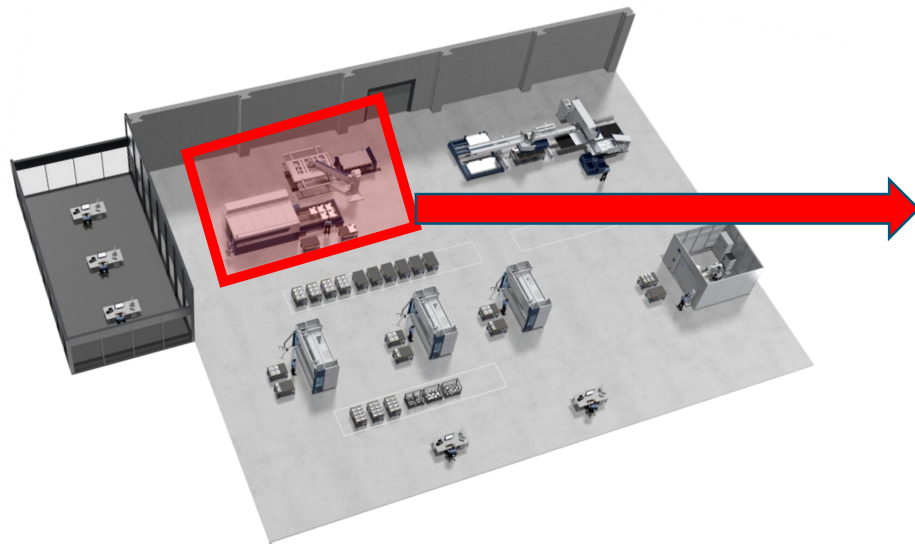


Collaborative Condition Monitoring

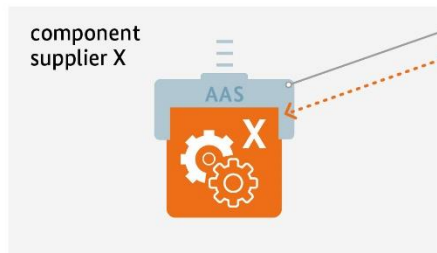
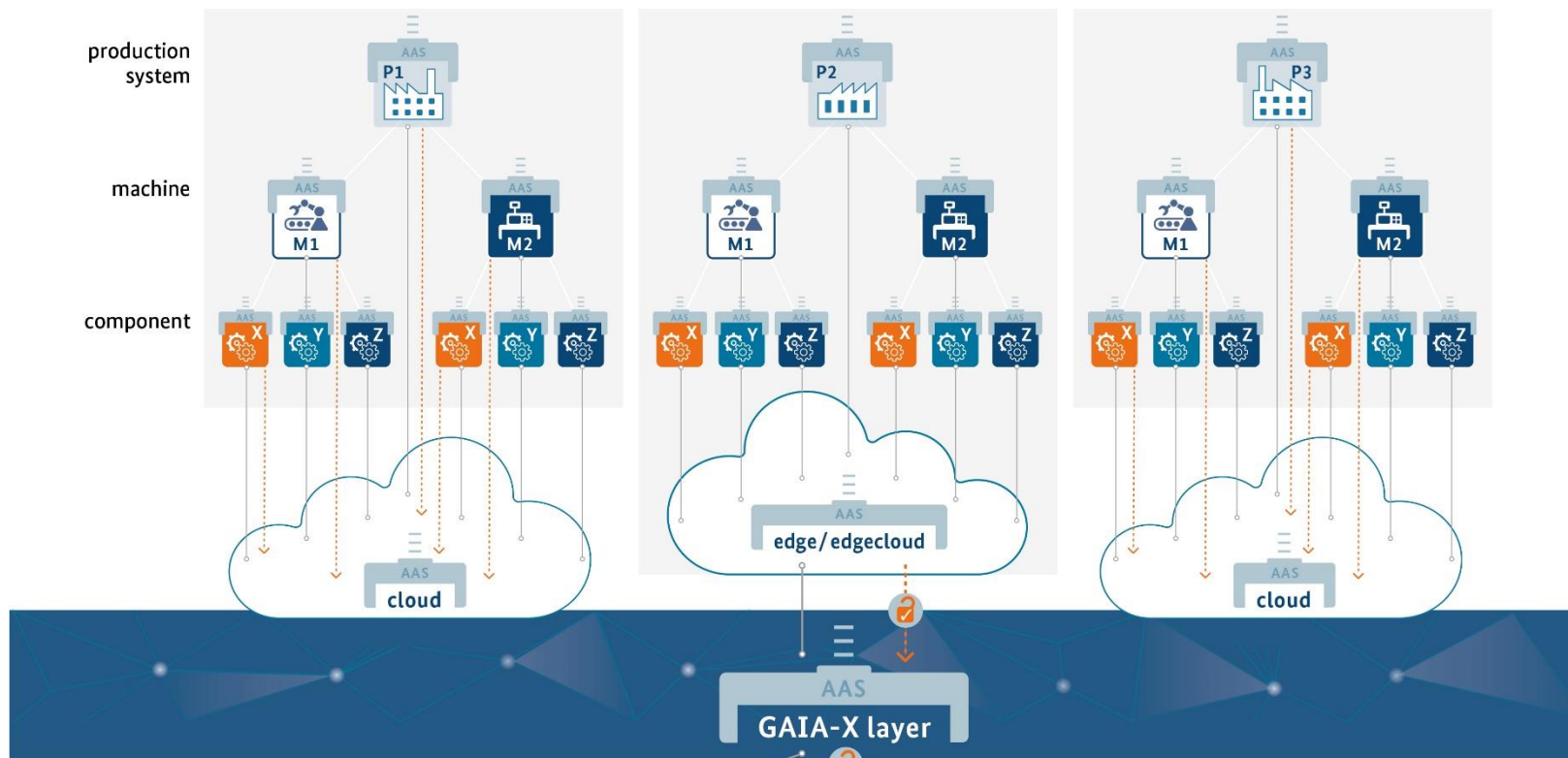
Current barriers to implementing collaborative business models



