Catena-X

THE FIRST OPEN AND COLLABORATIVE DATA ECOSYSTEM

Onboarding Guide: Initial Information for Large Enterprises

Overview tailored towards specific perspective of General Manager, IT Specialist or Business Specialist Roles

Release V1.1, August 2023

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

Catena-X

TABLE OF CONTENTS

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

1. MANAGEMENT SUMMARY

Many enterprises are convinced in **sharing** their **data** with partners to jointly **optimize** their **value chain**. The Catena-X Ecosystem has been created to provide the foundation for data exchange not only between two partners but for the **entire automotive industry**. However, there is often still little experience with, e.g., the concept of data spaces, data sovereignty, preparing and provisioning data for external data exchange, set up and operations of mandatory technical components to participate in the Catena-X Ecosystem.

Especially large enterprises, e.g. DAX Companies, with multi-national business activities, complex business processes, own dedicated IT organization, different roles (decision taker, business-user, IT specialist) and segregation of duties need to understand the different scenarios possible to participate in Catena-X Ecosystem and how to benefit from short-term possibilities, as well as strategically and technically prepare for scalable long-term Catena-X participation.

To support large enterprises in their decisions and actions towards successful onboarding to the Catena-X Ecosystem, a series of onboarding guides, best practices and whitepapers have been compiled. **This document** serves as a general frame that **provides** an **overview of all topics relevant for onboarding**. It is **complemented** with **further**, more detailed **guidelines** and **documentation** in respect of specific topics.

2. INTRODUCTION

In the following we will shortly lay out the frame condition in which this onboarding package is established. Therefore, we recap what Catena-X Ecosystem is about and explain the purpose and usage of this document.

2.1 About Catena-X

The transformation of the automotive industry is in full swing. Electric vehicles replace combustion engines. Circular economy enables resources to be recycled. At the same time, digitalization creates completely new opportunities to fulfill customer wishes, to make production processes more climate-friendly and generally increases competitive pressure. The necessary transformation of the automotive sector is additionally massively influenced by geopolitical disputes, pandemics, and climate change. These are all challenges that no company can meet on its own today.

As the Catena-X Automotive Network, we pursue the goal of creating a platform for all contributors in the automotive value chain. Together, we address challenges such as resilience, sustainability, and geopolitics. We set ourselves the task of creating end-to-end data chains and connecting experts within our network.

Therefore, Catena-X is the first collaborative, open data ecosystem for the automotive industry of the future, linking global players into end-to-end value chains - as simply, securely, and independently as never before. The shared goal: a standardized global data exchange based on

European values. The claim is data sovereignty. Participation is rewarded with above-average resilience, innovative strength, and earnings opportunities.[1]

2.2 About this Document

This initial onboarding guide is intended for large enterprises[2] which want to become part of the Catena-X Ecosystem. Onboarding is necessary to participate in the Catena-X Ecosystem technically, organizationally and under the right legal conditions.

Large enterprises in the context of the Catena-X Ecosystem are defined as organizations with higher complexity e.g. due to a multi-national setting. Additionally, they have a high IT infrastructure and organizational maturity including the operation of large ERP landscapes and possible internal software competencies. They will most likely act in the Catena-X Ecosystem as a Data Prosumer i.e. providing and consuming data. Therefore, the onboarding package provides the most relevant information and triggers questions for large enterprises to make strategic and operative decisions on **how to plan and execute** their **Catena-X onboarding process**.

It is important to keep in mind that the content of **this guide needs to always be interpreted** considering the **context of your individual organization**. For example, the maturity of data governance processes and roles will vary between different large enterprises joining Catena-X. So please keep in mind to eventually adapt to your organization's specific needs. Additionally, this will also impact the timeframe needed to complete the Catena-X onboarding journey. Some factors determining the duration and complexity of the onboarding process include technical and digital readiness, the chosen technical onboarding scenario[3], the impact on organizational governance processes, and internal change management activities need.

Further, it is important to note that for the prosumption of a single use case you might not need to take into consideration all the information in the chapters General Manager, IT Specialist and Business Specialist. Though, if you would like to harness the full power of Catena-X and scale the prosumption of use cases and value-added-services across your organization, it is important to pay close attention to all the information.

[1] https://catena-x.net/en/vision-goals

[2] Note that this document is tailored towards large enterprises as they have different prerequisites and thus, their onboarding journey will be different and usually more complex than that of small or medium sized companies.

[3] The technical onboarding scenario refers to different technical options enterprises have for data exchange e.g. using a Catena-X related business application or a managed service. More information: https://catena-x.net/en/catena-x-introduce-implement/onboarding

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

3. MAIN STAKEHOLDER GROUPS FOR THE CATENA-X ONBOARDING

Before we will deep dive into the onboarding related content, we want to give you a brief overview of the three main roles. The perspectives and questions of these roles regarding the participation and onboarding into the Catena-X Ecosystem will be addressed in the following chapters.

3.1 General Manager

The general manager is the **main decision-maker** for all Catena-X onboarding-related topics. The main task of the General Manager is to convince high management to join the network and manage the onboarding process assuring quick business value realization. Hence, he for example assesses how joining the Catena-X Ecosystem will fit into the corporate and data strategy but also the impact on the major other business functions such as IT, controlling, legal, supplier network etc. is of his primary concern.

The role has at least basic **technical and business knowledge** and is well positioned in the company to engage potential Catena-X sponsors. He ultimately is **accountable** for a **successful onboarding** of his organization into the Catena-X Ecosystem while the Catena-X Integration Lead which falls under the IT Specialist role, is responsible for a successful onboarding.

3.2 IT Specialist

The IT Specialist is **responsible for** the **technical integration** into the Catena-X Ecosystem. He collects the technical requirements from his organization (General Manager & Business Specialist) as well as from Catena-X side and assesses the technical impact of the integration on the organization's IT landscape. From a technical standpoint he ensures that his organization is ready to **provide and receive data** from/to external parties (data pipeline & integration solutions).

Hence, he is for example responsible for the implementation of the technical Catena-X components such as the Eclipse Dataspace Connector (EDC) which facilitates the exchange of data enabling the prosumption of value-added services (e.g. Co2 app, traceability app, …). From a technical standpoint he ensures that his organization is ready to provide and receive data from/to external parties (data pipeline & integration solutions). Another very important task of the IT Specialist is to ensure the security of confidential data and how data sovereignty is maintained from a technical standpoint.

The IT Specialist has an in-depth overview of the organization's IT landscape and highly experienced with the processes, tools and platforms involved along the data & analytics lifecycle. He is further very well interconnected with the roles along the lifecycle such as but not limited to Data Engineers, Data Scientists, Data Stewards, for example. The IT Specialist is ultimately responsible for the

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

technical Setup of Catena-X components, technical integration, and provision of data. The Catena-X Integration Lead as a special manifestation of the IT Specialist, is responsible for a successful onboarding of his organization into the Catena-X Ecosystem reporting to the General Manager.

3.3 Business Specialist

The Business Specialist **focuses on** the evaluation of **business and market potentials** that arise for an organization in the Catena-X Ecosystem. As the business is usually also the data owner, the Business Specialist is familiar with the challenges, processes, and specifics around data ownership within and across different functional domains. He understands the data on a functional level. This also results in business specialists being the best fit for identifying source systems to gather data for specific use cases. In his data ownership role, he further assesses the impact on data privacy controls and data release process within the organization and jointly with the IT Specialist ensures that the organization is ready for the Catena-X integration. This role is also heavily involved in the transformation of the organization (incl. trainings, communication, …) due to joining Catena-X.

Together with the other two roles, the Business Specialist role creates a concrete business case for an engagement in Catena-X Ecosystem and lines up the organization according to the impacts on data ownership, privacy, and data release ("Freigabeprozesse") topics.

The following figure depicts the presented main roles with their main characteristics:

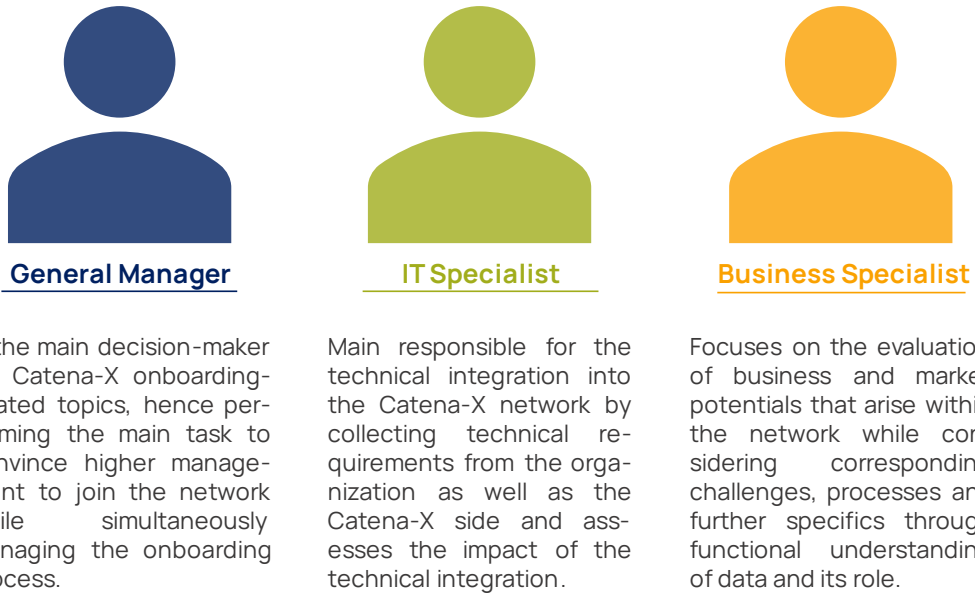


Figure 1: Main stakeholder groups in an organization for the Catena-X onboarding

4. GENERAL MANAGER

The following content is focused on the onboarding perspective of a **General Manager** and provides initial information based on the **most important onboarding** related **questions** for that role.

- In the sub-chapter "**Catena-X Benefits**" we will equip you with the most important arguments why you should join the Catena-X Ecosystem so that you can convince critical stakeholders / sponsors / high management in your organization. In case technical onboarding support is required, you can find more about **consulting offers** in a dedicated chapter.
- In the sub-chapter "**Impact on the organization due to joining Catena-X**" we will equip you with the most important information to answer questions on some impacts which are to be expected from an organizational, technical, regulatory and legal point of view once the organization joins Catena-X as a data provider or consumer.

4.1 Catena-X General Benefits

This section focuses on the opportunities that a data ecosystem such as Catena-X offers to large enterprises. Ultimately, we want to provide you with the right arguments to convince critical stakeholders such as, for example, potential Catena-X sponsors, high management or investors in your organization to participate in this open data ecosystem.

The Catena-X Automotive Network pursues the goal of creating a platform for all contributors in the automotive value chain. Together, its members address challenges such as resilience, sustainability, and geopolitics through data exchange resulting value added services. Ultimately, Catena-X participation will help your company to become (more) data driven.

4.1.1 Adherence to New Regulations

New regulations such as the Supply Chain Act or the "CO2 tax", as well as the pressure on companies to be responsive, require new ways of collaborating with a high level of security. Based on sovereignty and standardization, Catena-X creates a network in which data exchange as well as the provision and use of value-added services are offered to its participants.

Due to sharing and integrating data from various Catena-X participating companies into e.g., a traceability solution, organizations can use the insights to fulfill their due diligence obligations, extending to the entire supply chain - from the raw material to the finished sales product. Why is this important? In case of non-adherence to the Supply Chain Act ("Lieferkettengesetz") they can be fined up to €8 million or up to 2% of their worldwide annual revenue.

Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag
Funded by the European Union
NextGenerationEU

But consistent traceability is also an important basis, for example, for calculating a product's CO_2 emissions. Why is this important? If for example a car manufacturer exceeds the CO_2 fleet value, penalties will be due, and they can also be hefty.[4]

4.1.2 Industry-Relevant Use Cases

A set of **ten initial Catena-X Use Cases** have been identified to address a wide range of the challenges jointly.

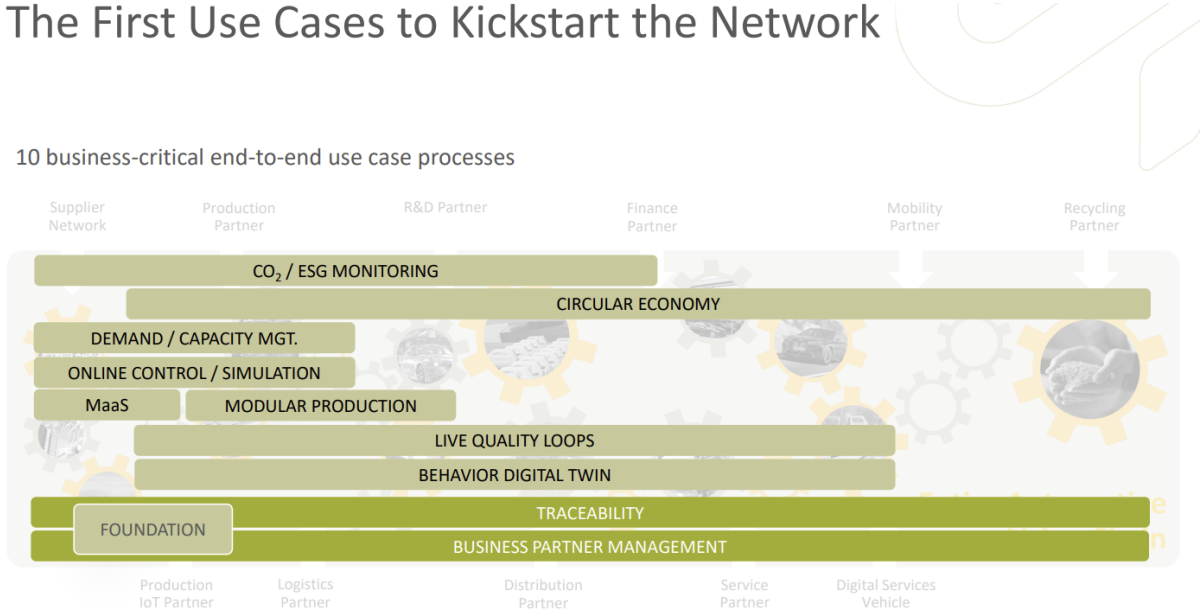


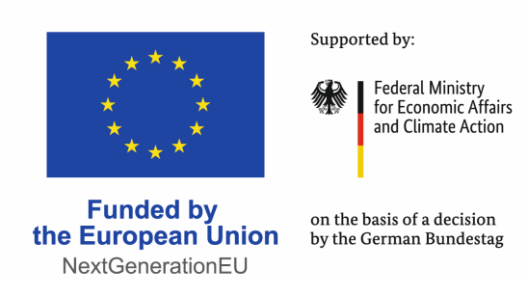
Figure 2: Use Case Overview

While use case specific benefits are not in scope of this document, the following gives you a first deep dive into one example.

