Your Quick Start into Catena-X
Why digital twins form the basis for sustainable use cases

Discover the critical role digital twins play for sustainability use cases in the Catena-X data space. Whether you want to implement a digital product passport or traceability along the supply chain, a decentral digital twin registry is key.

Moving towards a circular economy

The EU circular economy action plan aims to optimize the environmental compatibility and energy efficiency of certain products throughout their entire life cycle. Products need to be designed in a way that they are easy to dismantle and recycle and optimize the use of materials. In the coming years, many laws will come into force that are based on these principles and support the European Green Deal. For example, the digital product passport for newly manufactured automotive batteries will be mandatory by 2027. The transition from linear value chains to a circular economy requires close collaboration within the automotive industry, transparency in the supply chain, and common standards. It is therefore important to prepare your data for exchange in data ecosystems such as Catena-X.

Catena-X: a trusted collaboration space

With the Catena-X Automotive Network e.V., the automotive industry has launched an initiative to establish common standards. Its vision is to provide a trustworthy, collaborative, open, and secure data ecosystem in which all users can share information from the entire value chain or life cycle of vehicles. By connecting information from individual suppliers in the Catena-X network, supply chains or entire value networks become transparent. Each individual product is 100% traceable, while each user has full data access control.

What is a digital twin?

As defined by the Digital Twin Consortium, a digital twin is a **virtual identifiable representation** of a real-world entity or process in the automotive space, synchronized at a specified frequency and fidelity. When we look at digital twins, we focus on the data along the product life cycle (as engineered, as produced, as operated) that resides in various silos.

Your entrance ticket to the Catena-X data spaces

The Digital Twin Registry, a tool from the Bosch Semantic Stack portfolio, provides the digital foundation for the shared data space. It allows digital twins to be created and managed in a decentralized manner. Digital twins are key to providing a unified description of data while retaining data sovereignty. The registry can bring all data from various phases of the product life cycle together in a digital twin. It is the entrance ticket to the Catena-X data space and the starting point for numerous use cases, both within your own company and across company boundaries. The Digital Twin Registry from Bosch Semantic Stack has received the official certification from Catena-X. This makes it the first and so far only registry to meet the necessary interoperability and quality standards to gain access to the Catena-X data space.

## Traceability along the supply chain

Automotive supply chains are long and complex. They need data from many different entities, which is currently not always available or transparent. Countless individual solutions slow down the process in the case of an incident. Even if the data basis for seamless traceability is already available, the information is often stored in globally unconnected data silos. This is where digital twins come into play: they form a unique digital image of a real component and are the basis to bring all threads together. Within the Catena-X network, all information from the individual suppliers is connected. Supply chains or entire value creation networks become transparent, each individual product is 100% traceable, while data sovereignty is maintained.

Product carbon footprint for climate protection

Greenhouse gas emissions result from raw material extraction through to product use and recycling. Calculating the Product Carbon Footprint (PCF) requires gathering data across the entire lifecycle. This poses a significant challenge, particularly with durable components in the automotive sector, which involve numerous suppliers. The lack of a standardized methodology hinders meaningful comparisons. Catena-X proposes a solution: semantic data homogenization through digital twins. This enables the collection and harmonization of data from

all life cycle phases, even for thousands or millions of products. Additionally, Catena-X provides central specifications in a dedicated rulebook, ensuring optimal comparability in PCF calculations.

Digital product passport for an efficient circular economy
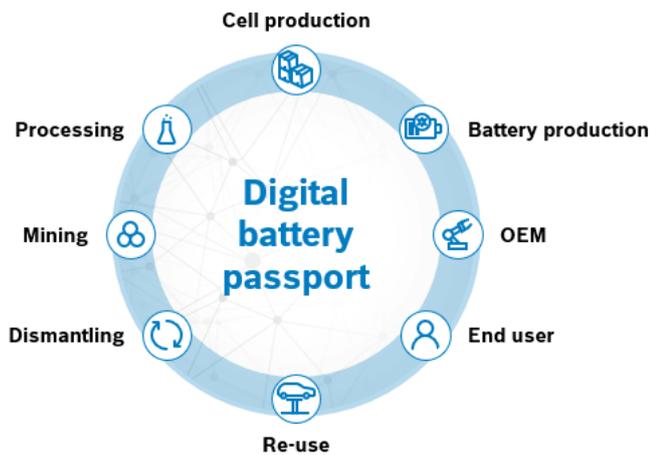
Digital twins are also the solution for the digital product passport, e.g., for EV batteries. This passport is a dynamic repository of information that is constantly updated based on digital twins and enables transparency throughout the supply chain. The different stamps on the product's journey mark its progress through the lifecycle stages and enable sharing and exchange of information via its digital twin. Each aspect represents data that is provided or required by various parties in the life cycle of a product.