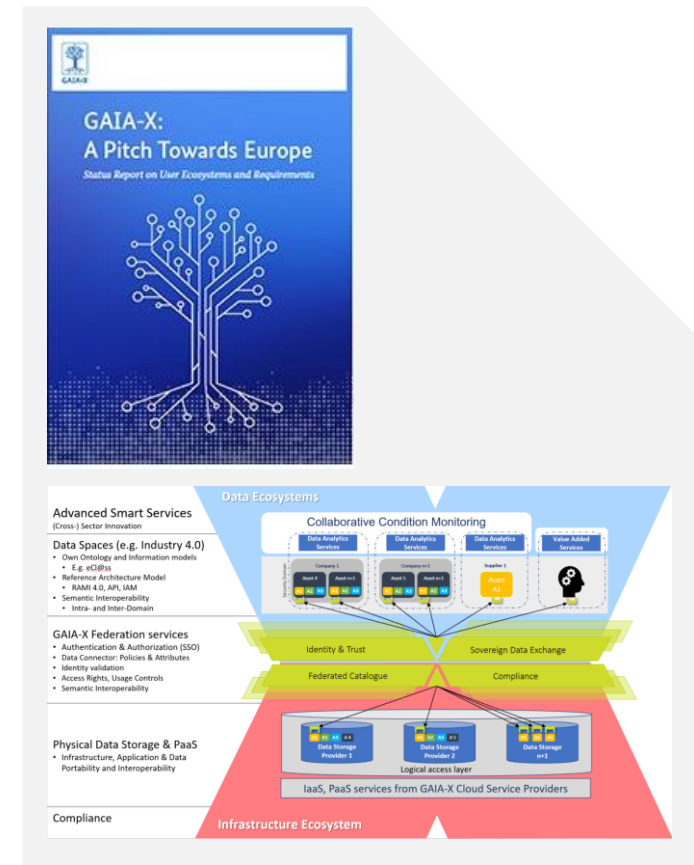
What would be a suitable information model and platform approach?



Collaborative Condition Monitoring Solution modules – Neutral integration platform

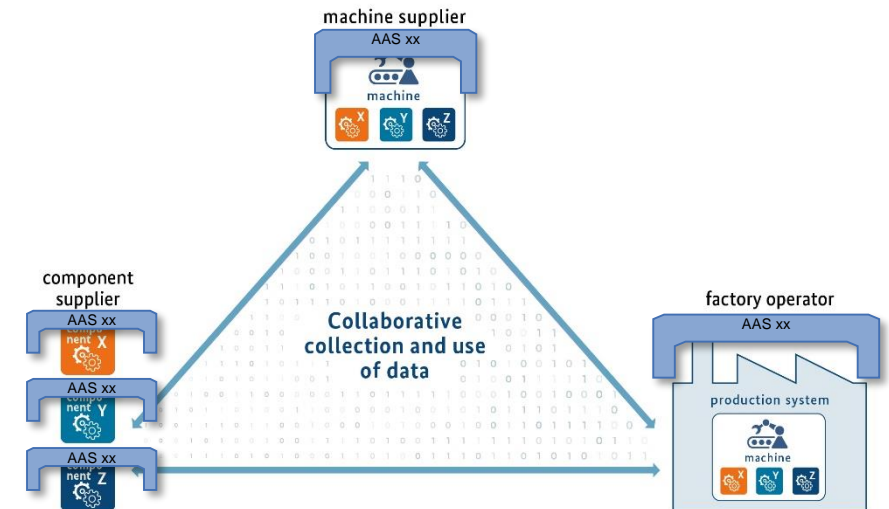


Note regarding graphics: this is an „Information“ point of view: arrows show information relations, *not* network infrastructure



Collaborative Condition Monitoring Solution modules – digital standards, e.g. Asset Administration Shell (AAS)

- Digital Standards
 - Use of AAS, semantically interoperable in terms of content and access rights
 - Submodel of AAS for asset-specific data on reliability and service life
 - Secure access, authorization and communication
- Possible implementation
 - The component supplier provides a component with an AAS that contains data fields for data relevant to service life and reliability.
 - The machine supplier delivers his machine with its own AAS which also contains data fields for service life and reliability-related data.
 - The AAS of the machine will be upgraded to be able to forward the data of the machine and the components accumulated over the service life of the machine to a neutral platform
 - The factory operator supplements the data with relevant machine usage data (e.g. operating temperatures, maintenance intervals) based on the data fields in the administration shell.



Collaborative Condition Monitoring

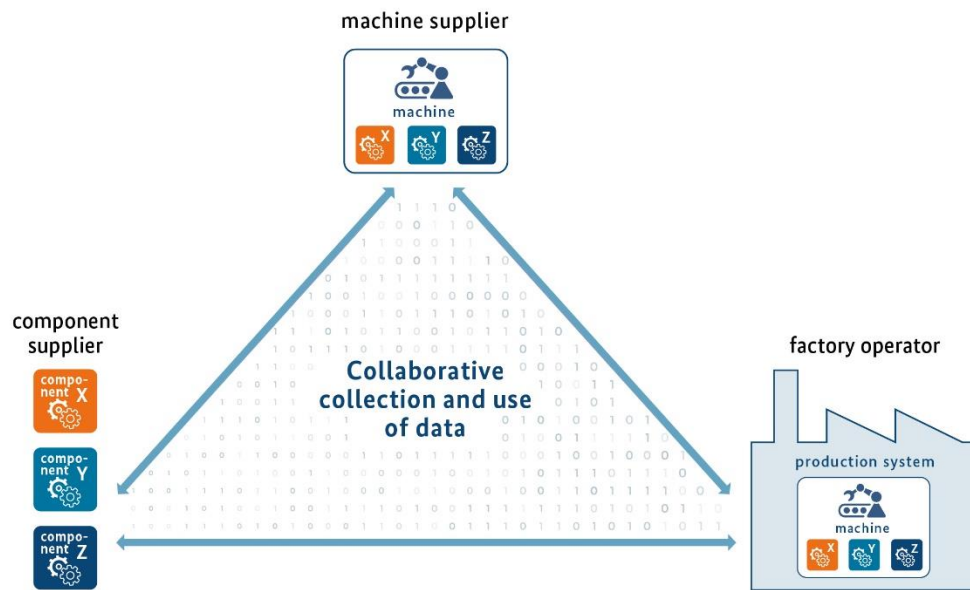
Further solution modules

- Digital identities
 - Usable cross-company and cross-border for authentication
- Data sovereignty
 - The data owner decides which data is shared with which user, with which access rights and for what purpose it is processed.
- Governance and legal framework
- Digital know how within the company
- Courage for data entrepreneurship: Field of action for industry
- PoC - Implementation

Collaborative Condition Monitoring Applicability in other industries

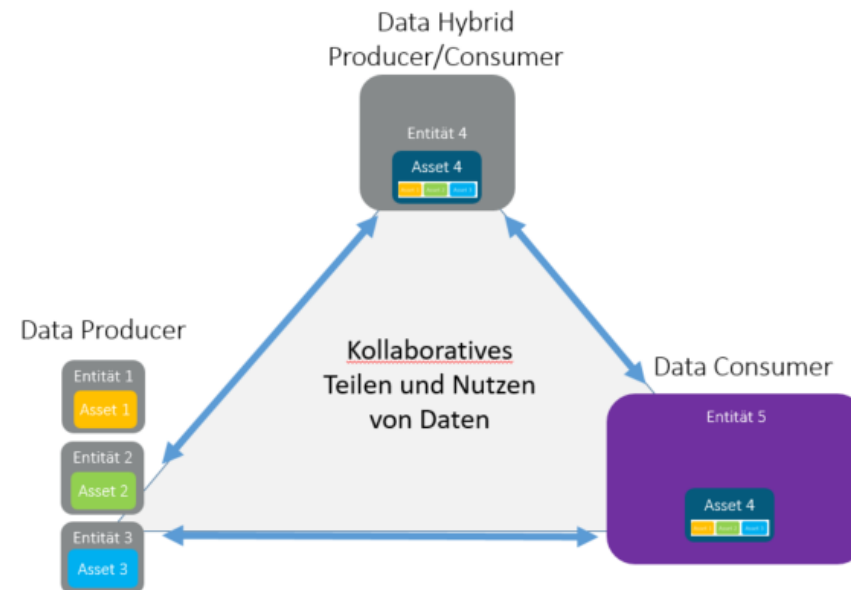
Example: production (physical assets)