Deep Dive: Circular Economy

Hardly any other field has changed as much in recent years as the Circular Economy. Resources that are becoming scarcer and more expensive have steered the rethinking toward sustainability. The primary focus is on the efficient, waste-reduced use of raw materials. Whereas yesterday, for example, the requirements were for a maximum of 20% of the aluminum raw materials to be recycled

[4] https://catena-x.net/en/mehrwerte/traceability



for quality assurance reasons, today there are demands for over 50% from the point of view of sustainability. Circular Economy considers the entire product lifecycle.

Collaboration is needed along the entire automotive value chain. According to Gartner[5], the coming years will be characterized by the urgent need to integrate vehicles more closely into digital ecosystems, which will open up new revenue opportunities and force automakers to reposition their hardware. The European Commission sees 700,000 new jobs being created across the EU by 2030 if the circular economy permeates all sectors and industries.

Circular Economy cannot be implemented within the boundaries of one company.

The Catena-X Ecosystem aims to bring all business partners, including suppliers, original equipment manufacturers (OEMs) and recycling service providers, in a network together to ensure open, secure, and interoperable data exchange along the entire automotive value chain.

For more information on the use cases and their specific benefits please check out the official Catena-X website.[6]

In the following you will find the most important general arguments why you should join Catena-X.

4.1.3 Catena-X Marketplaces

Reduce overheads through shared value-added services. A Catena-X Marketplace is the one stop shop for exploring and accessing new value creation potentials for your company and its network. In the future, products, services, hardware, and software applications will be traceable from production to recycling. This consistency is the basis for numerous use cases and resulting value added services within the Catena-X ecosystem.

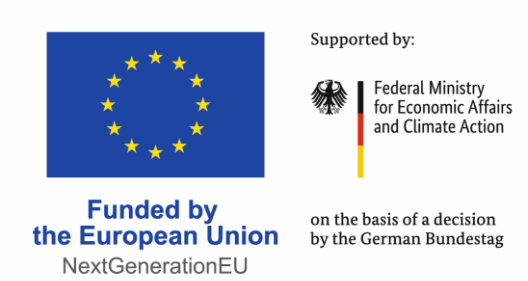
4.1.4 One Common Data Space

While today you need to negotiate contracts and build up data exchange bilaterally with each interface partner, participating in the Catena-X Ecosystem will give you access to one common data space. Exchanging data based on electronically agreed data contracts, usage policies, established standards and common data models thus reduces the complexity and in turn can help to reduce costs. It can be used in context of broadly available use cases (m:m) but is also available for bilateral (1:1) data exchange.

4.1.5 Catena-X Ecosystem

Besides new business opportunities and reduced overhead through value-added-services and reduced costs through standardized data exchange, the Catena-X Ecosystem also enables your organization to join resources and collaborate within the automotive industry. Benefit from the

[5] Gartner®: Top 5 Automotive Technology Trends for 2022
[6] https://catena-x.net/en/mehrwerte



largest global industry community of trusted members. Become part of a community which tackles the challenges of our industry that cannot be solved alone any longer (costs reduction, resilience, process efficiency & sustainability).

Reduce time to value through a quick onboarding via pre-defined onboarding processes and explanatory onboarding packages and exchange of experiences with other ecosystem partners.

Additionally, you can also choose to get technical onboarding support from one of the Catena-X association pre-qualified consultancies to reduce your time to value. Dedicated consulting offers will need to be further tailored to your needs to support in your technical rollout, operations and maintenance and help you to get the technology up and running.

You can find more information on Consulting Offers later in this document.

4.1.6 Innovation & New Business Models

Make use of the ecosystem as a foundation for apps and users while you create room for new data driven business models and innovation.

4.2 Potential Areas of Impact / Transformation

This section focuses on potential areas of impact in your organization when joining the Catena-X Ecosystem. We will draw your attention to considerations your company needs to take in the context of:

- Data Strategy for sharing data with external partners in the Catena-X Ecosystem
- Company Representation in the Network, i.e. understanding organizational, technical and legal frame conditions to decide which legal entities to register as business partner in Catena-X and how to organize Data Management and set up EDC / IT Stack instances
- Frame Agreements & Contracts for joining the Catena-X Data Space as a participant as well as for enabling data exchange
- Compliance by Design via electronically negotiated data usage contracts

One main important pre-requisite is common for all: You need to have a suitable setup of people, processes, and technology in place for managing and using data. Concrete impacts, however, very much depend on your company specific situation (e.g. how mature is your data governance framework, what does your IT landscape look like etc.).

4.2.1 Data Strategy

A "data strategy is a highly dynamic process employed to support the acquisition, organization, analysis, and delivery of data in support of business objectives"[7], joining the Catena-X Ecosystem

[7] https://www.gartner.com/en/information-technology/glossary/data-strategy

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

will have impact on your data strategy. The exchange of data with external organizations should be considered when formulating the vision, mission, and objectives of your data strategy.

One specific barrier which might need to be tackled is the hesitance of sharing data. The time of siloed and non-shared data comes from a time where a lot of data was proprietary and highly classified. Nowadays, companies must realize that not all data needs to be treated equally and that a good portion of the data they have available are uncritical to share. So why should you share data? Well, "according to the Sixth Annual Gartner Chief Data Officer Survey, respondents who successfully increased data sharing led D&A [Data & Analytics] teams that were 1.7 times more effective at showing demonstrable, verifiable value to D&A stakeholders". So, the question is more how risky is it to not share data and can you afford it?

In the end your data strategy is operationalized by having the right mix of people, process & technology in place guard railed by Information, data protection and corresponding policies. Therefore, in the following sub-chapters we will focus on those areas. We will give specific examples of impacts but also point towards areas where it makes sense to assess further.

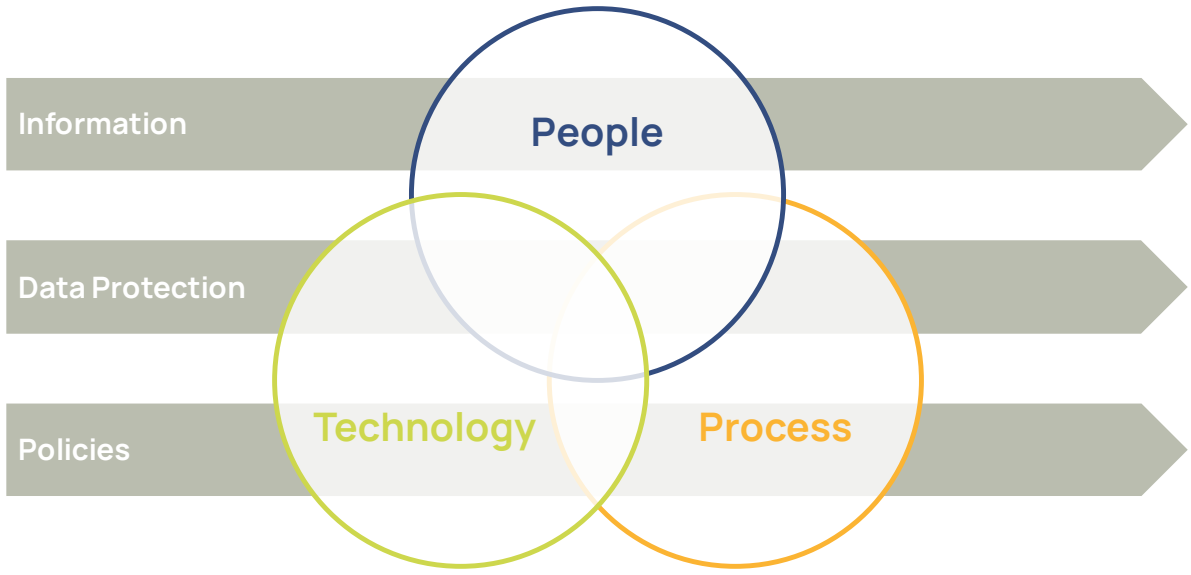
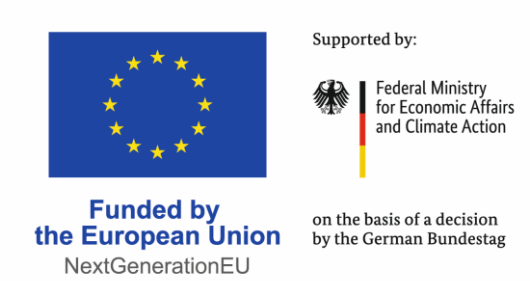


Figure 3: Data Strategy Operationalization

4.2.1.1 Processes

One specific impact is the need of the adjustment of the data release process as most likely the access rights differ for access from external compared to internal users. Another angle is the possibility of the creation of new business models by joining the Catena-X Ecosystem. In the end, you might not just consume but also offer value added services & data via the network.



Ask yourself the following questions to assess further e.g.:

- Which processes in your company are impacted?
  - Hint: One important area you should look at is the Data & Analytics Lifecycle
- What is the impact on the objective, key activities, and RASIC of specific steps in your processes?

4.2.1.2 Organization (People)

One specific impact is the establishment of the "Catena-X Integration Lead" role. When becoming part of the Catena-X Ecosystem many IT related matters need to be organized and aligned therefore we urgently recommend creating this position. They will be responsible for the coordination of the various IT functions within your company for the connection with Catena-X services and the smooth integration of solutions offered on the Catena-X platform, especially with regards to the overall Catena-X project plan.

An interconnectedness of this role as a continuation of the existing Community of Practice "Data Provision" should help to ensure that all Catena-X members prepare and plan the following dimensions similarly:

- Data Provision
- Local implementation
- Release processes

The Catena-X Integration Lead does not necessarily need to be from the IT side in the joining organization. Rather it is important that he has an IT skillset/affinity due to the technical nature of the components and its requirements.

In case more information on this role is required, details can be found in a dedicated IT Specialist section.

Another important impact is on the tasks & responsibilities of your Data Owners (usually business side) which will play a vital role in identifying the right source systems for the offered value-added services. They will also be heavily impacted on the data release side of things in case sharing data with external organizations is not already considered in the release strategy. But also, Data Engineers are impacted as the participation in the Catena-X Ecosystem requires the data presumption in a standardized target format which might differ from the ones you are currently using.

Additionally, not just specific roles but also governing bodies such as e.g. a "Data Office" and the governance structure itself (which decision boards exist, which body reports to which body) are affected by joining the Catena-X Ecosystem.

Ask yourself the following questions to assess further:

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

- What impact does the participation have on the defined roles & responsibilities in your organization?
- Which roles are impacted, and do you just need to adjust or also define new roles?
- Will governing bodies need to be changed or new ones to be introduced?

4.2.1.3 Information, Data Protection & Policies

For data assets to be transmitted via Catena-X related services and applications, they are fundamentally linked to policies via contracts; a transfer without a data contract is not possible. This helps to ensure Information & Data Protection. Hence one specific impact is that you need to assure, that data is always linked to policies via contracts. That means policies need to exist and be accurate but on top you need to make sure that those electronic contracts are being set up and managed. Besides you might need to adjust existing as well as define new data protection rules/regulations within your organization.

The following picture depicts the data transfer and its interrelations to contracts and policies.

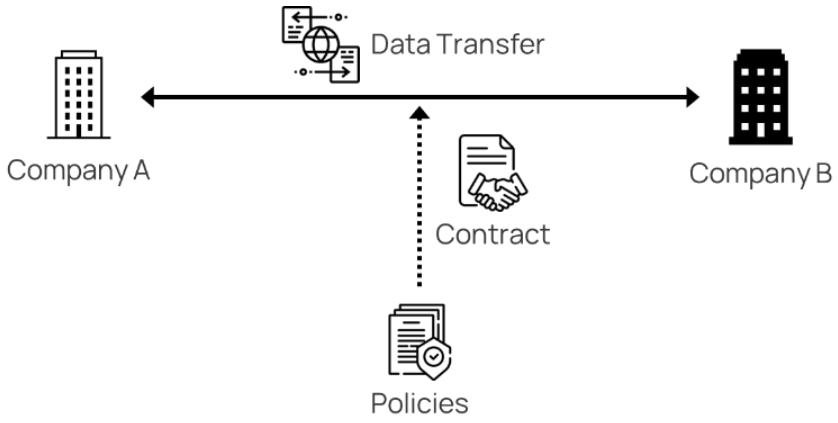


Figure 4: Data Transfer Interrelations

Ask yourself the following questions to assess further, e.g.:

- What is the **impact** on your defined **Information** & **Data Protection**?
- Which **controls**, **activities** and **measures** do you have in place along the Data & Analytics Lifecycle and how do they might need to be altered when becoming a Catena-X participant?

4.2.1.4 Technology & Architecture

Catena-X is a decentral system, where data is exchanged peer-to-peer between companies on demand. This means, that each company needs a component that handles:

- contract negotiations over data assets (who has how much access to which data)

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

- the actual data transfer (incl. the transformation into the predefined Catena-X target format)

Catena-X participants can use the Eclipse Dataspace Connector (EDC)[8] for this purpose. The EDC is the gatekeeper for incoming external data as well as outgoing internal data. Hence one specific impact on the technology & tool side is the integration and implementation of the EDC into the existing tech stack. The EDC also facilitates data sovereignty which means that if you make data available you retain control and decide individually who is involved in the data exchange, how, when, where and under what conditions.

Ask yourself the following questions to assess further, e.g.:

- What are general **conditions of data exchanges** (access & usage policies, obligations, permissions)
- Are specific categories of companies you exchange data with available, which could be always equipped with pre-defined access and usage policies?
- How does your **approach** for **exchange** of **data** with **external organizations** look like from a **technological** perspective? How does **Catena-X related technology fit into** this architecture picture?

More in-depth information can be found in the technical overview section.

4.2.2 Company Representation in the Network

Each company has its own organizational structure, consisting of different legal entities and / or subsidiaries. Figure 5 below illustrates different company setups that may exist, clustered into exemplary scenarios. Depending on the organizational structures of your own company you will need to consider how to organize the representation of your company in the Catena-X Ecosystem, as data exchange always happens **between two legal entities** (as only representatives of legal entities can sign legally binding contracts). Thus, prior to the registration to the Catena-X Data Space, a company must clarify how **data exchange** in the data space in context of their internal participation scenario **shall be organized**.