Recycling companies can extract all the relevant data to efficiently return the comprised raw materials to the cycle. This is particularly important for products that contain a large quantity of valuable resources, such as batteries for electric vehicles, which are playing an increasingly important role in the automotive industry.
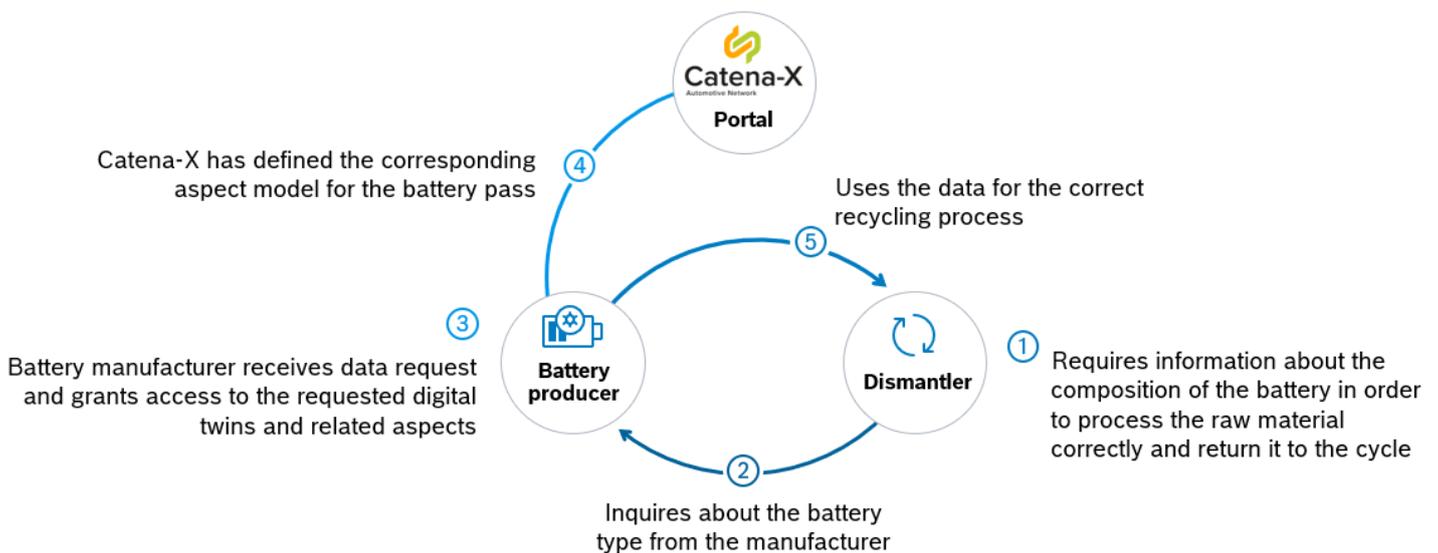
By submitting a specific request via Catena-X, dismantlers gain access to the corresponding digital twin and its relevant aspects. The manufacturer approves the data request and grants access to the digital twin and related aspects. Finally, the dismantler uses the data for recycling, thus closing the loop on raw materials. All information is securely provided via the decentral Digital Twin Registry.

The key: digital twin tools

A decentralized Digital Twin Registry makes it possible to share information across companies while preserving data sovereignty. This principle extends to the Aspect Model Catalog within Bosch Semantic Stack, ensuring data integrity while making aspects and models available in the data space.

Digital Twin Registry: the first and only Catena-X certified registry

The Digital Twin Registry functions like a digital phone book in which millions of twins can be quickly identified and retrieved – from their creation and assignment to storage and deletion. Each digital twin is defined along with its aspects, the reference to the aspect model used, and its data endpoints. The Digital Twin Registry acts as a secure intermediary between queries and data endpoints as a single-entry point for all phases of a product's life cycle. It fulfills the three most important requirements for digital twins: they are easy to find, selectively provisioned, and homogeneous semantics can be applied.

Aspect Model Catalog: the digital library for aspect models

Aspect models are the main prerequisite for a new use case. They describe the context and meaning of related data, group it, and define the data structure on a domain-specific basis. Once created, the aspect models can be reused for further use cases – provided they are discoverable via the Aspect Model Catalog. Available aspect models can be stored to ensure easy discovery by all authorized groups of users and applications.

What is an aspect?

Aspects in digital twins provide specific information, guided by an aspect model for structure and meaning. This system allows efficient onboarding of new data sources with flexible extension and reuse for diverse use cases.

Next steps

Watch our web seminar to take a deep dive into sustainable use cases in Catena-X.

Read our white paper on how to set up your data-driven project in 4 steps.

Get in touch for a personal introduction to our digital twin portfolio.