- The smallest possible fractal of a multilateral structure is a three-point structure, shown here as a component supplier, machine supplier and factory operator



Example: virtual assets

- The smallest possible fractal of a multilateral structure is a three-point structure, shown here as a data producer, data hybrid (producer / consumer) and data consumer





Reallabor für die Anwendung von Künstlicher Intelligenz in Industrie 4.0

Living Lab for the application of artificial intelligence in industry 4.0

Webinar „Collaborative Condition Monitoring“

Online, October 9th, 2020

Bastian Rössl

Fraunhofer IOSB-INA - Big Data Plattformen

Campusallee 1, 32657 Lemgo



Bundesministerium
für Wirtschaft
und Energie

Living Lab: SmartFactoryOWL

- Open research and demonstration platform
- Research - Transfer – Qualification
- Industrial IoT Experience Center (IIOT)
- Foundation: April 11th, 2016
- A joint initiative of the Fraunhofer Gesellschaft and Technische Hochschule Ostwestfalen-Lippe

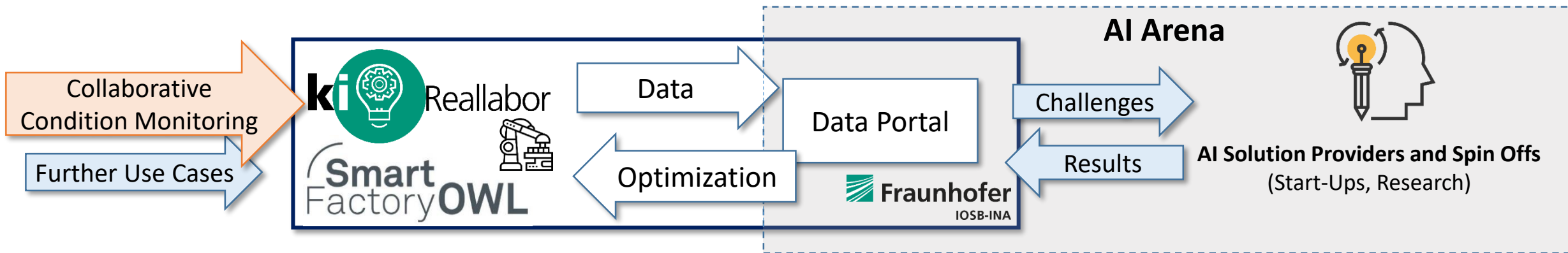


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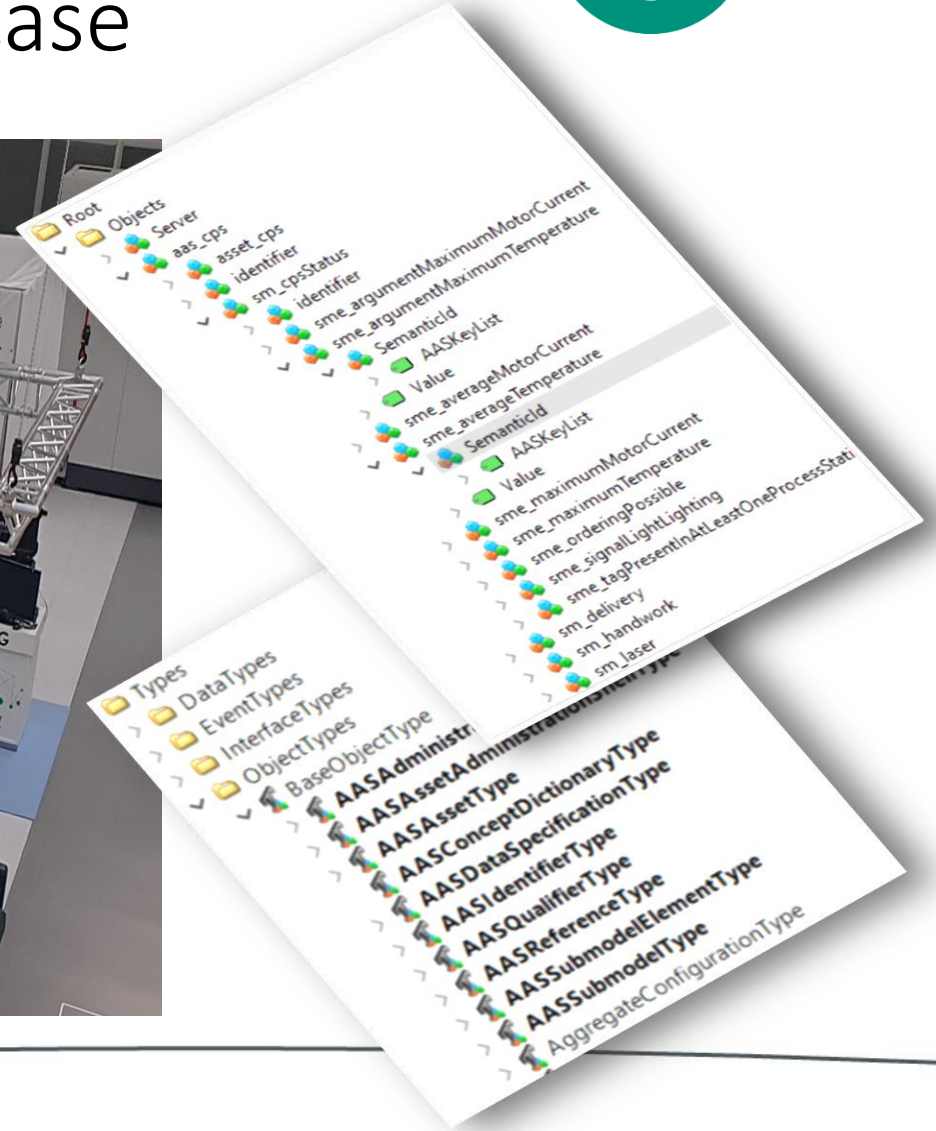
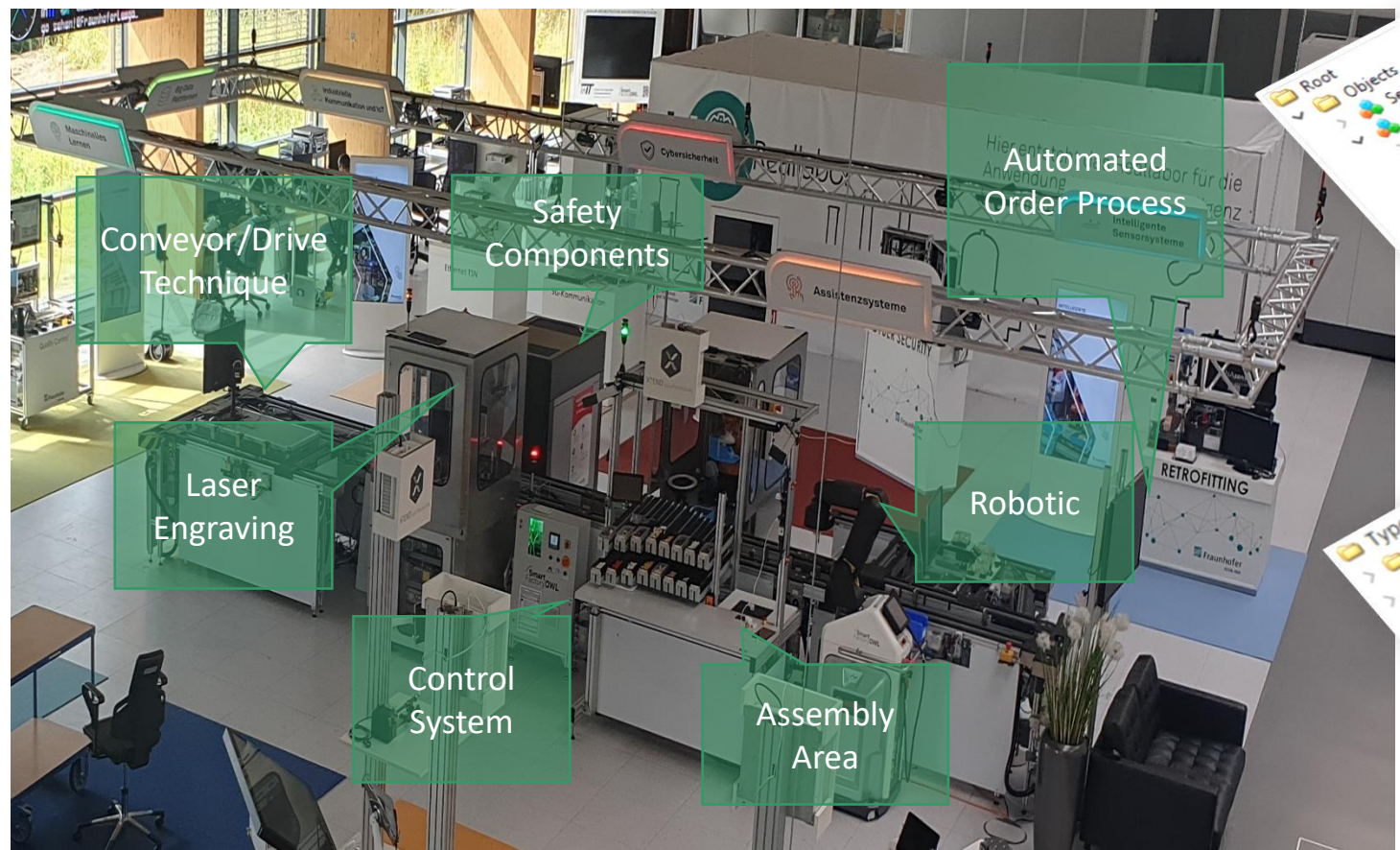
Project overview - within context CCM