This also entails considerations on the **set up of EDC instances with respect to organizational, technical and legal frame conditions**. Overall, the following premises apply:

- Contractual partners for data exchange within Catena-X can only be legal entities known in Catena-X.
- Representation of a legal entity in Catena-X requires an associated business partner number (BPNL).
- The EDC mediates data usage between endpoints (the data plane) by synchronizing access and usage policies between partners.
- There is no data processing or review of data content within the EDC itself. Data usage takes place instead at the endpoints of the data providers or data consumers, respectively.

[8] https://projects.eclipse.org/projects/technology.dataspaceconnector

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

- Usage of data with respect to location and assignment to computer instances / platforms is independent of the runtime environment of the EDC itself.

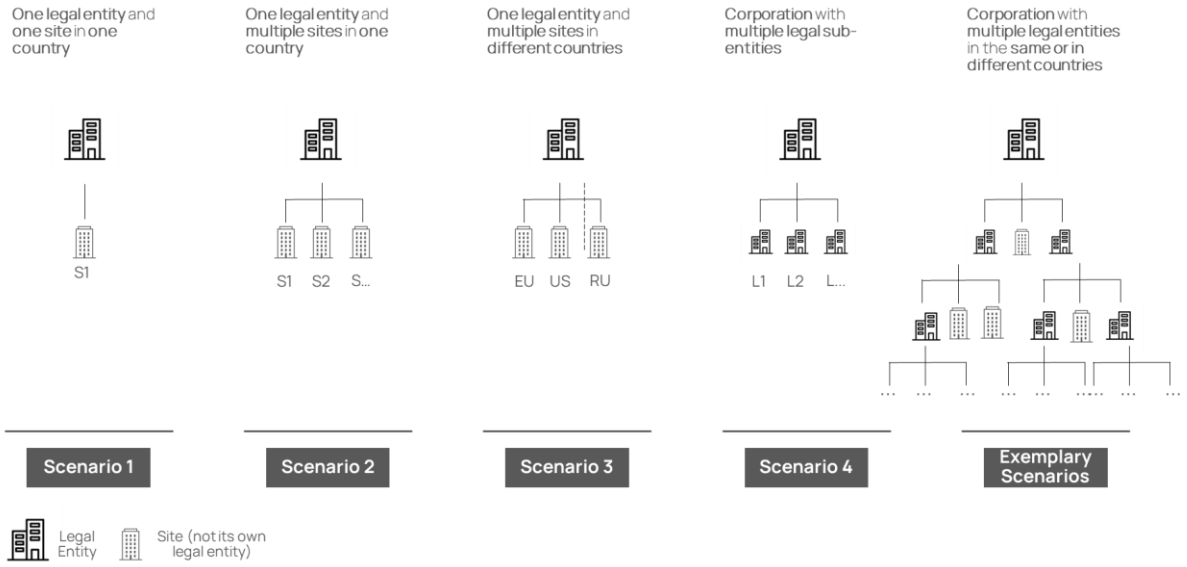


Figure 5: Types of organizational structures and hierarchies (exemplary)

4.2.2.1 General Considerations

Overall, when starting the decision process, companies should assess the following **typifying considerations** with respect to legal entities visible in the Catena-X Data Space, Data Management and EDC and IT Stack instances.

(1) Legal Entities visible in the Catena-X Data Space:

- Is your company represented by one legal entity only. Then this legal entity needs to be registered with Catena-X. Furthermore, considerations about data from different sites or countries need to be managed internally and represented towards partners by the legal entity.
- In case of different legal entities within your company hierarchy, there exist different options which you need to assess and decide if
  - each of them should be visible in the Catena-X Ecosystem: then individual registration for each legal entity is necessary.
  - some (or all) of them should be represented by another legal entity: only dedicated legal entities will be registered and are entitled to act on behalf of other legal entites within the Catena-X Data Space.

Note: registration of multiple / all legal entities as partners in the Catena-X Data Space will lead to respective costs and the need to manage multiple contracts.

(2) Data Management:

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

Your company internal data management and integration strategy will also decide your Catena-X setup in terms of data exchange capabilities.

- Identify the different roles with respect to *Data Sharing in a Data Space*[9] – like, for example, data owner, data provider, data consumer, data user – and understand how to manage the responsibilities of managing your data internally and abstracting this towards the Catena-X data space.
- As for integration strategy, if you run a central data lake, for example, you can also organize data transfers centrally. If you rather follow a data mesh approach, also data transfers will be organized more decentrally which means that your company might need or want to deploy multiple instances of the IT stack.

For a complete list of integration patterns and their impact on the EDC and IT-Stack deployment please refer to the Data Integration Pattern Guide (see *appendix*).

(3) EDC Instances and IT Stack:

- SaaS Solutions: Business Applications might bring their own EDC. That is, for any managed solution (Business Application or Enbling Services Solution) used, there may be an additional EDC instance and – where relevant – a corresponding Digital Twin Registry behind it. For some business applications you might be able to re-use an existing EDC.
- Realtime requirements: If a use case requires real time data sharing, the EDC should be deployed where the data resides.
- Geolocation: When there is legal obligation that data may not leave a specific country, this specific country requires its own IT stack.

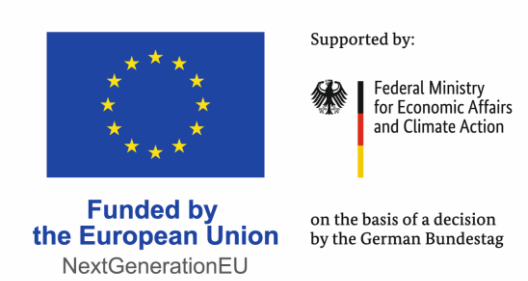
The following section provide more detailed aspects and examples that data providers or data consumers should assess from an organizational, legal and technical point of view.

4.2.2.2 Organizational Considerations

Accordingly, from an **organizational perspective**, the challenge for companies is to identify which of their legal entities becomes a partner of the Catena-X Ecosystem and which affiliated companies are represented by this entity. In some cases, it might be feasible to create a lead legal entity that represents the company's legal entities or subsidiaries for data exchange. In other cases, data exchange might be subject to specific conditions that require separate legal entities for the data exchange.

In the Catena-X Ecosystem participating companies are identified by a Business Partner Number (BPN). There are three different characteristics of the BPN that relate to each other: a legal entity (BPNL), a specific site (BPNS), and a given address (BPNA).[10] A BPNS or BPNA cannot share data but always belongs to a legal entity which can. Accordingly, the BPNL either represents the lead entity, or a subsidiary which is itself a legal entity and is registered with an own BPNL. In this context, the

[9] https://internationaldataspaces.org/wp-content/uploads/IDSA-Infographic-Data-Sharing-in-a-Data-Space.pdf
[10] Catena-X | Standard-Bibliothek | CX_-_0010_BUSINESS_PARTNER_NUMBER_PlatformCapabilityBPDM_v_1.0.1.pdf



BPNL is a company attribute that is registered with the EDC and required to provide data by or grant data access to specific companies.

As illustrated by figure 5, the underlying premise is that a legal entity can have multiple sites in different countries and a legal entity can have multiple subsidiaries – which themselves may or may not be separate legal entities.

4.2.2.3 Legal Considerations

From a **legal perspective** confirmed by a team of legal experts for Catena-X, the following recommendation is given for organizations and their affiliates:

- Utilisation of one general / comprehensive EDC with registration with the BPNL of the root organization.
- Possibility to restrict access and use towards specific legal sub-entities via dedicated Access and Usage Policies. The necessary requirement is that these sub legal entities are registered with their own BPNL in Catena-X.

Note: This requirement always applies regardless of the defined EDC structures.

This recommendation is based on the defaults of the Use Case Frame Agreements. However, it is possible that bilateral agreements may be reached between data exchange partners that do not allow this recommendation to be implemented. As an example, one such case would be if a partner wants to agree on data usage with OEM Subsidiary in the US and at the same time wants to explicitly exclude the OEM (as a "root" instance"). This corner case would mean that a separate EDC would actually have to be installed for the affiliate entity. Carefully weighing, however, it is recommended not to install EDCs including identities a priori for all legal entities, but to start with a "root" and, if necessary, to install the necessary EDC instances due to additional (bilateral) boundary conditions.

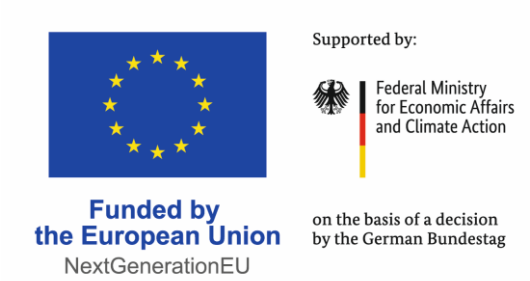
4.2.2.4 Technical Considerations

Technical considerations such as latency and performance may make it necessary to deviate from this recommendation from a legal perspective.

In the following, different options for organizational structures and data exchange scenarios will be outlined to support a company's decision on how to plan their legal representation as data provider and consumer in the Catena-X Ecosystem from a **technical perspective**. Please note that these options are not exhaustive, and only meant to provide a first overview. Organizational structures differ, accordingly, these scenarios need to be interpreted and evaluated in the context of an individual company structure, data strategy, participation scenario, and legal governance. To illustrate different perspectives, the scenarios as outlined in figure 5 above are clustered into requirements by data providers and data consumers.

Scenario 1 - One legal entity and one site in one country

In this scenario, an organization with one legal entity and one site in one country is being considered. This legal entity has one address (one BPNA) in one country only and is a participant of



the Catena-X Ecosystem. When deciding to become either a data provider or consumer, specific conditions need to be met:

- **Data providers** will have one EDC for their legal entity and **one additional EDC*** for each SaaS Solution used.
- **Data consumers** need to ensure compliance with access & usage policies. In case policies are not fulfilled, an inquiry for an updated contract offer with changed policies to the provider shall be initiated. Additionally, it needs to be assessed which managed service is legally and technically feasible to use.

Scenario 2: One legal entity and multiple sites in one country

- **Data providers** will have one EDC for their legal entity as the ownership of data resides with the legal entity and not with individual sites. However, **one additional EDC*** for each SaaS Solution used will be required. Alternatively, it is possible to deploy **multiple EDCs** if there is an individual self-sustaining IT (e.g. Plant IT). This option, however, **increases complexity** and makes it harder for consumers to find data as consumers need to first filter out the correct EDC that refers to the corresponding data set.
- **Data consumers** need to ensure compliance with access & usage policies for all internal usage and consumption of information from Catena-X participants. If the data provider requests to use data **only for one specific site**, there are two options:
  - (1) Ensure data separation via processes & tools or
  - (2) deployment of a complete IT stack for the site in question.

Scenario 3: One legal entity and multiple sites in different countries

- **Data providers** will have one EDC for their legal entity as the ownership of data resides with the legal entity and not with individual sites. However, **one additional EDC*** for each SaaS Solution used will be required. In **most cases**, one EDC* for multiple countries is sufficient.
  - When there is legal obligation that data may not leave a specific country, this specific country requires its own IT stack. Prior to data sharing to specific countries, for example, one might not be allowed to exchange data that resides in China through an EDC that is hosted in Europe, even if the EDC itself does not store data but only transmits it. In this case, a separate EDC for data provisioning in China is required.
  - If a use case requires real time data sharing, the EDC should be deployed where the data resides. Accordingly, an additional EDC with the same BPNL in a separate country might be required.
  - In case there is a self-sustaining IT (e.g. Plant IT) another option would be to deploy multiple EDCs with the same BPNL. This option, however, increases complexity and makes it harder for consumers to find data / retrieve digital twins.

* When using SaaS, the Service Provider will host the infrastructure and the service, however, the EDC must be registered, and data contracts must be legally owned for specific partner. This may result in additional EDCs that need to be deployed.

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

- **Data consumers** need to ensure compliance with access & usage policies for all internal usage and consumption of information from Catena-X participants.
  - If the data provider requests that data does not leave the specific country / region, a **separate IT stack** needs to be deployed in the corresponding country.
  - Additionally, the legal department should review what special requirements are to be considered for personal data.

Scenario 4: Corporation with multiple legal entities

When multiple legal entities are in place, there is the possibility of data exchange via a lead legal entity on either side.

- **Data providers** have two options:
  - (1) Depending on the organizational and technical setup, **each legal entity** can have its own EDC or
  - (2) the organization decides to define a lead legal entity and only registers **one EDC*** with one BPNL if it is ensured that the corresponding "Lead" legal entity is **organizationally and technically entitled** to handle the data exchange for associated legal entities.
- **Data consumers** need to ensure compliance with access & usage policies. Data Providers need to be aware of the lead legal entity, as they define on a BPNL level, with whom to share data. In this case the BPNL of the lead legal entity and not of the actual entity needs to be listed. Additionally, they have two options:
  - (1) If the data provider **allows** to share data with affiliates, **one parent legal entity** with one EDC is sufficient for the data exchange or
  - (2) If the data provider **allows** data usage **only for one legal entity**, the connectors **cannot be shared** (since one connector represents one legal entity). In this case, the legal entity must have its own EDC.

Further Exemplary Scenarios: Corporation with multiple legal entities and/or sites in the same and/or different countries

The last illustration shows exemplary that organizations may have multiple legal entities and/or sites which themselves may or may not be separate legal entities. Due to this **complexity** and **variety** of different possible organizational structures **not every single** scenario or data exchange option can be listed in this guide. In all cases, however, data consumers and providers can follow and extend the recommendations listed in the abovementioned scenarios 1 – 4. While these scenarios are **not exhaustive**, they serve as a first overview for companies to consider their individual setup for representation in the Catena-X Ecosystem.

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

4.2.3 Frame Agreements & Contracts

For the success of the Catena-X Ecosystem and each individual partner it is crucial to know the legal and contractual requirements for the participating companies which are needed to allow for data exchange between the Catena-X participants.

