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Prof. Dr.-Ing. Boris Otto · 17 October 2024

Interoperability Within and Across Data Spaces

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Business Drivers for Industrial Data Sharing

Interoperability Within and Across Data Spaces

Common Use Cases

Circular Economy

- **Secondary use** of components, parts built of scarce and valuable resources (e.g. rare earth elements, batteries)

Traceability and Sustainability

- End-to-end, detailed reports on **carbon dioxide emissions** required by customers and the law
- Complex production and supply networks require **transparency about origin of parts**, capacity availability, and delivery status

Quality Management

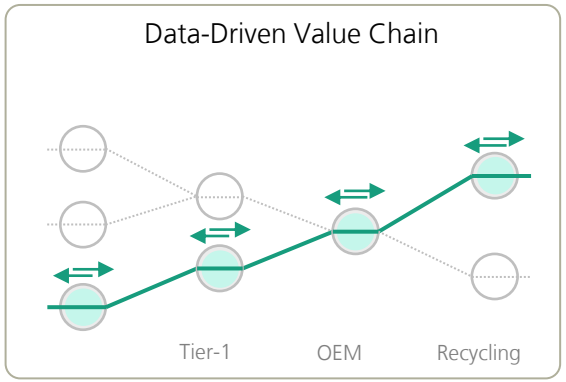
- **Cost of quality** of finished goods
- Reduction of **recalls costs**

Production System Complexity

Products

- More than 10^{30} theoretical **product variants** for a mid-class car
- Relatively low **vertical range of manufacture** (~ 25 %) at OEM
- Transformation towards electric mobility

Supply Network



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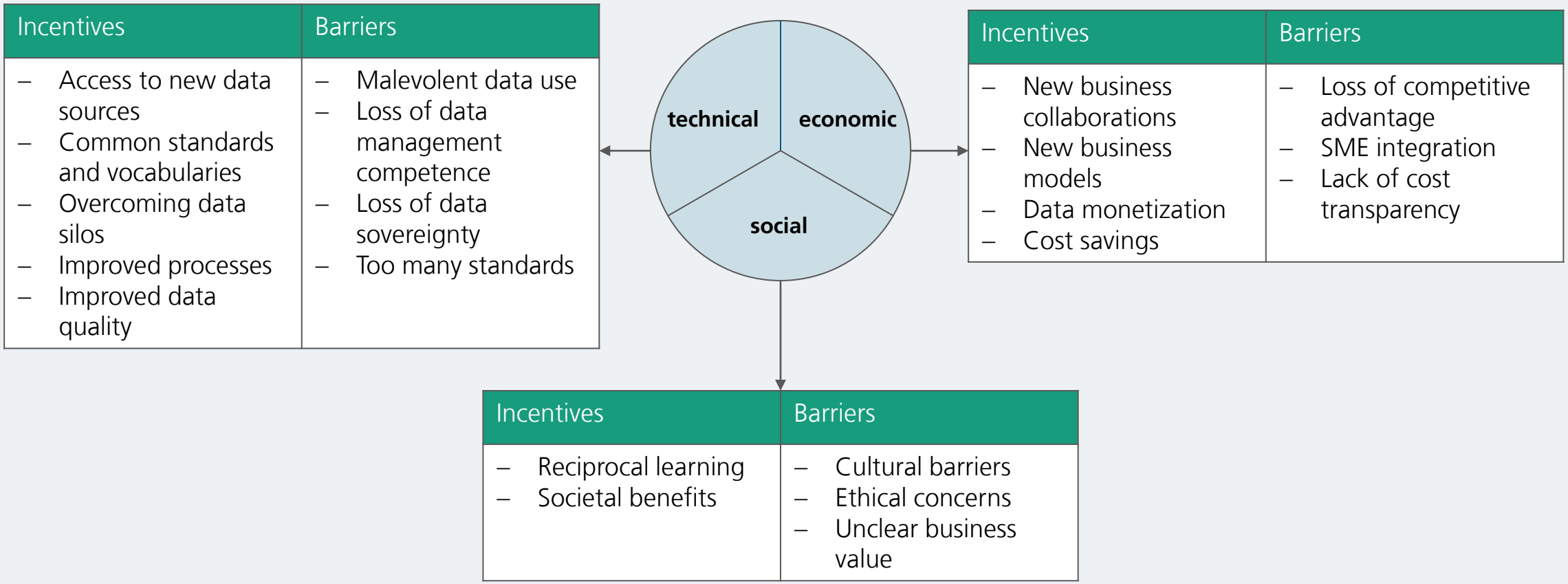
Incentives and Barriers for Inter-Organizational Data Sharing