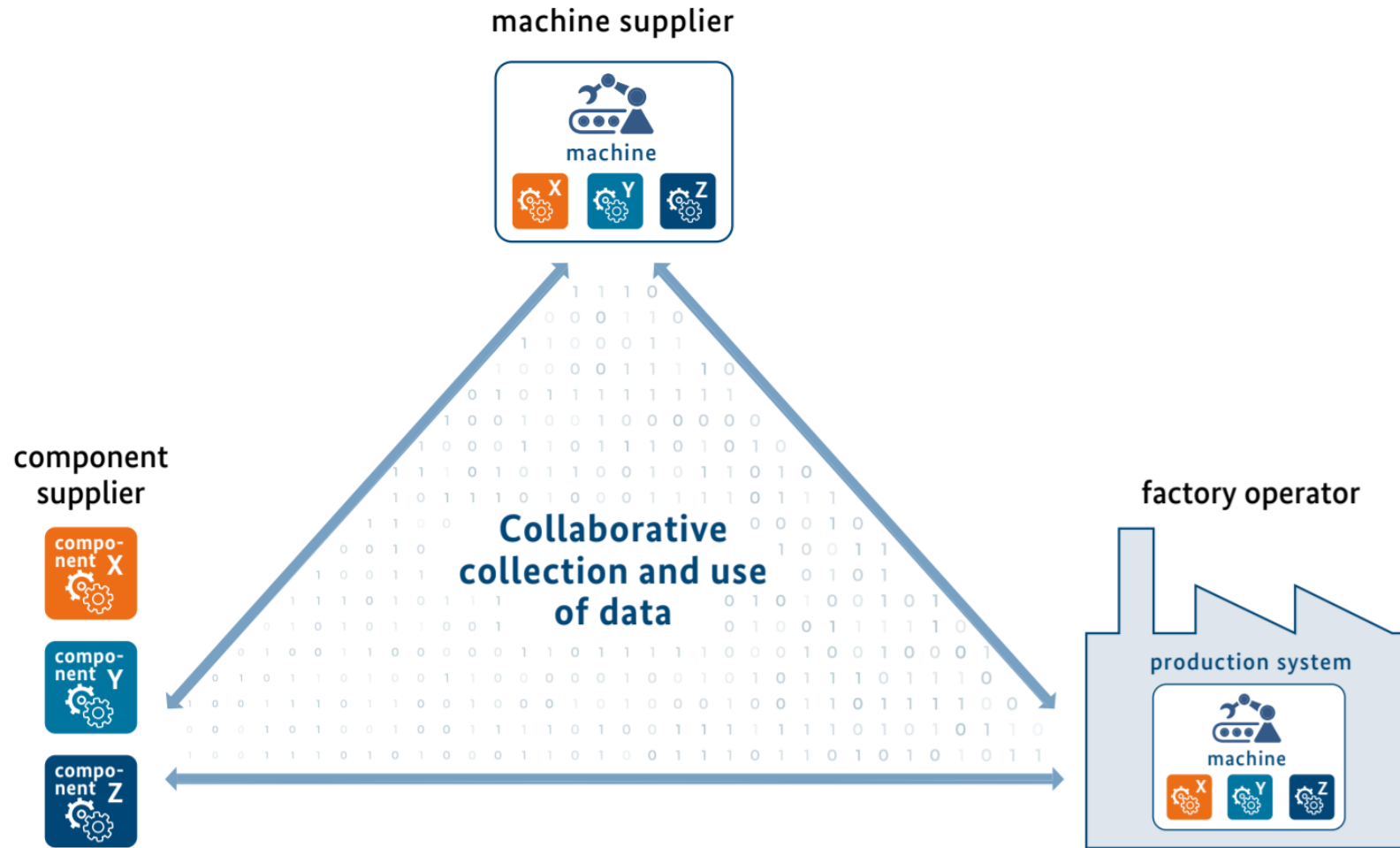
PLATTFORM INDUSTRIE 4.0



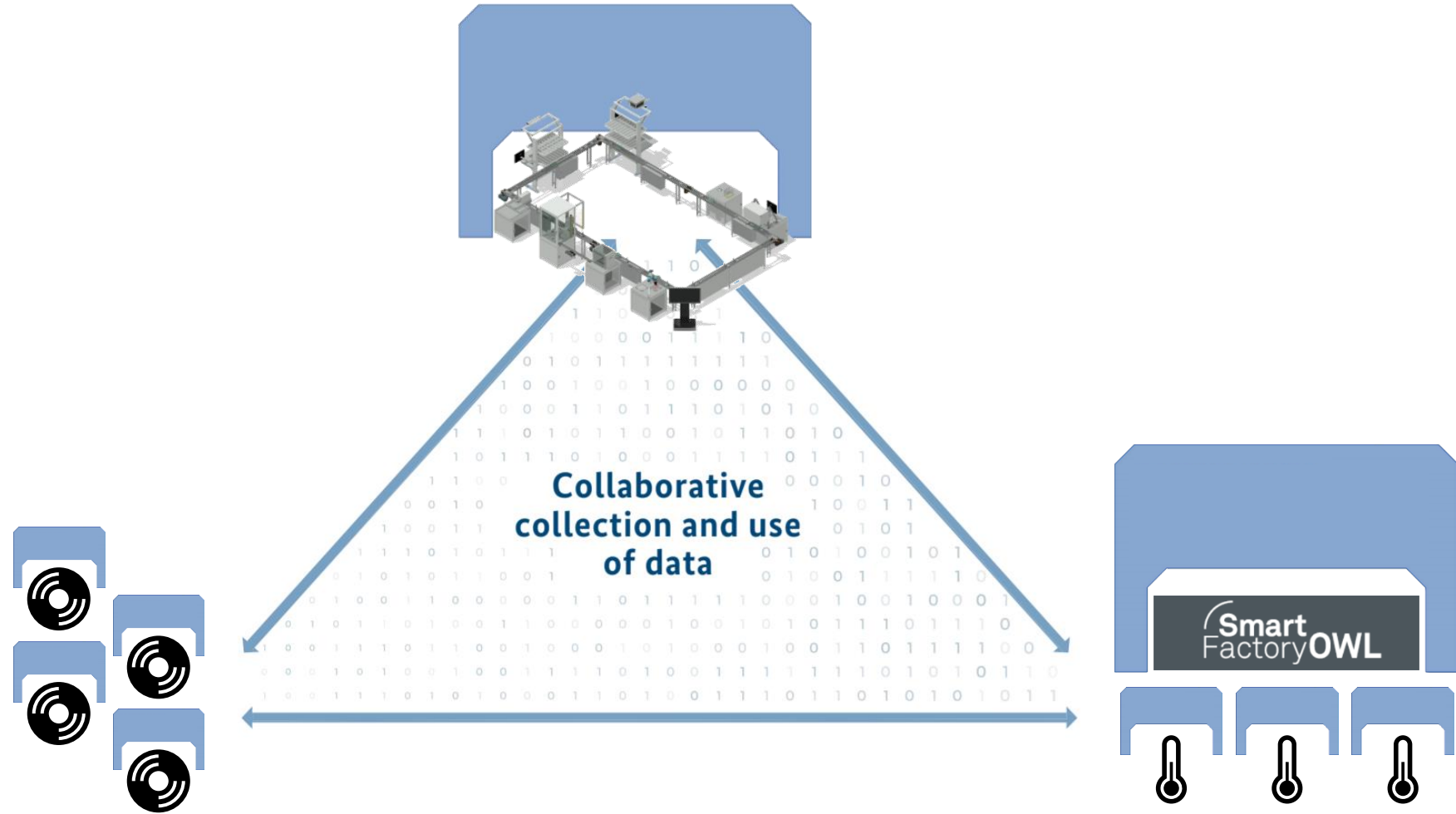
„Customized Production