Those requirements are two-fold:

- Those imposed by Catena-X to regulate **joining the data space** (such as agreements during registration with an Operating Company as well as general Catena-X Governance frame agreements)
- Those imposed by the participating companies to **regulate data exchange** (like data offers together with access and usage policies)

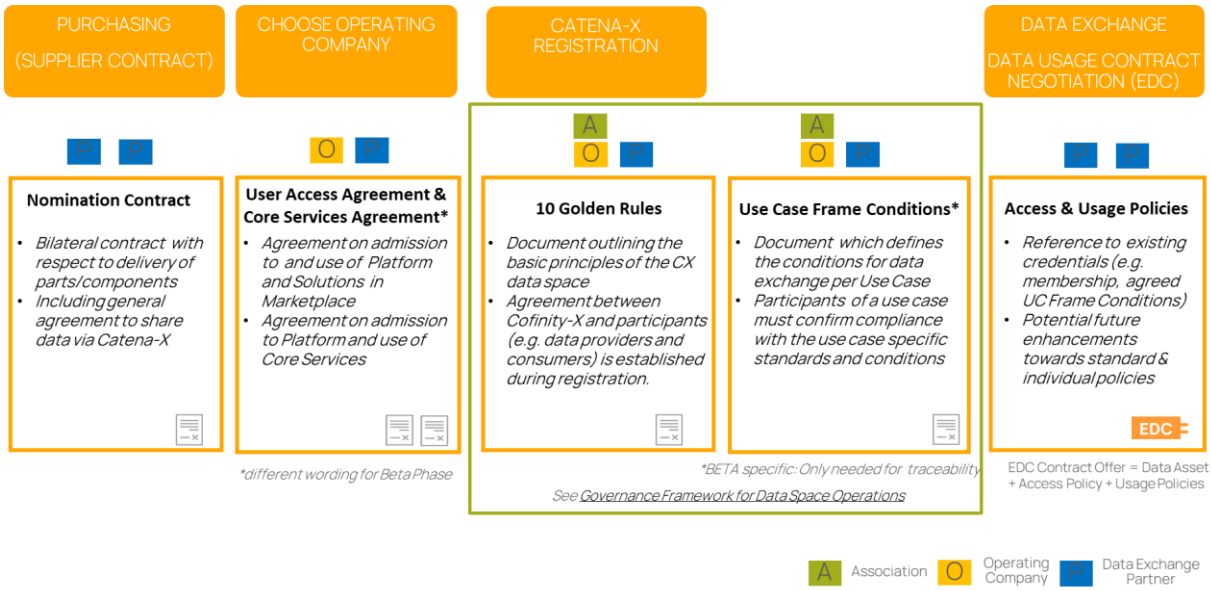
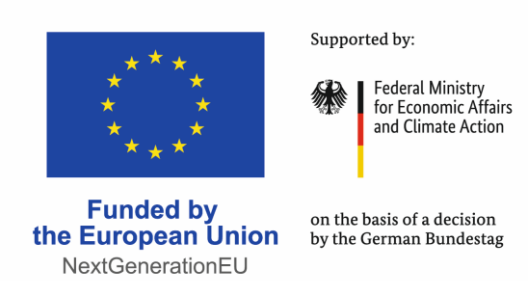


Figure 6: Overview Catena-X Regulatory Frame

For more details on how different layers are defined in the Catena-X Governance Frame to implement the concept of Data Sovereignty, please also refer to the later section on Data Sovereignty.

4.2.3.1 Joining the Network

Prior to data exchange between two parties, the partners must registered with the Catena-X central service to be listed as valid participant (e.g. Catena-X AGB). The token received at registration will allow a data consumer to ask for data offers from the data provider.



For this purpose, an ecosystem of providers will emerge who provide the operation and other services with the Operating Companies. The selected Operating Company will become the legal contractual partner for customers and thus form the basis for business use of the data ecosystem.

4.2.3.2 Regulating the Data Exchange

As already mentioned in the sub-chapter "Information, Data Protection & Policies" data is linked to policies via EDC-negotiated contracts in which data usage "rules" are defined. Each data provider will create so called contract offers for specific data assets that he wants to make available to data consumers. A contract offer consists of the data asset (a description and access instructions to the actual data) and access and usage policies. Access policies define, which partner can see a contract offer in the first place. Usage policies define the rights and obligations of the data consumer that he needs to follow when he consumes the data. If a data consumer agrees to the contract offer of a data provider, a contract agreement is made. As the contract is legally binding it is crucial that you ensure, that the usage and access policies are known and adhered to.

If required, you can find more details on how contracts regulate the data exchange in the chapter technical overview and its subchapters in the IT Specialist part.

Ultimately, your company needs to understand and adopt one of the principles of the Catena-X Ecosystem, Compliance by Design:

4.2.4 Compliance by Design

On data usage level, there will be no more paper-based data usage contracts between two partners. For specific data offerings, those will rather be electronically negotiated through the EDC. This needs implementation of technology and processes to ensure compliance with applicable law and regulations, but ultimately enables audit-proof retention of the contracts on both sides. For further details refer to the Catena-X Governance Framework for Data Space Operations[12].

4.3 Catena-X Roadmap

For the most recent Catena-X roadmap please refer to the currently published Catena-X overview[13] document on the Catena-X website.

[12] Catena-X Governance Framework for Data Space Operations
[13] https://catena-x.net/fileadmin/user_upload/Vereinsdokumente/Catena-X_general_presentation.pdf

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

5. IT SPECIALIST

The **IT Specialist** is ultimately **responsible** for the technical setup of Catena-X related components, technical integration, and provision of data. In this chapter, you will learn how to successfully establish technical connection to the network and the follow-up topics such as network monitoring and security from an IT specialist's point of view.

The following content focuses on the onboarding perspective of an IT Specialist and provides initial information based on the most important onboarding related questions for that role.

- The sub-chapter "**Integration Lead**" explains the core tasks and responsibilities of person responsible for leading the technical implementation of Catena-X related components.
- The sub-chapter "**Introduction of Dataspaces**" elaborates on the general concepts regarding data spaces in context of Catena-X. This chapter further talks about data discover, data sovereignty, interoperability, and multi-level data chains.
- The sub-chapter "**Technical Overview**" talks about how EDC data access policies and usage in regard to the Catena-X Ecosystem. This sub-chapter will also give you an overview of DT registry, deployment view and technical enablement.
- The sub-chapter "**Backend Integration**" is a quick introduction to the **data integration patterns guide**, which will help you understand the possibilities, advantages, and disadvantages of different backend integration options for your set-up. It also gives you insights into best practices for building data pipelines for external data exchange. For more and detailed information on Backend Integration, please refer to the **data integration patterns guide in the appendix.**
- The sub-chapter "**IT Operations in Context of Catena-X**" informs you about the specifics that need to be considered when adapting company internal processes and tools to a decentral network. This will thereby ensure stable, secure, and reliable network.
- The sub-chapter "**Overview of Consulting Offers**" will equip you with details on possible consulting support that will make your technical onboarding journey seamless.
- Finally, for more information on the topic of "Technical Enablement", please refer to chapter 7 "**key onboarding steps and requirements"** for the important steps you need to follow.

5.1 Integration Lead: Role and Responsibilities

An Integration lead in the Catena-X context is a person who can take decisions of filling IT roles in the Catena-X environment, is aware of requirements processes and associated responsibilities of the use cases and is competent to take important decisions regarding Catena-X IT budget usage.

5.1.1 Integration Lead: Tasks

Typical tasks of an Integration lead include the following:

- Development/coordination of an E2E requirement process for Catena-X related issues in the direction of organization's IT
- Representing the interests of Catena-X related topics (with focus on IT) in the organization's IT functions

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

- Communication of the latest Catena-X Ecosystem developments in the direction of organization's IT
- Escalation instance for use cases with regards to organization's internal IT topics with technical subject relevance (without general workplace problems)
- Coordination of individual organization's IT departments for the overall project
- IT budget control for organization's Catena-X project part

5.1.2 Integration Lead: Responsibilities

Further, the main responsibilities of an Integration lead consist of the following:

- Complete overview of the Catena-X related requirements for organization's IT and their planned completion dates
- Creating transparency about impediments with regards to Catena-X requirements in organization's IT
- Ensuring delivery dates that are aligned with the Catena-X project plan
- Finding interim solutions and developing alternative scenarios if delivery dates are too late for the requested solution

5.2 Introduction to Data Spaces

Data spaces aim at providing an end-to-end solution for data integration and data exchange between organizations. Data spaces help to overcome the traditional practice of engaging in data silos by allowing to manage and exchange your data in a shared space.

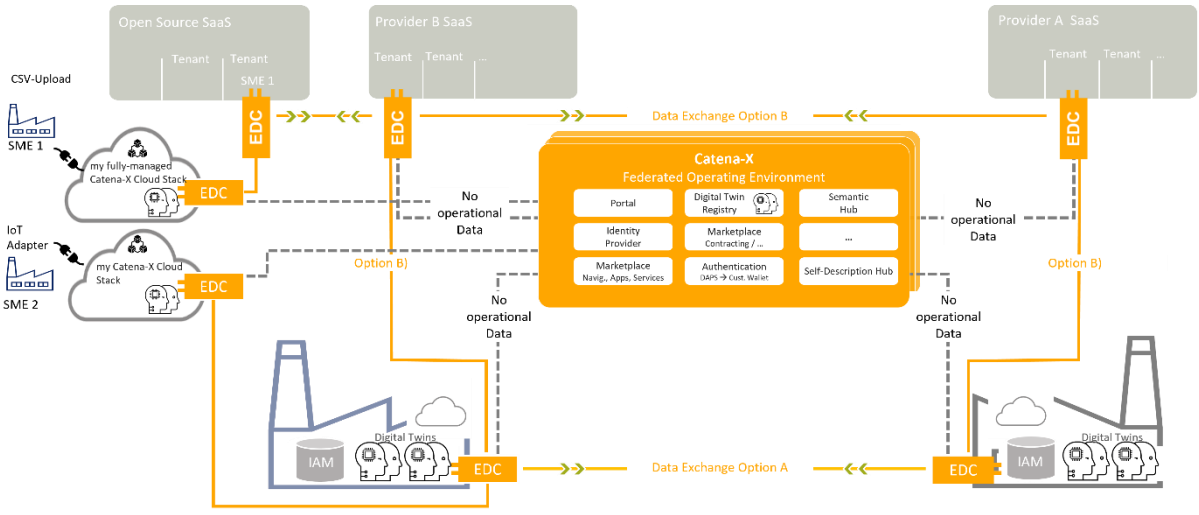
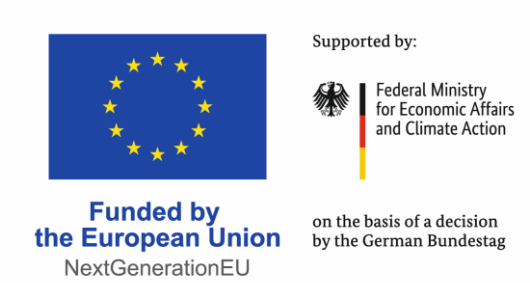


Figure 5: Catena-X Data Space

There are several major initiatives that shape and drive the creation of data spaces. The Catena-X Ecosystem is inspired and guided especially by the following two organizations.



International Data Spaces Association (IDSA) in a collaborative effort by over 130 member companies to derive the value of their data to the greatest extent by inculcating a culture of trust and equal partnership. The goal of IDSA is to drive data economy across industries by realizing and implementing global standards for international data spaces (IDS). IDS connector has been developed further to enable direct metadata transmission via EDC interface. You can find more about IDSA on their website.[14]

Gaia-X aims to create a federated open data infrastructure based on European values regarding data and cloud sovereignty. Gaia-X and Catena-X share the same values including openness, transparency, trust, and data sovereignty. You can find more about Gaia-X on their website.[15]

Further initiatives that are worth mentioning are:

- Data Space Business Alliance[16]
- Data Space Support Center[17]
- The EU Project "SIMPL"[18]

5.2.1 Concepts of the Catena-X Data Space

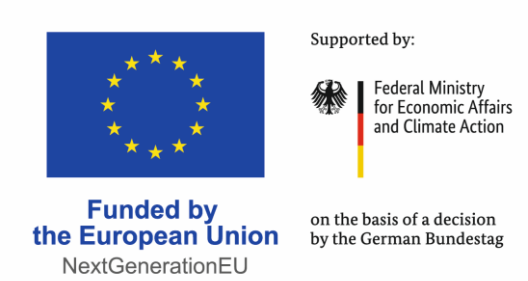
The Catena-X Data Space contains most of the features which can be found in any data space such as decentral data sharing or data discovery mechanisms. In addition to that, the Catena-X data space puts special emphasis on the following concepts, which the subsequent chapters describe on a high level:

- Data Sovereignty
- Interoperability
- Multi-Level Data Chains

5.2.1.1 Data Sovereignty

Data Sovereignty can be defined as a natural person's or corporate entity's capability of being entirely self-determined with regards to its data.[19] Data sovereignty is a principle that spans multiple layers of the dataspace ecosystem. These layers range from identity and attributes of the Catena-X Ecosystem participants and services that are trusted and verifiable, through middleware provisions for data sovereignty, such as ability to define access and usage policies, sign contracts and verify the validity of the conditions before the data exchange takes place, through the end-user applications on both data consumer and data provider sides being able to integrate with the Catena-X services to read and enforce usage policies.

[14] https://internationaldataspaces.org/
[15] https://gaia-x.eu/
[16] https://data-spaces-business-alliance.eu/
[17] https://dssc.eu/
[18] https://digital-strategy.ec.europa.eu/en/news/simpl-cloud-edge-federations-and-data-spaces-made-simple
[19] https://gaia-x.eu/faq/glossary/



Data sovereignty can be enforced in two ways – legally and technically. Legally enforcing data sovereignty means that a data provider can formulate the rules and obligations that a data consumer needs to follow when consuming the data in a legally binding way by data contracts. The issue is that the data provider has little to no control mechanisms if the data consumer in fact does follow those rules. Technically enforcing data sovereignty means that the applications on data consumer side can understand imposed usage restrictions and automatically execute them, such as a "delete data after 30 days" usage restriction.

Currently, legal (and thus organizational) enforcement of usage policies is the only viable option, however in the future, the technical enforcement could be made possible. This will require integrating an engine that can read and understand usage policies and apply them to data within applications. Access policies are already enforced technically by the EDC and data is only transferred to partners that meet the requirements stated in those access policies.

To ensure data sovereignty within the Catena-X Data Space, the **Governance Framework for Data Space Operations**[20] is established, which contains multiple levels.

Data Space Level

The "golden rules" on data space level outline the basic principles which all participants in the data space need to follow. It anchors the framework conditions per use case as well as the usage and access policies as binding principles.

Use Case Level

The "Use Case Policy" per use-case regulate the obligations and duties of data providers and consumers within a use-case. They are based on the latest standards and data sovereignty guidelines.[21] Among others, the policy defines, which semantic models will be exchanged within a use-case, which usage-policies can be used or for how long data is exchanged. Frame conditions can be referenced technically with a framework condition ID. Application Providers need to ensure that data providers and consumers can fulfil the framework conditions while using their apps.

Data Offering Level

On the level of concrete data offers, policies govern who can access the data (access policies) and under which conditions the data is shared and can be used (usage policies).

Data Usage Level

At this level, automated negotiations of data usage contracts between participants for specific data offerings occur through the Eclipse Data Space Connectore (EDC).