Interoperability Within and Across Data Spaces



Source: Jussen, I.; Möller, F.; Schweihoff, J.; Gieß, A.; Giussani, G.; Otto, B.: Issues in inter-organizational data sharing: Findings from practice and research challenges. In: Data & Knowledge Engineering 150 (2024).

European Data Strategy

Interoperability Within and Across Data Spaces

A real **data economy**, on the other hand, would be a powerful engine for innovation and new jobs. And this is why we need to secure this data for Europe and make it widely accessible. **We need common data spaces** — for example, in the energy or healthcare sectors. This will support innovation ecosystems in which universities, companies and researchers **can access and collaborate on data.«**

State of the Union Address on 16 September 2020

Source: (EC, 2020).

Implementation of the European Data Strategy

Interoperability Within and Across Data Spaces

The **European Strategy for data** (2020) aims to make the EU a leader in data-driven society

The **Data Governance Act** (2020) facilitates data sharing across sectors and Member States

The **Data Act** (2022) clarifies who can create value from data

Regulatory Framework

Ten **European common data spaces**, ranging from industry to mobility, from European Green Deal to energy and health

Interoperability for Innovation

Source: adapted from (Cyber Risk GmbH, 2023).

Meta-Requirements for European Data Spaces

Interoperability Within and Across Data Spaces

Trust

Data Space Participants

- Trust among the data space participants

Shared Data

- Trust in the data and its source
- Trust in the use of the data

Interoperability

Within Data Spaces[1]

- Legal aspects
  - e.g. the regulatory framework of the European Union for the data economy
- Organizational aspects
  - e.g. following the DSSC Governance Framework[2] or the IDSA Rulebook[3]
- Semantic aspects
  - **Identity** of data space participants
  - **Claims** of the data space participants (e.g. w/ regard to storing, processing, using etc. data)
  - **Meta-data** (e.g. to be stored in a catalog)
  - **Conditions** for accessing, sharing, and re-using data
  - Data sharing **contracts**
  - **Shared data**
- Technical aspects
  - All data sharing transaction lifecycles

Across Data Spaces

1) Layers according to the European Interoperability Framework (EIF); see https://ec.europa.eu/isa2/eif_en/ (accessed on 9 October 2024).
2) See Blueprint V1.0 by the EU Data Spaces Support Centre https://dssc.eu/space/BVE/357073006/Data+Spaces+Blueprint+v1.0 (accessed on 9 October 2024).
3) See https://docs.internationaldataspaces.org/ids-knowledgebase/idsa-rulebook/idsa-rulebook/1_introduction (accessed on 9 October 2024).

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Data Sharing Requirements of Data Spaces Participants

Interoperability Within and Across Data Spaces

The data rights holder…

- must be free to **grant rights** for accessing, sharing and re-using **their data**
- must be able to **publish meta data** for the data including terms and conditions under which data can be accessed, shared and re-used
- must be able to **trust the third-party** requesting access to and sharing and re-using of data
- must be able **negotiate terms and conditions** for the access, sharing, and re-use of data and to access a respective data sharing contract
- shall be able to **log** data access, sharing, and re-use **activities** if needed
- must be able to **trust that neither data sharing transaction nor data sharing contract information are accessible** and usable by third parties as long as not otherwise specified
- shall be able to **track data sharing and re-using activities** performed by third parties if needed