System“ as Demonstrator for the CCM Use Case



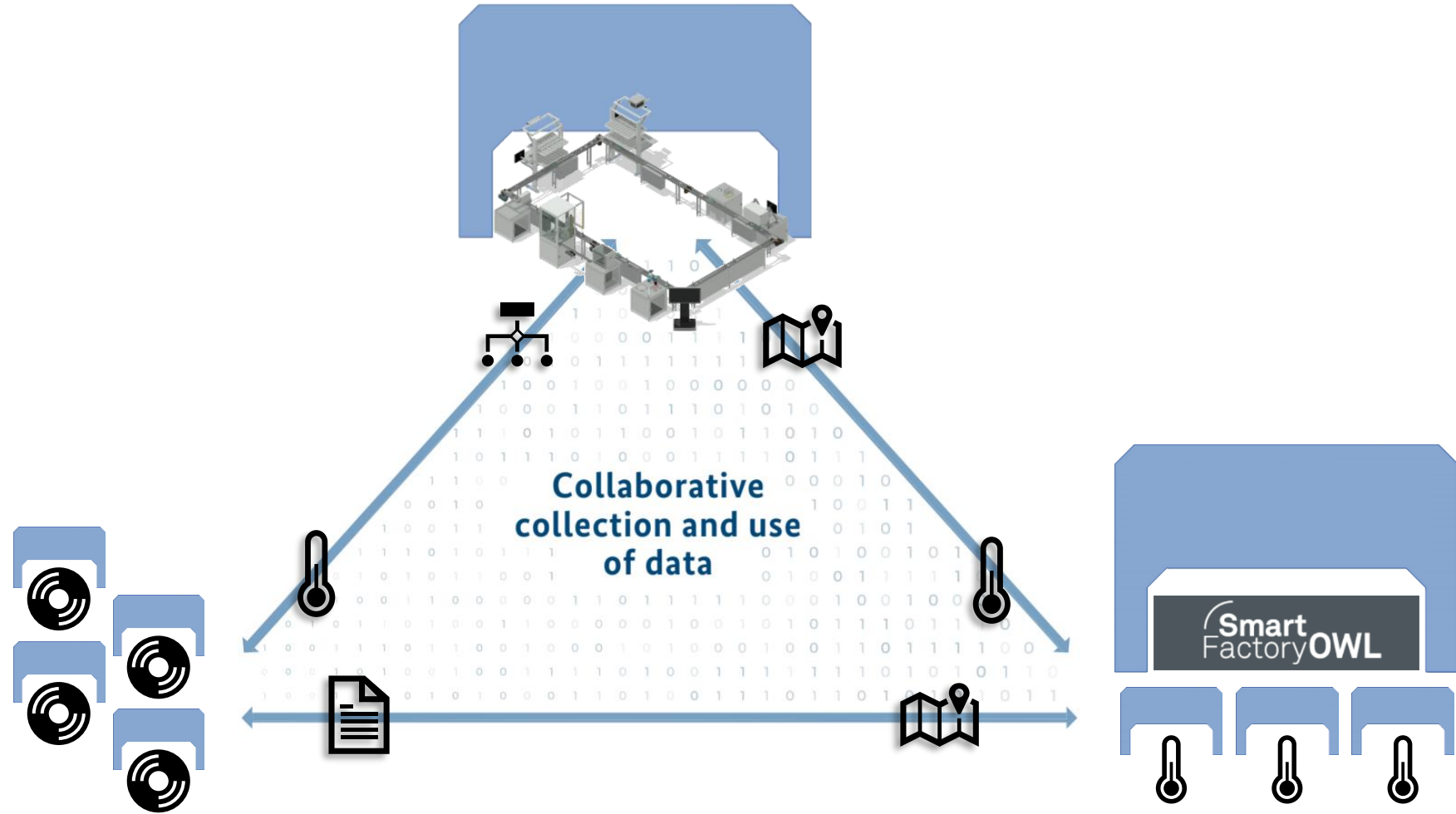
The multilateral three-point fractal ...