---

[20] Catena-X I Governance Framework for Data Space Operations
[21] Catena-X Standards I Catena-X

5.2.1.2 Interoperability

Interoperability, along Data sovereignty, is one of the two core architecture principles in the Catena-X Ecosystem.

In today's business world, many issues cannot be resolved by a single corporation in isolation but only in collaboration. Collaboration is the striving of multiple entities (individuals or organizations) to achieve a common goal. To support that, it is essential that the IT systems supporting the individual entities' processes can be integrated appropriately to run processes and joint issue resolution across organizations.

Interoperability is the ability of different systems, devices, applications, or products to connect and communicate in a coordinated way, without effort from the end user. Functions of interoperable components include data access, data transmission and cross-organizational collaboration regardless of its developer or origin.

The idea is that no matter which application or service is used by a company within a use case, data can be exchanged with other participants. Interoperability builds on top of the concept of a shared semantic, standardized data exchange mechanisms and calculation logics.

Company A can use a completely different application than its supplier B to calculate its CO_2 footprints, and because both apps are interoperable the app of company A can calculate its footprint based on the values provided by its supplier.

5.2.1.3 Multi-Level Data Chains

Catena-X is organized around use-cases, of which many only work when a complete supply chain from Tier-X up to the OEM or even recycler combine their data in a meaningful way:

- A recycler needs to know, which raw materials he can extract from a battery cell which is provided by a Tier-2 supplier.
- An OEM needs to know the exact CO_2 footprint values of its supply chain to effectively reduce it.
- Demand and Capacity values need to be propagated from Tier-N to OEM and back to effectively optimize production and transport.
- Technical actions can dramatically be reduced in size and effort if a microchip-producer can tell an OEM exactly, which of his vehicles are affected by a defect.

The goal of Catena-X is **not** to send all data to the OEMs and store them in a central platform, as the network is decentral in nature. Rather, the idea is to keep a "1 up – 1 down" principle: Data is only shared with direct customers or suppliers to keep data sovereignty and not disclose any information about customer-supplier relations to other parties in the tier-chain. For the use-cases this means that data is recursively collected and aggregated before it's sent from lower to higher tier-levels.

5.2.2 Decentral Data Sharing

Opposite to existing data platforms, where data is collected and distributed by an intermediary, the Catena-X data space is decentral in nature. There is no third party that has control over the data that is shared between data provider and data consumer. Every data exchange happens on a peer-to-peer basis. Central components are only used to facilitate the data exchange by e.g., providing data discovery mechanisms or lookup functionality for semantic models.

5.2.3 Identity and Trust

Because the Catena-X data space is decentral, the correct and reliable identification of business partners with which data is shared, is of utmost importance. A data provider needs to be sure that the data consumer is really who he claims to be, and vice versa. This requirement puts special emphasis on the concept of identity and trust. During onboarding, each member company needs to undergo a know your customer (KYC) process where the identity of the company is validated by a trusted third party. The third-party issues a Catena-X identity and guarantees for its correctness, acting as a so-called trust anchor. During data exchange, the data provider and consumer can, by the means of cryptographic keys and certificates proof their identity to each other.

5.2.4 Data Discovery

Because the data is distributed across all participants and each participant offers different data, mechanisms, and tools to discovery, browse, and filter all the various data assets are needed. Of course, each company stays in full control over which of his partners can see which data assets. Those discovery mechanisms can be fine-tuned to a degree that only one specific partner can discover a certain data asset. Catena-X platform plays the intermediary role of connecting the data provider and data receiver.

5.2.5 Standardized Semantic Models

A standardized semantic model - or standardized meaning of data - is one of the prerequisites for the growth and adoption of the Catena-X data space. Catena-X is organized around sharing data in predefined use-cases. Imagine, that each participant within those use-cases would come up with its own descriptions of the fieldnames in a dataset and then would need to explain to all of its customers and suppliers, what the fieldnames mean. This surely isn't a scalable approach. To overcome this challenge, the Catena-X association creates standardized semantic models which are shared by every participant in a use-case. Each participant must ensure that data that he sends to partners follows that standardized semantic model and in turn the recipient knows the exact meaning of the data that he is receiving.

Semantic models are described using specific semantic modelling languages. The to be used modelling languages are also standardized within the Catena-X Ecosystem.

In case two partners decide to share data outside of the agreed use-cases, they do not necessarily have to standardize a semantic model for the data they exchange.

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

5.3 Technical Overview

The following subchapters provide an overview about relevant technical concepts within the Catena-X context.

5.3.1 How Data Connectors (EDC) Implement the Idea of Data Sovereignty

The EDC enables data exchange across the Catena-X data space while maintaining conditions of data sovereignty and interoperability. The EDC is a set of reference implementations and standardized specifications (APIs, protocols etc.) that allow data flow conditions verification and orchestrate the data exchange preparation and data flow.

Each data provider will create so called contract offers for specific data assets that he wants to make available to data consumers. A contract offer consists of the data asset (a description and access instructions to the actual data) and access and usage policies. Access policies define, which partner can see a contract offer in the first place. Usage policies define the rights and obligations of the data consumer that he needs to follow when he consumes the data. If a data consumer agrees to the contract offer of a data provider, a contract agreement is made. This contract agreement is legally binding.

In a way, the EDC only digitizes the manual and cumbersome process of creating classic data exchange contracts, drastically reducing the time that is needed to exchange data between two organizations.

The EDCs on data provider and data consumer side will each provide a snapshot of each contract agreement, including the digital signature that was used to sign the contract offer. Logging of all involved steps of data exchange, as well as the documentation and storage in “human-readable” form will be handled technically by the EDC. However, each partner (data provider and consumer) must make sure that they comply with the agreed policies.

The following figure shows the end-to-end process of contract negotiation, from contract offer creation by a data provider to data processing by a data consumer.

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

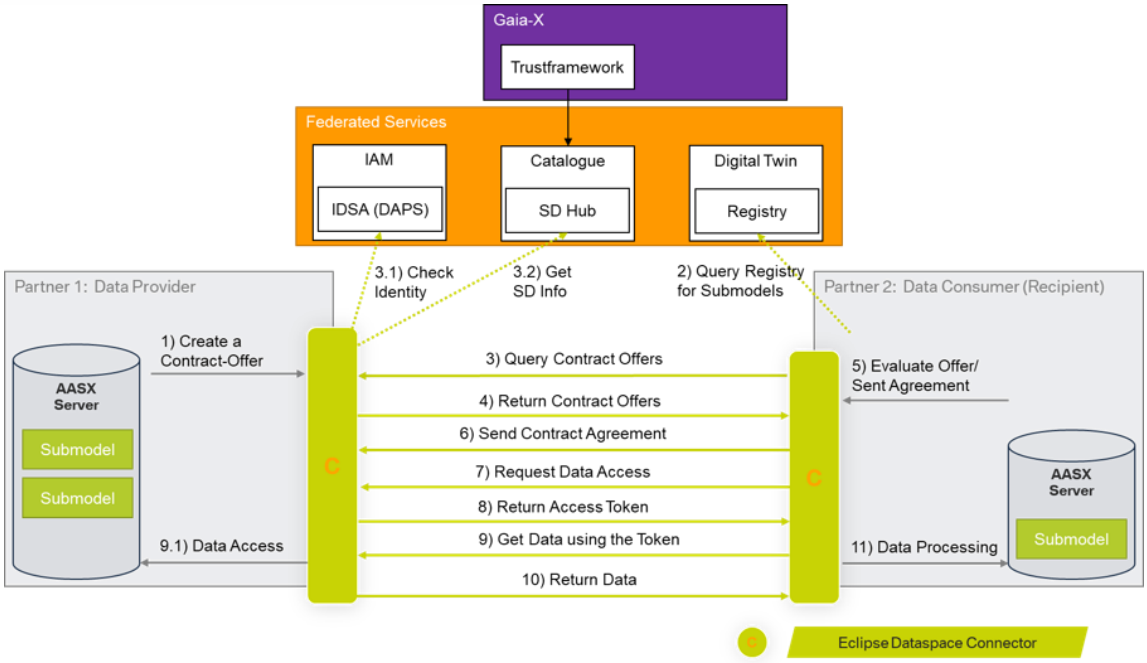


Figure 6: Data Offering Process

The following sections explain in more detail how the EDC implements data sovereignty principles in the context of the Catena-X data space.

5.3.1.1 Attribute Based Access Control

The concept of Attribute Based Access Control (ABAC) is usually implemented on an individual employee level. In Catena-X, ABAC refers to the level of companies. Companies can have a variety of different attributes, such as but not limited to:

- Specific type of company (e.g. a “Recycler”)
- ISO certifications
- Headquarters in a specific country
- Company Identifiers (e.g. Company Registration Number/”Handelsregisternummer”)

The attributes of a data consumer can be used to determine, which data assets a data provider offers to his partner. The other way round, a data consumer could decide to only consume data from providers which e.g. have certain ISO certificates.

5.3.1.2 Access Policies

The EDC Contract Offer Access Policy limits who (which companies – or rather which connectors of those companies) can access the contract offers of a data provider.

Note: access policies, as implemented by the EDC, don’t refer to enforcement of back-end system data access rules (ACLs).

5.3.1.3 Usage Policies

Similar to access policies, a data provider will be able to create a set of standardized usage policies in the process of data offer creation. Usage policies state the rights and obligations that a data consumer must follow when he agrees to the contract offer.

Data providers will be able to select pre-defined usage polices and modify their attributes or parameters and, if the pre-defined policies are not enough for the data to be shared, within the Catena-X data space a free-form policy will allow the data providers to add any number of text policies to the data offer.

Initially, the following data usage policies have been defined and agreed upon:

Duration-restricted Data Usage	Role-restricted Data Usage	Purpose-restricted Data Usage
The data asset can only be used for a specific time. The duration of the usage time is defined in the policy itself. It starts counting after the contract agreement is made on the control plane, even before the data transfer itself is made on the data plane.	The data asset can only be used by specific persons or roles (e.g. a quality engineer is allowed to see the data asset while the risk department isn't allowed).	The data asset can only be used for a specific purpose (e.g. only the quality investigation scenario is allowed to access the data asset). This policy is similar to the role restricted data usage policy.

Table 1: Data Usage Policies

It is important to note that, since these policies govern HOW the transmitted data can be used, these policies are not technically enforceable at present. However, since they are included in the contract agreement signed by both data exchange parties, the data consumer is legally bound to observe the policies and to execute them according to their conditions. Companies participating in the Catena-X Ecosystem need to be aware and think about possibilities to implement supporting procedures that help them to adhere to the policies into their local systems. An example of such a non-technically enforceable policy would be a policy stating that the transmitted data can only be used for a given number of days after which the data has to be deleted.

To provision for the technical enforcement of the usage policies in the future, the Catena-X association is planning to define a certification process for the vendor applications that would verify that the applications can access, read the usage policies and, most importantly, enforce them within their business logic implementation. This certificate process would, most likely, be optional but it could be a supporting factor in market penetration of the commercial application that is certified to comply with Catena-X usage policies.

5.3.2 Digital Twins to Access Data

Many of the Catena-X use-cases are built on top of the Asset Administration Shell (AAS), an implementation of a digital twin.[22] Digital twins are virtual representations of physical product, system, or process. Each twin can have multiple aspects[23] that describe certain areas or behavior of a specific twin.

The digital twin registry lists all digital twins (a digital representation of assets) centrally and references their aspects including information about the underlying asset, asset manufacturer, and access options (e.g. aspect endpoints). This central service provided by Catena-X will be replaced with a decentral registry in the near future, which will be source of decentral information. Please note that documentation will be updated as new information on updates becomes available.

Note: Not all Catena-X use-cases use a digital twin registry to discover data. Nevertheless, it is one of the core technical components and needs to be understood in detail.

5.3.3 Deployment View

The deployment view will show you an execution architecture of the Catena-X system, including a hardware or software execution environment and the middleware connecting them. It provides an overview of Catena-X components (EDC, DT Registry, …) and concepts (SAMM[24]/AAS) from both internal as well as partner perspective (outside view).

The Catena-X deployment View will be updated with each release and published as part of the technical documentation to Eclipse Tractus-X.[25]

5.3.4 Technical Enablement

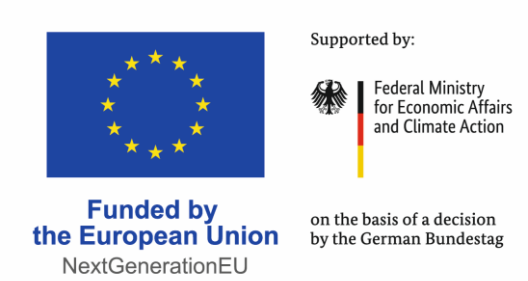
The technical enablement process will empower you to use the Catena-X platform with ease.

For more information, please refer to the "Technical Enablement" area of key onboarding steps and requirements for the important steps you need to follow.

5.4 Backend Integration

Understanding the different ways one can connect their existing backend systems and applications with the Catena-X data space to successfully enable data provisioning and reception is a crucial part of the data exchange process. A separate data integration patterns guide will give you a tour of

[22] https://industrialdigitaltwin.org/wp-content/uploads/2022/12/2022-12-07_IDTA_AAS-Reading-Guide.pdf
[23] An aspect of a digital twin includes both structural as well as behavioral data and models.https://industrialdigitaltwin.org/wp-content/uploads/2022/12/2022-12-07_IDTA_AAS-Reading-Guide.pdf
[24] https://projects.eclipse.org/projects/dt.esmf, https://github.com/eclipse-esmf/esmf-semantic-aspect-meta-model
[25] https://eclipse-tractusx.github.io/



different patterns you can use to connect backend systems for data exchange and their advantages and disadvantages – general and Catena-X specific.

*In order to learn more about these patterns, please refer to the **data integration patterns guide** in the appendix.*

5.4.1 Building Data Pipelines for External Data Exchange

There are two specific scenarios in context of external data exchange that need to be considered:

- Outbound: Data provisioning to external partners
- Inbound: Data Consumption from external Partners

As the data demands by partners will often not be known upfront, it is important to be able to react to change requests quickly and design and build data pipelines that are configurable and can be adapted to the specific needs of partners.

Moreover, it needs to be ensured by processes and tools that the IT department is able to technically implement the access and usage policies specified and agreed by business.

Finally, when receiving data from external partners and potentially enriching internal systems with this information, you will need to not only comply with your IT Security Rules and Regulations, but also be able to observe usage policies of the data that is imposed by the data provider.