The data user…

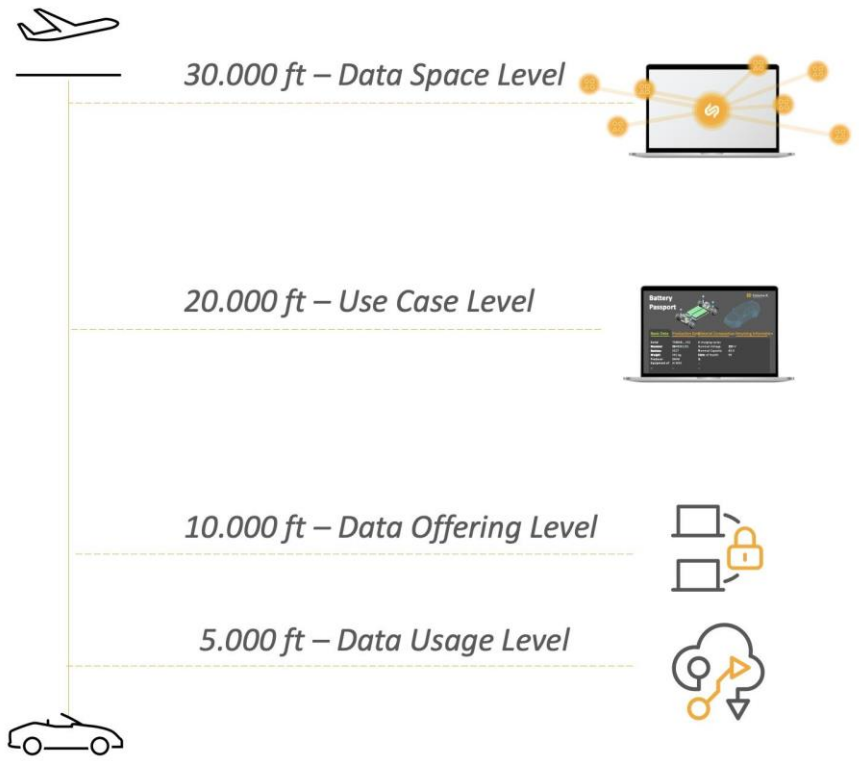
- must be able to **trust that the legal status** of the data accessed, shared, and re-used is clear
- must be able to **trust the data provider** and that the data provider has the license to act on behalf of the data rights holder if the two are different entities
- must **have the right** to access, share, and re-use the data if the data user is the data rights holder
- must **be able to negotiate** terms and conditions for the access, sharing, and re-use of data and to access a respective data sharing contract
- shall **be able to log data access, sharing, and re-use activities** if needed

NB: Work-in-progress.

Trust and Interoperability in the Example of Catena-X

Interoperability Within and Across Data Spaces

Governance Framework for Data Space Operations



»Flight Level« Model

30,000 ft - Data Space Level
- Governance framework
- Operating model and 10 golden rules

20,000 ft - Use Case Level
- Data exchange governance
- Standards and policies

10,000 ft - Data Offering Level
- Guidance for individual data offerings

5,000ft - Data Usage Level
- Automated negotiations of data usage contracts
- EDC support