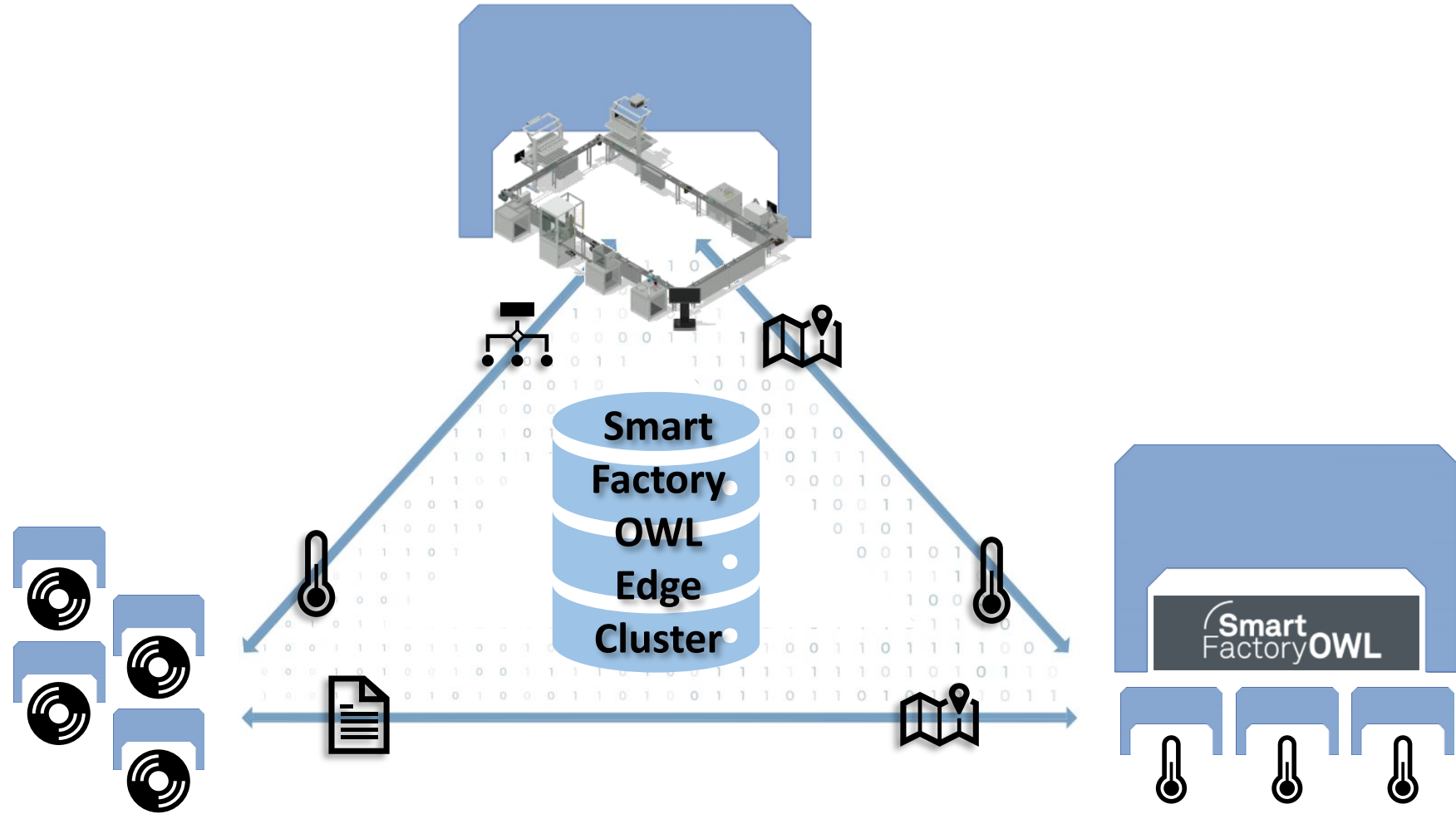
... with reference to the „Customized Production System“