5.5 IT Operations in the Context of Catena-X

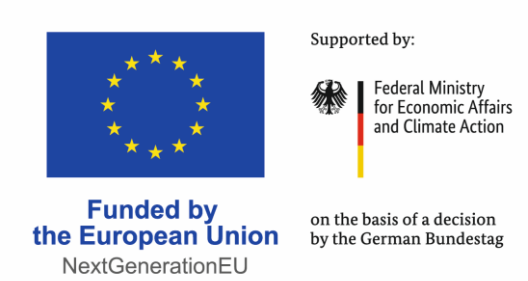
A decentral network that spans across multiple companies imposes some specific challenges on IT operations within each of these companies. Each company has its own and specific tools and processes for operations. However, for most of the tasks of IT operations, there needs to be interaction and coordination with partners outside of the organization.

The following chapter tries to give an overview of the specifics that need to be considered when adapting company internal processes and tools to a decentral network.

This overview is by far complete and won't give specific instructions on how to organize a company's IT operations. It will be a joint effort of all member companies of Catena-X to harmonize the processes and interactions for joint IT operations to ensure a stable, secure, and reliable network.

5.5.1 Monitoring & Logging for Data Transfer

To ensure reliable operations across multiple tier-levels, a minimal consent on monitoring needs to be found. Concepts like proactive monitoring, automated creation of tickets based on thresholds and anomaly detection should be a common ground.



Logging becomes especially important in the context of data exchange. For revision purposes it should at least be logged which partner company consumed which data asset when, logging attributes like IP-addresses, executed queries and timestamps becomes crucial. Furthermore, alignments on log-retention policies will be needed so that – in case of an incident that spans two or more companies – all involved parties have the same minimal level and availability of logs to analyze the incident.

5.5.2 SLAs in a Data Space Context

While there won't be any predefined SLAs that are effective for the whole network, the members of the Catena-X Ecosystem might jointly define an SLA baseline depending on the criticality of business processes behind the use-case.

SLAs must be seen on multiple levels, not only concerning the "classic" areas that are listed in ITIL v4.

- Joining a use-case

No specific SLAs apply for timelines to join a use-case. Each company has the same interest of joining as soon as possible after having taken the decision to join to realize the business value.

- Release new kind of data to partners

As not all data that is potentially required by data consumers can be released upfront by a data provider (or it is simply not known at the time of contract offer creation who will request data), processes and agreements need to be in place to offer a reliable forecast when the data will be available. This includes the technical preparation of data assets as well as governance processes.

- Transfer data that is released already

For the permanent data exchange process and potential incident investigations it would be beneficial to agree on minimum lead times so each party can evaluate quickly if data transfer is hanging, or data is just still in the process of transmission. Such lead times may vary from data asset to data asset and from party to party. Important is that parties on both sides of the communication chain are familiar with the base line that has been agreed.

Furthermore, an organization needs to be able to react in time to data quality issues or change requests that are raised externally and/or inform data consumers about internal issues in data quality.

Classic ITIL Process SLAs for Incidents, Changes, Problems

Active participation in the Catena-X Ecosystem requires operating several network facing components (if not bought as managed services), such as the EDC. There needs to be SLAs for incidents, changes and problems that can be triggered by individuals outside of the organization.

5.5.3 Extension of IT-Service Processes

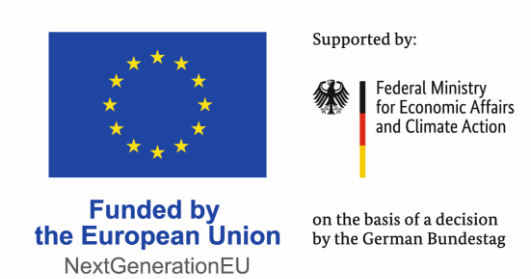
From a process perspective, operations in a network must address the following items:

- **Bridging of Different Tools**: Each partner in the network has its own brown field of operations processes and tooling already in place. However, the interaction in the network must be organized. Therefore, apart from the differing SLAs also Tool fractions must be identified, discussed and mitigated. This applies to the connection Data Provider <--> Data consumer as well as to the connection Data Consumer/Provider <--> Operating Company. In this context SaaS Providers are considered as being part of the data provider/consumer's organization.
- **Way of Communication of Incidents**: Anticipating that there will be an incident situation sometimes the Communication of those has to be organized as well in terms of
  - format (E-Mail, Jira, Calls, etc.),
  - language,
  - right target group (relevant partners and even within a relevant partner different stakeholders might have to be informed),
  - group of stakeholders depending on the criticality of the incident to be predefined and finally
  - target group adequate level of detail (management summary with KPIs if needed)
  - criteria how to classify an incident being relevant for network communication also has to be defined (easy to use decision matrix)

5.5.4 On the usage of FOSS

If a company decides to use and operate the FOSS reference implementations of EDC and further components to provide and consume data, they need to be aware of the implications of using FOSS in a business context:

- **Licensing**: All reference implementations are released under Apache 2.0, which is a very unrestrictive license when it comes to commercial use of software. Furthermore, the Catena-X consortia that developed the reference implementations took great care to not use any restrictive copyleft licenses that restrict commercial use in subcomponents of the reference implementations. However, there still might be transitive licenses from packages or tools used by the reference implementations that pose restrictions on the use in a specific business context. Thus, a check of all used licenses and sub-licenses against the company internal FOSS-whitelist is advised.
- **Interaction with FOSS-Community**: The development of components in FOSS-projects follows its own rules. If e.g., a security issue is detected, there aren't any SLAs that guarantee fixing the issue in a certain amount of time. Rather, someone has to pick up the task to close the vulnerability and provide a fix which then needs to be implemented by each affected partner. New features or required changes to adapt a FOSS component to a specific enterprise IT setup can't be simply requested but would rather need to be developed proactively and then contributed to the community. Updates, just as security patches, won't be delivered automatically, as they would be with a managed service from a SaaS-vendor. Companies that use FOSS software, need to be monitoring the projects that they are using for updates and upcoming releases.



- **Scheduled Maintenance and Updates:** One of the challenges of a decentral network is, to keep all components that are deployed at different partners up to date. In case of breaking changes (which will occur), an update window needs to be coordinated jointly.

If no FOSS components are operated and only managed services are used, the whole interaction with the FOSS community as well as special considerations for maintenance and updates aren't as relevant. Nevertheless, even those managed services might use FOSS components and the usage of which needs to be approved

5.5.5 Joint Operations in the Network

This part of the onboarding guide needs to be understood as an outlook, as at the time of its creation, no guidelines and instructions for joint operations are available. While some of the operations tasks can be planned and executed in isolation, some others require coordination.

Even though the operating company will be the driving force behind the following topics, rather than each individual partner, it is likely that there will be the need to join and interact with other partners in the network for some special operations topics such as:

- Network Disaster Recovery

In case of failure of a central network component such as the digital twin registry or the IAM solution, it should be exercised how the network can be brought up again and which impact a failure of the central components has on the decentral components of data providers, consumers, and other network participants. Generally, joint network disaster recovery exercises should be held to understand the reaction of the network on certain downtime scenarios and to take measures for mitigation if needed

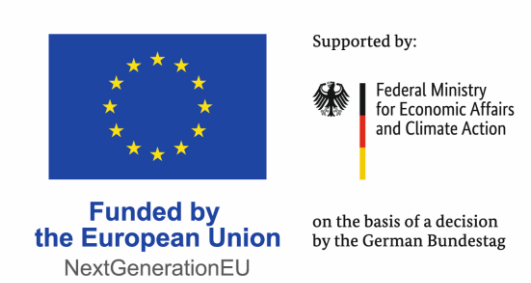
- Testing in Multi-Tier Data Chains

Coordinated testing is necessary to keep the quality of the entire network stable. It will likely be necessary to run regression tests prior to each major release (=breaking changes) or to join integration tests for new features in case they will be used together with partners.

More specifically, as described in 5.2.1, multi-tier data chains play an important role in the realization of the various use-cases. The "1 up – 1 down" principle implies that information will be recursively passed up and down the supply-chain to calculate results. This means that the functionality of those components needs to be tested not just with a direct customer or supplier, but with multiple levels of the supply-chain.

- Penetration Tests

Compared to a monolithic, company internal system, where the possible cyber security threats are manageable, the attack vectors in a decentral network are as diverse as the IT landscape of its participants. It might be enough to compromise only one component of one participant to cause harm to many other participants. This makes cyber security one of the top priorities of a decentral network. Which means that penetration tests are a scenario as-close as possible to the productive



network that test the diverse setup of components is highly recommended. To keep the security level on a high level and to avoid leaks in the communication between the partners it could be useful to organize and join white-hat hacking.

5.6 Overview of Consulting Offers

Consulting packages will assist you in ensuring successful onboarding to the Catena-X Data Space and help your organization along the way.

You may work with your existing DevOps Partner(s) and agree on specific consulting packages for services of specific technical support you require. It may as well be reasonable for you to work with Consulting Service Providers who already have experience in the context of Catena-X. In this case, you will find a list of Catena-X qualified Consultancy Service Providers and the scope of their offer via the respective Catena-X Service Marketplaces. In both scenarios, details must be defined and agreed on individually based on your companies needs and range of services offered.

As a base recommendation for technical enablement and operations, essentially three packages may be useful to consider on a fixed price basis:

1. **Rollout Package:** helps the participants with the rollout tasks such as core EDC setup, data mapping for use cases and data lake connections. This package could be offered in different sizes with varying number of use cases in scope.
2. **Individual Package:** assists with individual tasks such as establishing high availability landscape for PROD, establishing monitoring tooling and incident alerting, and developing extensions as EDC Add-Ons. The scope of services varies again depending on agreed package size.
3. **Support and Maintenance Package:** provides support and maintenance with focus on EDC installment including SLA based support, EDC installment as managed services, etc. The scope of services provided depends on agreed package size.

Further, there should be the option of a Customer Individual Service on demand for additional services that are not covered in the packages mentioned above. These will require additional clarification with the provider.

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

6. BUSINESS SPECIALIST

The following content is focused on the onboarding perspective of a Business Specialist and provides initial information based on the most important onboarding related questions for that role.

- In the sub-chapter "**Business Value Framework**" we will equip you with a framework that may support you to evaluate if joining the Catena-X Ecosystem provides general value to your organization. However, please note that the package focuses only on possible general Catena-X Ecosystem business value. Detailed business value concepts will be provided by use cases. For more information on general benefits, you can also view the **Catena-X General Benefits** section of this package.
- In the sub-chapter **"Data Governance"** we will equip you with the most important information about data management processes, data governance policies, it governance policies and digitization strategy. For in-depth information on Data Governance, we created a dedicated **Data Governance Guide** which you can refer to in the appendix.
- In the sub-chapter **"Data Ownership"** we will equip you with the most important information on how data access, data privacy, and data release as well as source systems, data mapping and data governance to use cases that will impact your business organization. For more information on data ownership you can refer to the **data sovereignty** chapter and the **data integration patterns guide in the appendix.**
- In the sub-chapter **"Organizational Evolution"** we will equip you with the most important information on how your organizational, technical, and legal business- related processes will be transformed through Catena-X participation. As an addition, you can visit **the data strategy** section for more information.

6.1 Business Value Framework

The Catena-X Ecosystem offers your organization a wide range of business opportunities like new data-driven business models and room for innovation. Therefore, we hereby present a framework that you may use to identify in which aspects, services, and use case of Catena-X may provide value for your organization.

Based on the specific need of your organization potential value can be evaluated in four different categories as pointed out in the following visualization. In the General Manager section, you will find general benefits of Catena-X which you might use as a basis for your own specific evaluation.

The business value framework is divided into four categories since Catena-X might create value for your organization in four different ways: Growing revenue, managing costs, increasing intangible value, and mitigating risk.

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

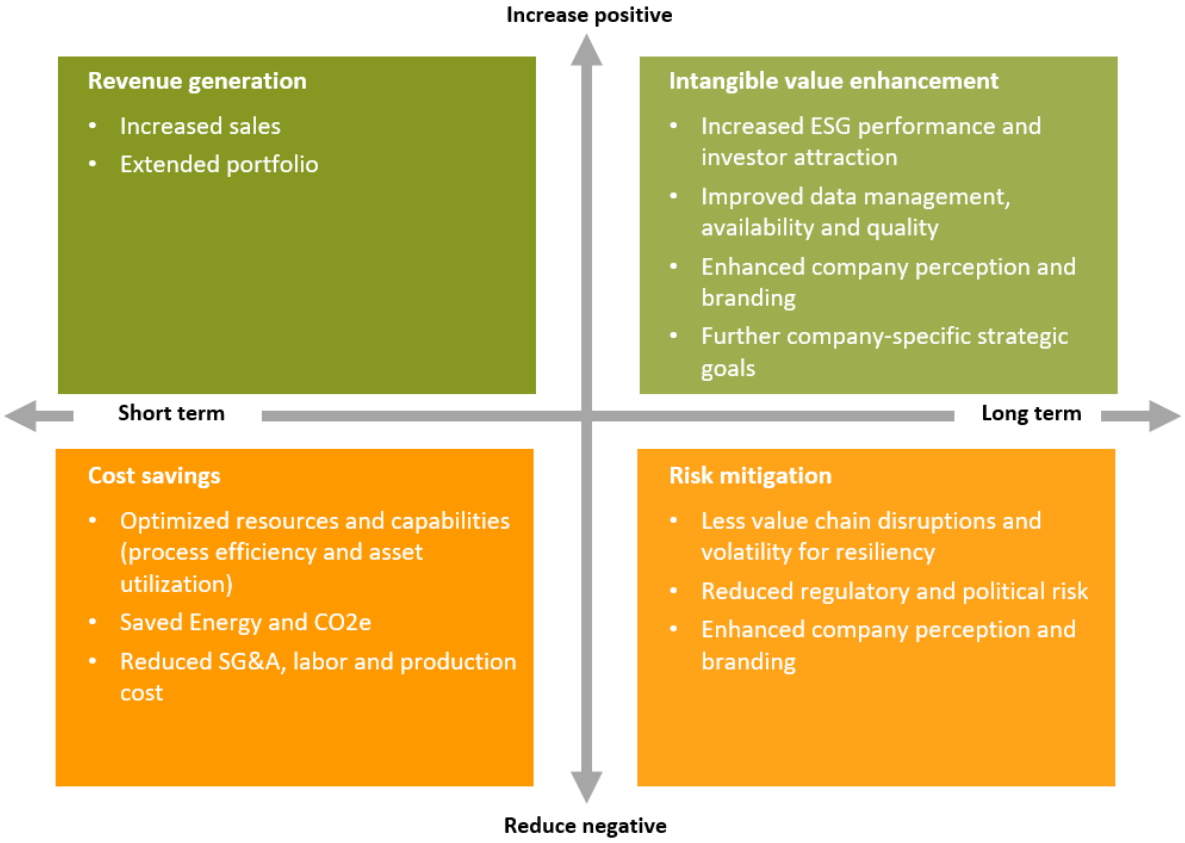


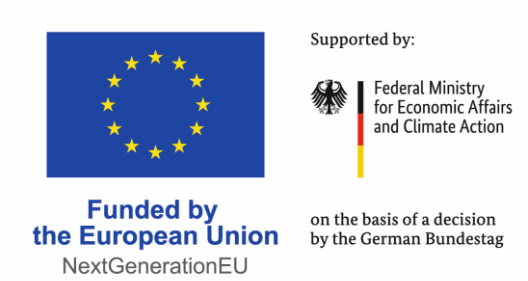
Figure 7: Business Value Framework

6.1.1 Revenue Generation

The following table provides further information about revenue generation potentials.