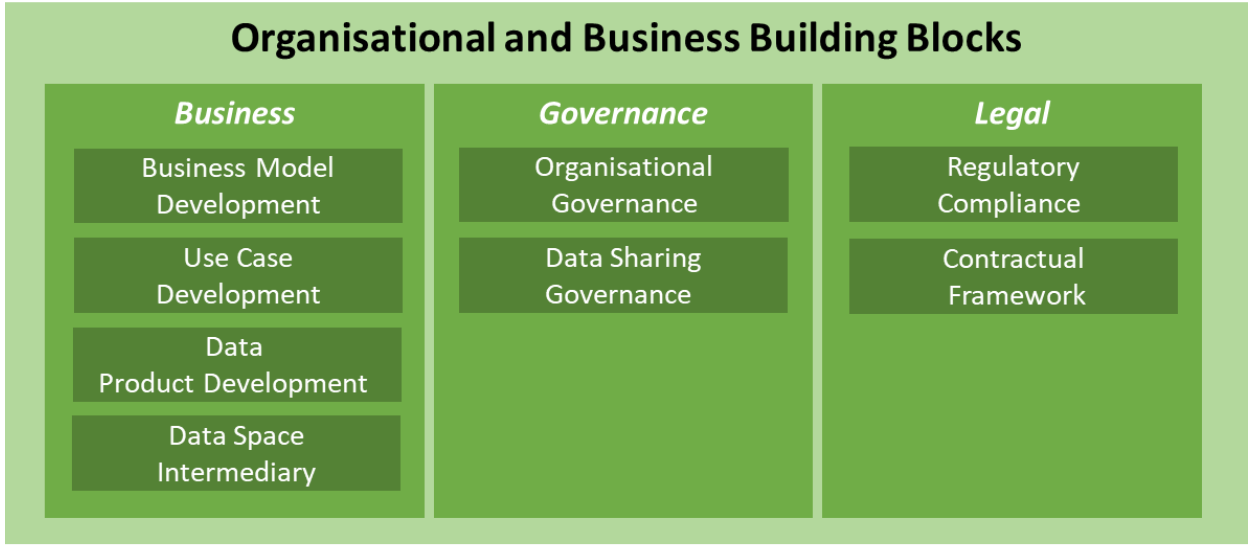
Source: Catena-X Automotive Network (2024).

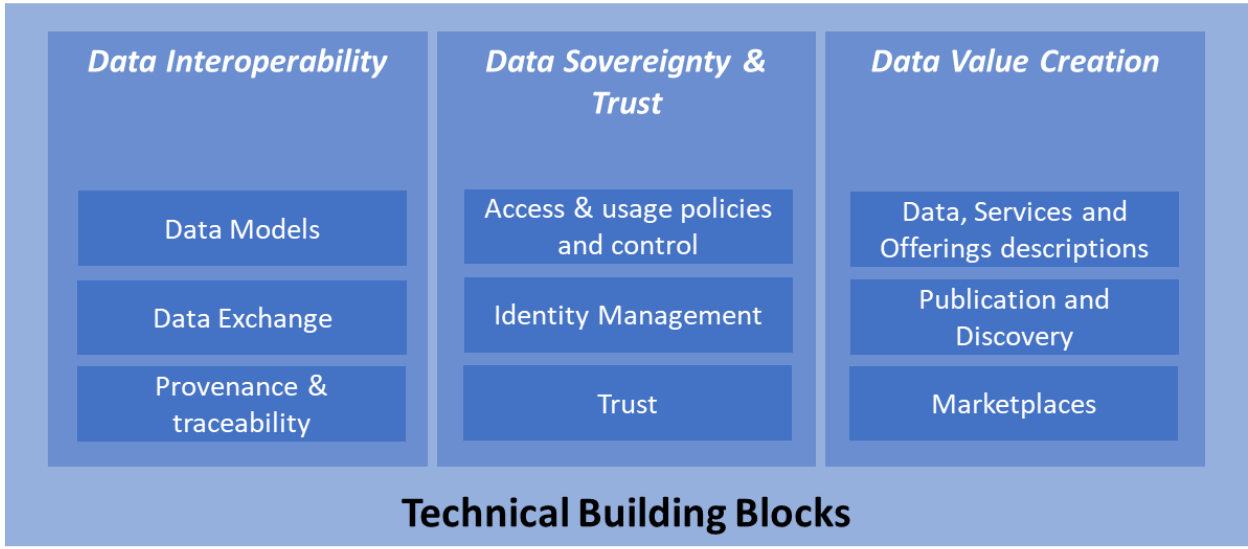
Blueprint for Data Spaces

Interoperability Within and Across Data Spaces

The EU Data Spaces Support Centre helps European data space initiatives:

- Exchange of knowledge and information
- Networking and sharing of »Best Practices«
- Blueprints and building blocks





DATA SPACES SUPPORT CENTRE

Funded by the European Union

NB: The Data Spaces Support Centre receives funding from the European Union Digital Europe Programme under grant agreement n° 101083412.