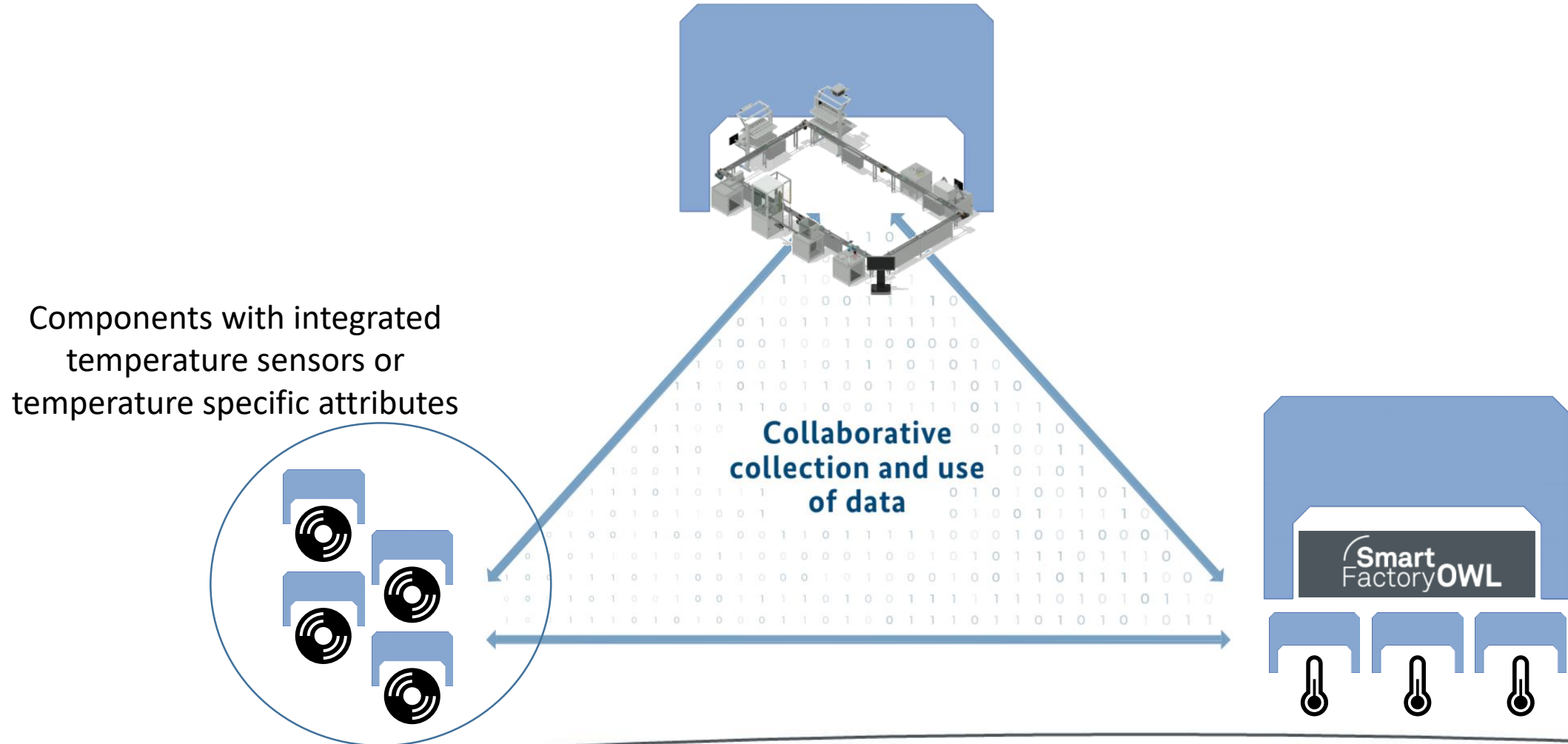
Motivation



Motivation



Temperature specific attributes on component level



Submodels for temperature specific data on type level



Submodels: NAMEPLATE IDENTIFICATION MCAD DOCUMENTATION **TECHNICALDATA** SERVICE

Mounting_type: Mounting plate, bolted with top-hat rail

Storage_temperature: -25 ... 55 °C

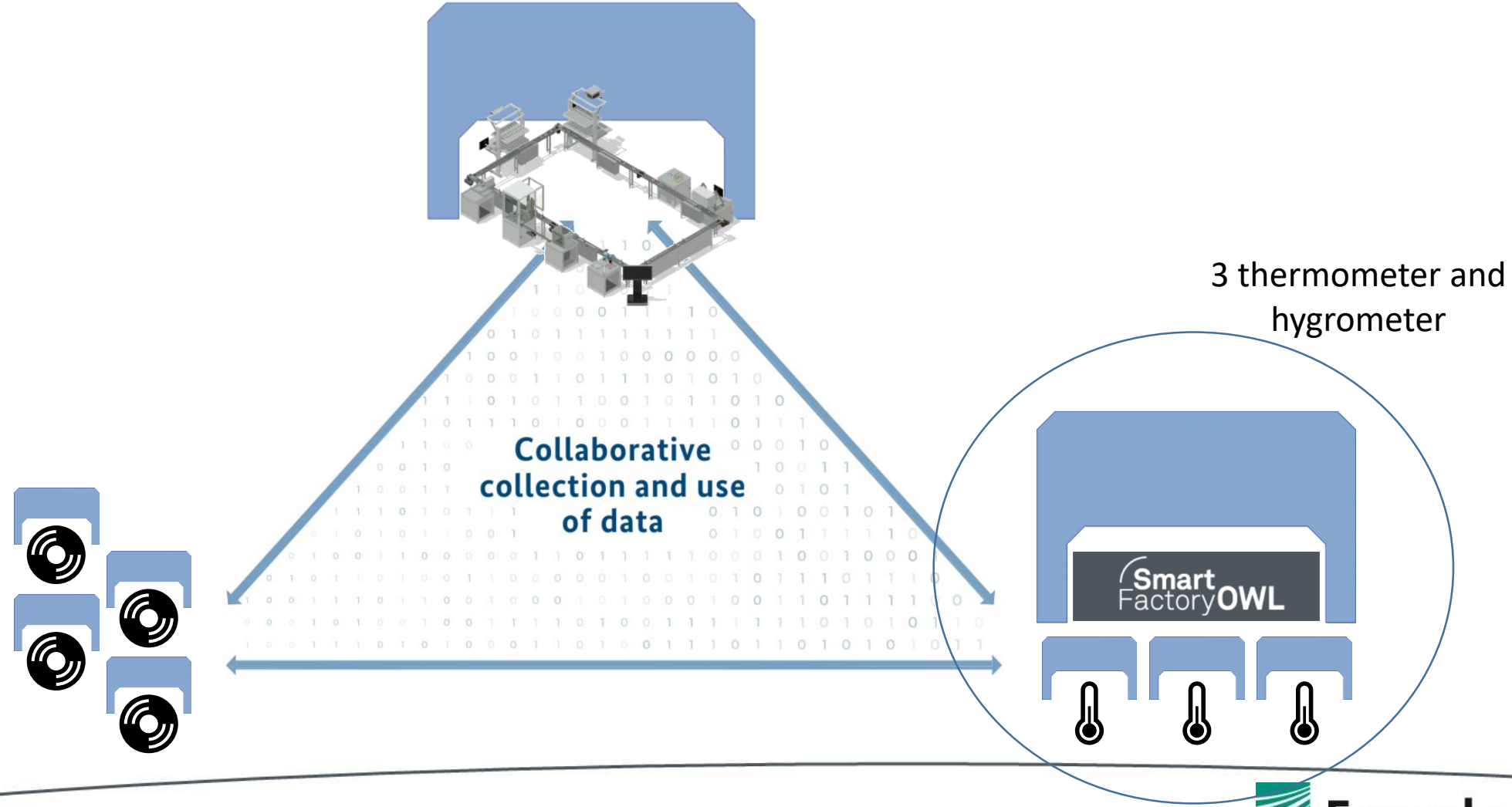
Ambient_temperature: 0 ... 50 °C

Protective_function: I²t monitoring Temperature monitoring Current monitoring Voltage failure detection Drag error monitoring Software end-position detection

ID	Name
0173-1#02-AAC821#006	Max. operating temperature

Property	02-AAC821 Max. operating temperature
short name	-
Format	REAL_MEASURE
Unit of measure	°C
Definition:	maximum limit value of the typically arising temperature in the immediate surrounding area of the operating unit which arises as a result of rated operation
Values:	