Category	Sub-Category	Description
Revenue generation	Increased sales	Catena-X offerings might allow enterprises to increase the numbers of sold units. Higher sales volumes can potentially be achieved through **better product performances, competitive advantages, reliabilities in processes, shorter planning times or new business relations.**
	Extended portfolio (e.g., through new business models)	The existing portfolio can be extended as enterprises get the possibility to sell **new products and services**. In addition to that, **new business models** are a direct effect. E.g. through access to more and different resources such as data, new value streams and new monetization opportunities.

Table 2: Revenue Generation Potentials



6.1.2 Intangible Value Enhancement

The following table provides further information about possible intangible value enhancement.

Category	Sub-Category	Description
Intangible value enhancement	Increased ESG performance and investor attraction	A better ESG performance creates intangible value and increases the **attractiveness** of an organization for investors. Enterprises might use solution to easily report on ESG matters and use **innovative models** to steer their ecological and social performance, while enabling the **best governance structures**.
	Improved data management, availability, and quality	A better data management is a basis for many value creating initiatives, such as **transparency and traceability**.
	Enhanced company perception and branding	Catena-X participation improves the degree of **innovation and sustainability** in the short-run and creates an enhanced perception and branding in the long-run. Catena-X can therefore become an easily accessible starting point towards a more innovative and sustainable perception after a few of the above-mentioned values have been captured.
	Further company-specific strategic goals	Catena-X participation can contribute to a broad number of company-specific goals. The individual goals, which cannot be generalized, are summarized in this category.

Table 3: Possible Intangible Value Enhancement

This category contains a special element. The third sub-category "further company-specific goals" has been added because it can be assumed that many companies and potential partners of Catena-X have goals that are highly specific or cannot be allocated to the other sub-categories. Therefore, this category was introduced to leave enough space for this.

6.1.3 Cost Savings

The following table provides further information about cost-saving potentials.

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

Category	Sub-Category	Description
Cost savings	Optimized resources and capabilities (process efficiency and asset utilization)	Better process efficiencies and asset utilization can lead to lower costs through optimized resources and capabilities for certain enterprises. Enterprises can achieve this through **better planning** times, more **stable processes,** and **optimized automation**.
	Saved Energy and CO_2e	Energy consumption and CO_2e emissions are reduced, therefore related costs for energy and CO_2e certificate are lowered. Enterprises can achieve this through access to **standardized processes**, better **energy and CO_2e data** management, **optimized resource usage and higher secondary material ratios.**
	Reduced overhead, labor, and production cost	Different types of costs are reduced through better cost management. Lower spendings for resources and materials, automation of processes and less-expensive solutions e.g. through the procurement of **secondary materials, improved warehousing and packaging.**

Table 4: Cost Savings Potential

6.1.4 Risk Mitigation

The following table provides further information about potential risk mitigation.

Category	Sub-Category	Description
Risk mitigation	Less value chain disruptions and volatility for resilience	High **value chain resilience** is created through Catena-X participation and **decreases risk of volatility, bottlenecks, and disruptions**. Main levers are increased efficiency in **material flows, smart and digital simulations/ prediction models.**
	Reduced regulatory and political risk	**Compliance, information availability and automation** reduce political and regulatory risks. This created by **higher information availability**, increased **transparency** and **traceability**, prevention models and interconnections between enterprises.

Table 5: Potential Risk Mitigation

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

Ask yourself the following questions while you work with this framework:

- What impact does a potential use case have on my business for each of the four proposed value drivers?

Example Use Case Circular Economy

Current trends such as zero-emission vehicles or CO2-neutral production demonstrate the growing importance of sustainability in the automotive industry. Increasingly scarce and expensive raw materials are challenging companies to find new solutions.

In most cases, the information on the individual product lifecycles is available locally and thus does not provide any meaningful insights. Looking at the automotive value chain (as shown below), it becomes clear that the process requires a high degree of standardization and high efforts to close the loops.

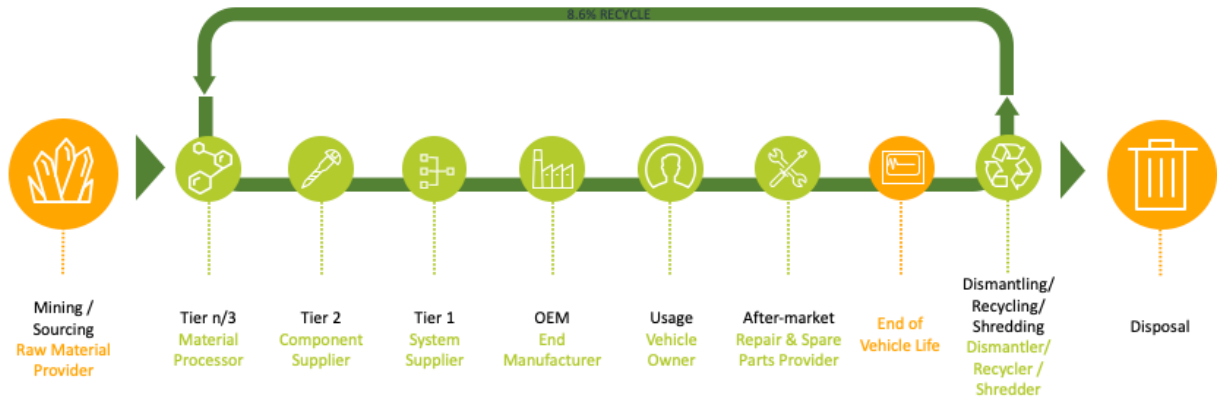
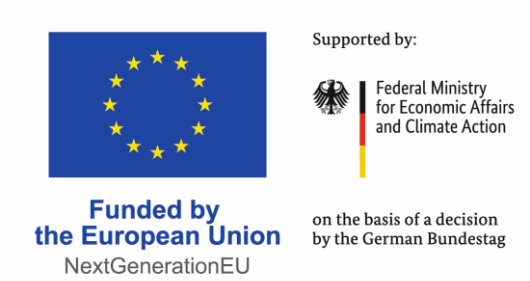


Figure 8: Automotive Value Chain

Catena-X participation can provide significant added value to move from a linear value chain to a closed loop circular value chain. The benefits differ depending on the stage in the lifecycle and the type of user. In the following, the benefits are exemplified, and the framework presented above is used for this purpose. Please note that the following overview does not represent all benefits but lists purely exemplary points. The advantages are strongly dependent on the use case, the company, and their goals.

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

Category	Sub-Category	Description
Revenue generation	Increased sales	• OEMs base procurement decisions also on the ecological performance of suppliers, thus, increased chance to win tender processes • Higher secondary material ratio allows higher prices
	Extended portfolio (e.g. through new business models)	• Recovery of used components and parts offers opportunities for new business models • Offering refurbishment services and other after sales products
Cost savings	Optimized resources and capabilities (process efficiency and asset utilization)	• Improved access to secondary materials • Better asset utilization
	Saved Energy and CO_2e	• Better data availability and resource usage lead to improved CO2e performance (even for scope 3) • Savings in production emissions if companies refurbish parts instead of producing them from scratch
	Reduced overhead, labor, and production cost	• Save occurring costs for external partners that companies hire to gather environmental data on the ESG performance of products
Risk mitigation	Less value chain disruptions and volatility for resilience	• Better information availability and prediction models prevent high-impact disturbances. • Traceability along the supply chain further improves the ability to conduct return requests and trace the reason for failures
	Reduced regulatory and political risk	• Catena-X components are always up to date when it comes to regulatory obligations • Ability to provide certificates and reporting to meet regulatory compliance.



Category	Sub-Category	Description
Intangible value enhancement	Increased ESG performance and investor attraction	• Potential to optimize ESG performance through easier access to secondary materials • Information transparency on products and components to improve resource usage.
	Improved data management, availability, and quality	• First-class data corridors to release and retrieve information, which lays the foundation for circularity • Closing information gaps and lowered complexity.
	Enhanced company perception and branding	• Improved branding and perception of companies in the long run • Attracting and retaining talent

Table 6: Business Value Framework Overview

More in-depth information regarding general benefits can be found in the Catena-X benefits section in this package.

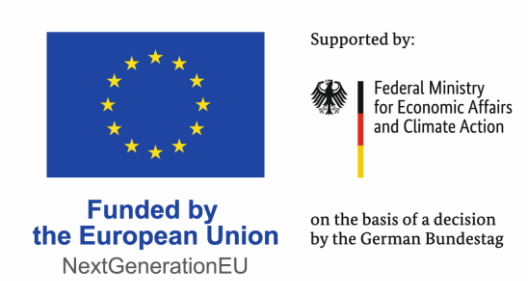
6.2 Data Governance

By collaborating with business partners in ecosystems, organizations can take advantage of opportunities in the environment, but there is also a risk of loss of control on data, unsecured access to information, or low-quality information. To deal with these issues and support the objectives of a shared ecosystem, **inter-organizational data governance** mechanisms need to be established.

These Mechanisms can be grouped into the five areas:

- Data Management Processes
- Data Usage Processes
- Data Governance Policies
- IT Governance Policies
- Digitization Strategy

Data management processes encompass the various aspects of handling data. This includes defining specific roles and their respective responsibilities. In addition, data policies provide rules for the creation, control, management, and auditing of data. The development of data standards is particularly important for the inter-organizational exchange of data. These standards define, for example, how data is handled and how it is represented to ensure that the required quality criteria are met.



Data Usage processes comprise all elements that are required to build and operate Data, Analytics and AI Use Cases. Thereby Data, Analytics and AI Use Cases are characterized by any kind of data processing for direct or indirect value generation for a specific purpose.

The data governance policies target the methods to govern data inside and outside the organization. On the one hand, this involves establishing processes and procedures for data use and data flow. On the other hand, the setting for data provisioning and data sharing is defined. In this way, the sharing of data between two or more organizations is regulated, including the descriptions of the data, the data flow and the obligations for providers and users through legal and data governance terms.

In addition, IT governance policies are established to address the complexities of managing IT Assets and ensuring appropriate security. This can be achieved by leveraging technology with its ability to automate and scale the implementation of standards, processes, and policies.

A digitization strategy that embraces transformation in terms of the adoption and leverage of digital technologies is essential for organizational success. It has a strong impact on the organization and, to this end, includes interaction with competitors, suppliers, and customers across organizational boundaries.

For a more detailed description of the required business process, you can visit the Data Governance Guide referred to in the appendix.

6.3 Data Ownership

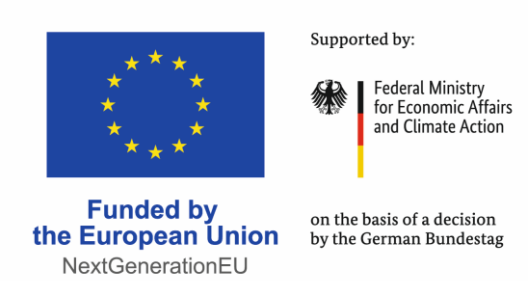
In the sub-chapter "Data Ownership" we will equip you with the most important information on how data access, data privacy, and data release as well as source systems, data mapping to use cases and data governance will impact your business organization.

6.3.1 Access, Privacy and Data Release

As Data Owner you are the expert for data on a functional level. Together with Information and Data Protection Specialists, you assess the impact on data privacy controls and data release process within the organization. Subsequently, you define requirements towards the IT Specialist for technical implementation regarding the former.

Data sovereignty is an important topic covered in Catena-X data space. As a data owner this topic is of high importance to you because you define data release (access) and usage policies, sign contracts and verify the validity of the conditions before the data exchange takes place. This ensures that your organization keeps control over its data. Like access policies, you will create usage policies in the process of data offer creation.

More in-depth information can be found in the Data Sovereignty section in this package.



After joining the Catena-X Ecosystem your organization benefits from a gapless audit trail due to the digital nature of the contract bound data exchange. Furthermore, you need to ensure that a record is kept of who (external party) accessed which data when, to be able to prove compliance with e.g. antitrust laws.

6.3.2 Source Systems and Data Mapping to Use Cases

As Business Specialist you enable your organization to provide data to partners to create the data chains that may power the different use cases. This data for Catena-X use cases will mostly come from various source systems, which need to be combined to provide the right data.

*For a step-by-step data provisioning explanation you can visit the **Data Integration Patterns Guide** referred to in the appendix.*

This means that you are responsible for the requirements of this data and related processes together with the IT Specialist. Since Catena-X use cases are data-driven and often are based on data from external partners, you will also have to deal more with external stakeholders to get the right external data for your use case. You also need to consider the impact on your organization when you provide data from different internal sources out of your organization that may have different requirements. On the other hand, when you consume external data the internal use of it needs to be in line with the agreed policies between your organization and external partners.

Therefore, you must analyze risks of mutual data usage. In short: collection, evaluation and documentation of data for data exchange to partners for Catena-X use cases is an important topic for you to observe regarding data protection rules/regulations within your organization.

6.4 Organizational Evolution

In the sub-chapter "Organizational Evolution" we will equip you with the most important information on how your organizational, technical, and legal business-related processes may need to be transformed.

6.4.1 Transformation and Roles

In your role as Business Specialist, you are also heavily involved in the transformation of the organization (incl. communication) due to joining the Catena-X Ecosystem. This means that you not only need to consider impacts on data ownership, data privacy, source systems, data usage and data governance, but also how to embed this transformation into your organization. Communication and skill development are key when you align your team on your organization's goals. Depending on the use cases and the goals your company wants to achieve with Catena-X, participation people, processes, and technology may be significantly impacted. For a successful transformation, a comprehensive impact analysis of the affected organizational parts is necessary and should be followed by supporting transformation activities.

For more Information, you can refer to the Data Strategy section.