Temperature specific process data on factory level

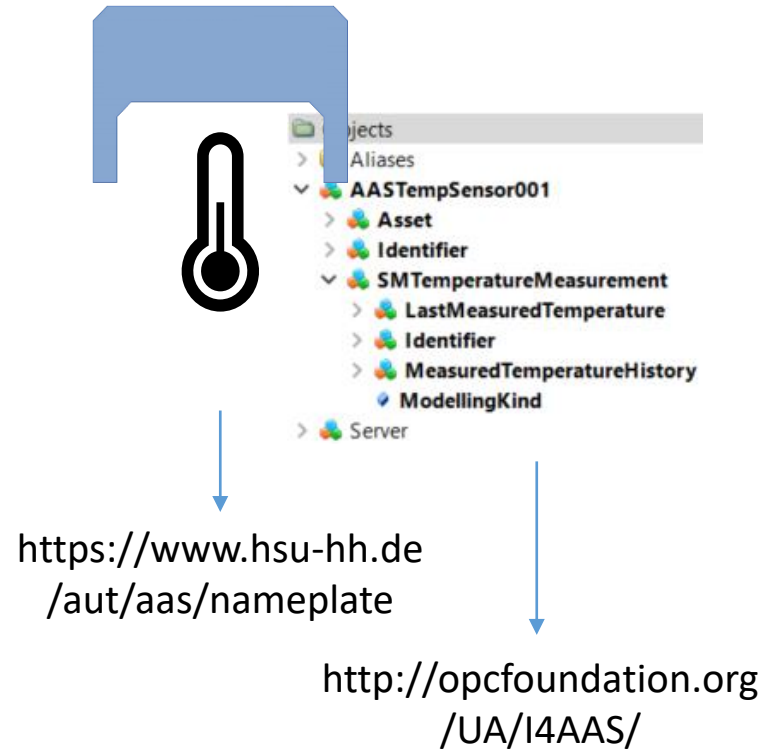


Temperature specific process data on factory level

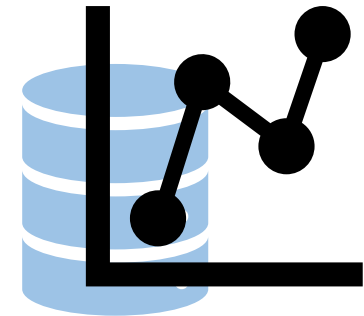
Asset



AAS

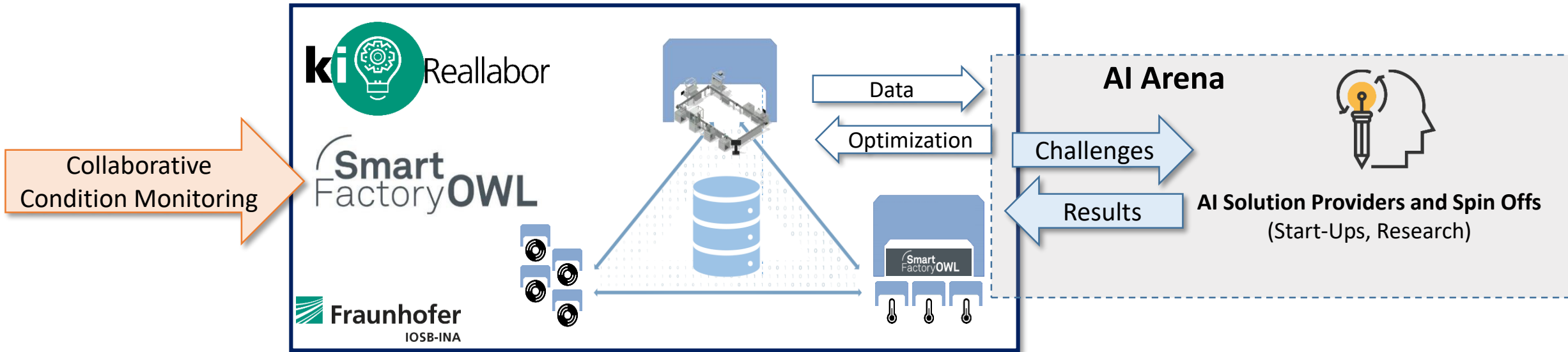


Data



Motivation

PLATTFORM INDUSTRIE 4.0



Collaborative Condition Monitoring Q&A

Collaborative Condition Monitoring Conclusion

- Hypothesis: CCM can generate an economic advantage within the digital ecosystem ("digital business model")
- We believe that interdisciplinary cooperation has added value

Collaborative Condition Monitoring

Possible next steps

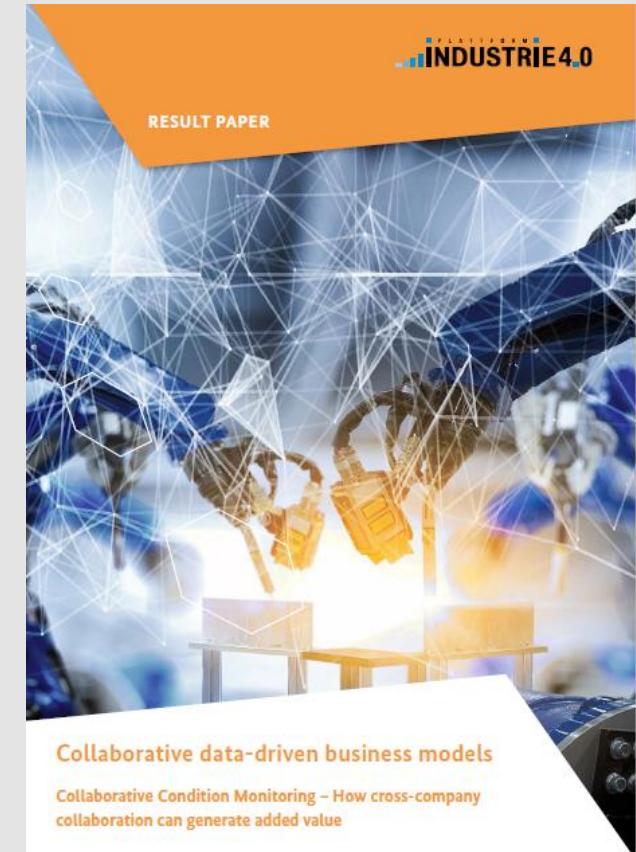
- Especially within context of AI development: How to link large time series data with the AAS?
- How to ensure barrier-free data exchange and interoperability without downsides on high security standards?
- How to build an AAS of the machine based on different AAS from the component suppliers? How to make a composition?
- We are open for Collaboration, Feedback and further Input!
- We would like to invite you to further detail the hypothesis and the necessary solution modules

Collaborative Condition Monitoring

Thank you



<https://www.plattform-i40.de/PI40/Redaktion/DE/Downloads/Publikation/kollaborative-datenbasierte-geschaeftsmodelle.html>



<https://www.plattform-i40.de/PI40/Redaktion/EN/Downloads/Publikation/collaborative-data-driven-business-models.html>

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