6.4.2 Communication

As a Business Specialist you should prepare and equip the people of your organization to deliver the transformation in order to realize benefits identified above. Therefore, aligning and engaging all the relevant stakeholders on the organizational evolution journey is essential to build understanding and buy in. Consistent Communication will provide clarity and engagement before, during and after transformation.

Consider the following **phases** for setting up your internal Catena-X related Communication.

1. Corporate Why – Creating Awareness:
   Show As-Is Situation, create awareness of the problem and highlight future opportunities, importance of achieving goals together and why action needs to be taken now

2. Personal Why / Shared Why – Classification:
   More detailed information and clarification, break down to department-specific options for action (personal why) and identification of shared whys (corporate & personal) as a basis for next steps and actions

3. How – Support:
   Promote the dialogue (across departments, markets, hierarchies and industries) through regular "info nuggets", identify potential incentives

Moreover, it is important to identify and install suitable **communication channels** like

- Company channels (App, Intranet, Streaming)
- Integration into existing company and departmental formats
- Events on management and employee level

and define metrics and ensure feedback loops to understand the acceptance and value of respective formats.

For defining your company's **communication roadmap** for Catena-X participation, you may first want to identify stakeholder and target groups (company, department, sector, affected employee) and define possible channels/activities (department events, group channels, events, intranet page...), then match channels/activities to the respective target groups/stakeholders.

Based on this, preparation of a schedule for communication roadmap and synchronization with communications departments should be planned. In your communication, do make use of the communication materials from the Catena-X website.

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

7. OVERVIEW OF KEY ONBOARDING STEPS

In the following you will be guided briefly through the main steps that are recommended and at times necessary for successful onboarding to the Catena-X Ecosystem.

Be sure to also refer to and make use of the document complementary to this guide, *the **Internal Company Onboarding Tracker*** *(see appendix)*. It is designed as a working document and provides a detail checklist to plan, execute and track your onboarding progress and allocate responsibilities within the company. Moreover, it includes references to further supporting information and material.

Note that many of the onboarding steps can be done simultaneously. For example, data pipelines can already be prepared and an EDC set up and internal testing started while completing the registration process or integrating the first Catena-X business applications into the system landscape. Only data provisioning requires prepared data and thus needs to be done one after the other. Though we assume most of the large enterprises will go through the stages in a consecutive manner up until including the registration, Technical as well as Organizational Enablement will most likely happen in parallel.

Stage	Step	Description	Purpose	Mode	Role
Contact	Initial contact	Company gets contacted, usually via invite by an operator.	Raise awareness and build first contact.	Mandatory	GM
Onboarding preparation	Initial on-boarding information	Receive all relevant information about the onboarding.	Clarification of the main onboarding-related questions from stakeholders of joining company.	Mandatory	GM, IT, BUS
	Onboarding partner	Select a consulting / implementation partner who supports you during onboarding. Note: Collaboration with an OpCo will be necessary.	Utilize standard software packages or consulting services to leverage existing expertise and skills, and to reduce onboarding efforts.	Optional	GM

Supported by:
Federal Ministry for Economic Affairs and Climate Action
Funded by the European Union
NextGenerationEU
on the basis of a decision by the German Bundestag

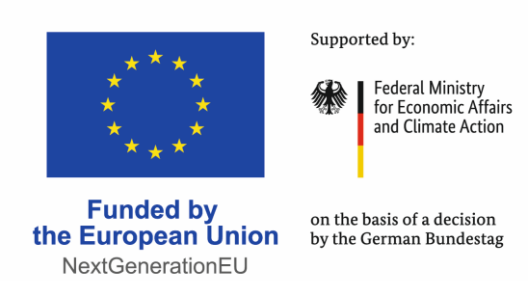
Stage	Step	Description	Purpose	Mode	Role
Pre-assessment	Business value	Analyze business value of joining Catena-X (quantitative vs. qualitative).	Derive arguments to convince sponsors and decision makers within the joining company.	Optional	BUS
	Legal	Assess Catena-X frame agreements and usage policies if applicable at this time.	Assure the company is compatible with Catena-X from a legal perspective.	Mandatory	GM
	Technical Assessment	Check technical readiness and integration options.	Assure readiness of company to technically participate in Catena-X (e.g. data availability, deployment of Catena-X components).	Mandatory	IT
Registration	Decision Questionnaire	Conduct the questionnaire to determine your technical onboarding scenario.	Understand your integration scenario (business app, managed service or do-it-yourself) and resulting technical integration scope.	Mandatory	GM
	Catena-X Registration and Frame Agreements	Register in Catena-X portal via the received invitation link and sign Frame Agreements.	Access to all the Catena-X offered services (e.g. use cases & apps).	Mandatory	GM

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

Stage	Step	Description	Purpose	Mode	Role
Technical Enablement	Backend Preparation and Data Trans-formation	Define and clarify current technical environment and standardized data models.	Ensuring that relevant technical and business processes are indentified and responsibilities assigned to validate tech and business scope.	Mandatory *	IT, BUS
	Enabling Data Exchange	Set-up the EDC (Eclipse Data Space Connector).	EDC is the technical component enabling sovereign, cross-organizational data exchange.	Mandatory *	IT
	Data Access & Discovery	Based on Use Case, identify applicable mechanism. In most cases the AAS / Digital Twin approach is used.	The Digital Twin Registry provides a source of information ("phone book"): All digital twins within the data ecosystem, need to be registered and the decentral component deployed along with an EDC.	Mandatory	IT
	E2E Testing	Test the system incl. conformity testing	Testing the set-up system for its functionality and stability as well as performing conformance test to check if pre-defined standards is adhered to.	Mandatory *	IT, BUS

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

Stage	Step	Description	Purpose	Mode	Role
	Data Monitoring & Operations	Define, implement and maintain data monitoring solutions and IT operations (e.g. SLAs, support, security, network monitoring …) processes, tools and the organizational setup around it.	Ensure a stable solution including data pipelines from source systems, EDC and asset registration.. Catena-X spans across multiple companies and thus imposes specific challenges on IT operations internally as well as in coordination with partners outside of the organization.	Mandatory *	IT, BUS
Organizational Enablement	Data Governance	Integrate Catena-X in your Data Governance Framework (strategy, organization, processes & standards, technology & solutions)	Only if you assess the impact of joining Catena-X on your Data Governance Framework and make the necessary adjustments, you will be able to harness the power of the data space. Especially if you do not just consume one single use case but you want to scale prosumption.	Mandatory *	GM, IT, BUS
	Training	Train stakeholders on how to use Catena-X.	Depending on the use cases and the goals your company wants to achieve with Catena-X, people, processes, and technology may be significantly impacted.	Mandatory	GM, IT, BUS



Stage	Step	Description	Purpose	Mode	Role
Internal Go-Live	Go-Live Preparation	Prepare communication and documentation around go live. Additionally, submit certification of conformity assessment prior to go-live.	The go-live is the final step of the onboarding journey after which regular IT operations for data exchange is possible.	Mandatory	GM, IT, BUS

Table 7: Key Onboarding Steps

Role:** GM = General Manager; IT = IT Specialist; BUS= Business Specialist I **Mandatory = This step is optional if you operate as managed service.*

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

8. GLOSSARY

Term	Description
AAS	Asset Administration Shell (AAS) is a standard format for digital twins allowing multi-vendor and cross-industry information transfer.
ABAC	Attribute Based Access Control (ABAC) refers to an access control approach in which access is mediated based on attributes associated with subjects (requesters) and the objects to be accessed.
ACL	Access-Control List (ACL) as the term suggests is a list of a system resource related permissions. It is, therefore, a set of rules that aims at filtering network traffic.
Aspect Models	Data bundles needed for a use case (e.g. Vehicle Product Description). One aspect model specifies which data exactly to look for in this category (e.g. Vehicle Product Description: color, size, ...).
Aspect Endpoint	Access link to retrieve information about the digital twin requested – created by the data provider and retrieved by the data consumer. Aspect corresponds to Submodel in AAS.
BPN	The Business Partner Number (BPN) is a unique identifier for participating companies. With its help, a secure and automated flow of information is achieved between distinct partners. The BPN is purely for identification purposes and does not allow any conclusions about costs, delivery or production locations. There are three different characteristics of a BPN that relate to each other: a legal entity (BPNL), a specific site (BPNS), and a given address (BPNA).
DAPS	A Dynamic Attribute Provisioning Service (DAPS) is used to provide dynamic, up-to-date attribute information about Participants and Connectors.
Data Asset	A data asset may be a system or an output file of an application, database, document, or a web page. It may also include provided services to access data from an application, such as a service that returns individual records from a database, which would be considered as a data asset.

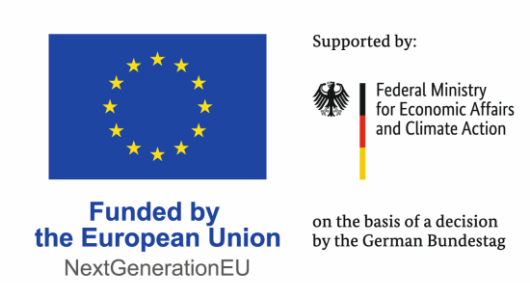

Funded by the European Union
NextGenerationEU

Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

Term	Description
Data Mapping	Your data format and the data format of Catena-X may not be identical (e.g. Vehicle size in terms of m vs. cm), thus you will need to map/transform your data.
Data Space	A Data Space is a virtual data integration concept defined as a set of participants and a set of relationships among them, where participants provide their data resources and computing services. Data Spaces have following design principles: a) data resides in its sources; b) only semantic integration of data and no common data schema; c) nesting and overlaps are possible; d) spontaneous networking of data, data visiting, and coexistence of data are enabled. Within one Data Ecosystem, several Data Spaces can emerge.
Digital Twin	The Digital Twin is a virtual representation of assets and adheres to the following characteristics: • The Digital Twin has at least one Catena-X-wide unique ID. • Digital Twins are organized by a set of Aspects. The set can be extended over lifetime. • An Aspect of a Digital Twin includes both structural as well as behavioral data and models (including operations and simulation models). • The semantics of an Aspect can be described via semantic models. • A single Aspect can be connected to different heterogenous data sources (including behavioral models) • The Digital Twin can represent asset types (e.g., virtual prototype of a car) and asset instances (e.g. real car) • A Digital Twin can cover the whole asset lifecycle including (e.g., planning phase, production, sales, use and decommissioning phase). However, in practice there may be more than one twin with different IDs representing different lifecycle phases (e.g., a twin for types and multiple twins for instances). • An Asset can have more than one Digital Twin. • The Digital Twin represents current available information about an asset (synchronized at a specified frequency and fidelity) which can be leveraged for simulation and business process integration. By using Aspects, the Digital Twin can reference other Digital Twin to express "part of" or "consists of" relations.

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

Term	Description
DT Registry	The Digital Twin Registry (DTR) is a Catena-X component listing all digital twin meta data and references of their relevant aspects. To ensure data sovereignty, it is realized as a decentral component (dDTR).
EDC	Eclipse Dataspace Connector (EDC): Open-source IDS connector designed to easily integrate different parties. The EDC requires a protocol implementation for policy enforcement among participants. Moreover, it implements the International Data Spaces standard (IDS) as well as relevant protocols and requirements associated with Gaia-X. However, the connector will be extensible so that alternative protocols can be supported.
Identity	An Identity is a representation of an entity (Participant / Asset / Resource) in the form of one or more attributes that allow the entity to be sufficiently distinguished within context. An Identity may have several Identifiers.
IdP	The Identity Provider (IdP) will allow you to authorize and authenticate yourself in the Catena-X Ecosystem. **IdP at Catena-X:** You may use the Catena-X Identity Provider Management or your own company IdP by connecting your IdP with Catena-X.
LE	Large Enterprises (analogous to DAX corporations in Germany) are typically globally distributed and employing a big IT department. Decision-makers and users are separated, and tasks are diversified among different groups of IT and Business specialists. Moreover, in terms of infrastructure, such enterprises usually have their own data lake and backend systems with sophisticated software development capabilities and dedicated governance processes in place.
Marketplace	You can access it through a Catena-X portal to acquire, sell or exchange data assets and apps.
Prosumer / Prosumption	The term prosumer is an artificial combination of the words producer and consumer. In context of data sharing, it expresses that a (data) provider may also be a (data) consumer at the same time for the same or a different scenario or use case. Similarly, the term prosumption = (data) provisioning and (data) consumption is used.



Term	Description
SAMM	The Semantic Aspect Meta Model (SAMM) provides a set of predefined objects that allow a domain expert to define aspect models and complement a digital twin with a semantic foundation. Note: Previously named BAMM Aspect Meta Model, renamed from BAMM to SAMM since moved to the Eclipse Foundation.
SME	Small and medium enterprises (German: KMU)
RASIC	RASIC (responsible, approves, supports, is informed, is consulted) is a tool / matrix used to establish the roles as well as their accountability and responsibility of key resources for activities in a project.
Use Case	Catena-X splits into 10 different thematic clusters (use cases), each developing usable software for the automotive supply chain.

Table 8: Glossary

Funded by the European Union
NextGenerationEU
Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

9. APPENDIX: SUPPORTING ONBOARDING MATERIAL & FURTHER GUIDES

This document is an introductory frame document tailored to different key roles within the Catena-X partner companies. It will be complemented by further detailed Catena-X (technical) documentation, best practices, whitepapers and guides tailored to different stakeholder and information needs.

A sample list of existing Large Enterprise specific Guides which are made available on the Catena-X Website or will be released and published as part of the technical documentation to Eclipse Tractus-X https://eclipse-tractusx.github.io/:

Title of Document	Target Audience	Purpose / Description
Data Integration Pattern Guide	Data Providers and Consumers – Enterprise / Chief Data Architect	This guide gives an overview on different patterns to integrate existing systems into Catena-X.
Data Governance Guide	Data Providers and Consumers – Data Engineers, Data Stewards, Data Governance Functions, Use Case Owners, Data Scientists	This guide gives a rough overview of basic governance principles for cross company data exchange.
Internal Company Onboarding Tracker	Data Providers & Consumers – General Manager, IT Specialist, Architects, Business Specialist, Legal Specialist, , Data Governance Functions & supporting roles	This document is intended as a working document. It describes the main (technical) onboarding scenarios and based on these provides a detail checklist to plan, execute and track your onboarding progress and allocate responsibilities within company. It also includes references to further useful information and material.
KIT (Keep it Together) published via Tractus-X	Data Providers & Consumers, Business Application Providers, Enablement Service Providers – IT Specialists, Architects, Business Specialists	Catena-X KITs provide software components, standards, installation scripts to support development in the area of Catena-X use cases.

Table 9: Further Large Enterprise Onboarding Guide & Technical Documentation