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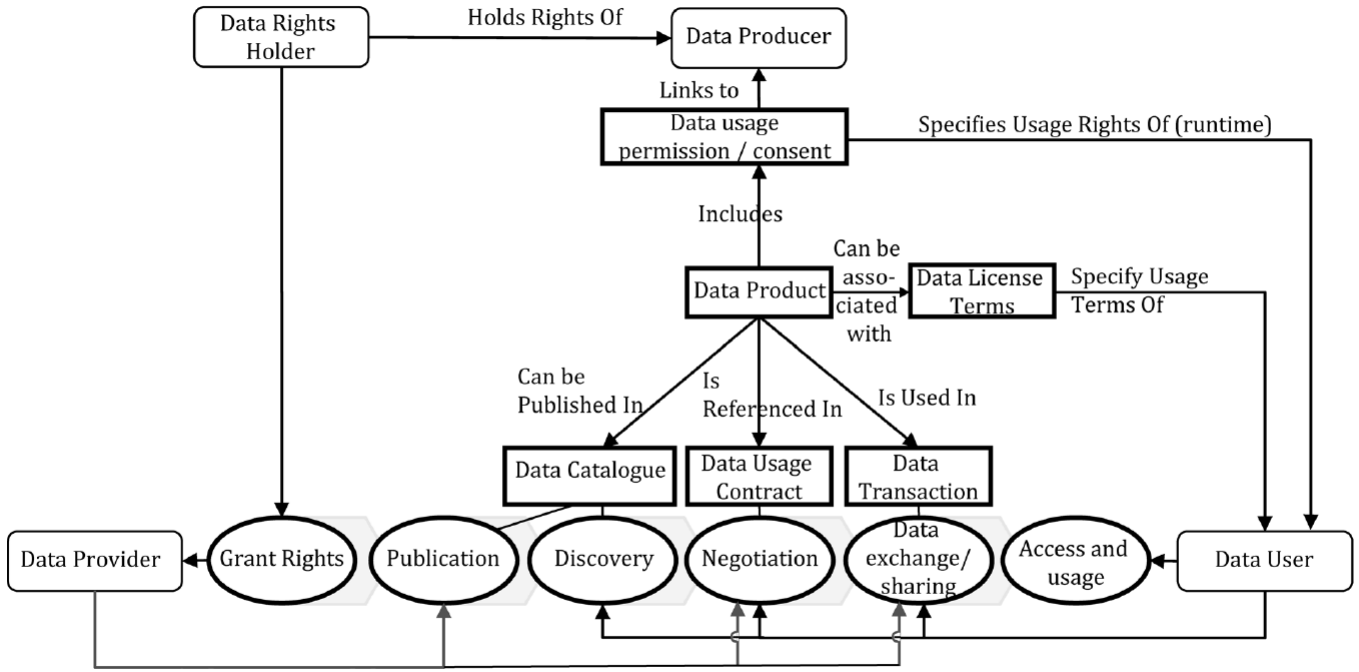
Trusted Data Transaction

Interoperability Within and Across Data Spaces

CWA 18125, Part 1



CEN

WORKSHOP

AGREEMENT

CWA 18125

July 2024

ICS 35.030

English version

Trusted Data Transaction

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties, the constitution of which is indicated in the foreword of this Workshop Agreement.

The formal process followed by the Workshop in the development of this Workshop Agreement has been endorsed by the National Members of CEN but neither the National Members of CEN nor the CEN-CENELEC Management Centre can be held accountable for the technical content of this CEN Workshop Agreement or possible conflicts with standards or legislation.

This CEN Workshop Agreement can in no way be held as being an official standard developed by CEN and its Members.

This CEN Workshop Agreement is publicly available as a reference document from the CEN Members National Standard Bodies.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No.:CWA 18125:2024

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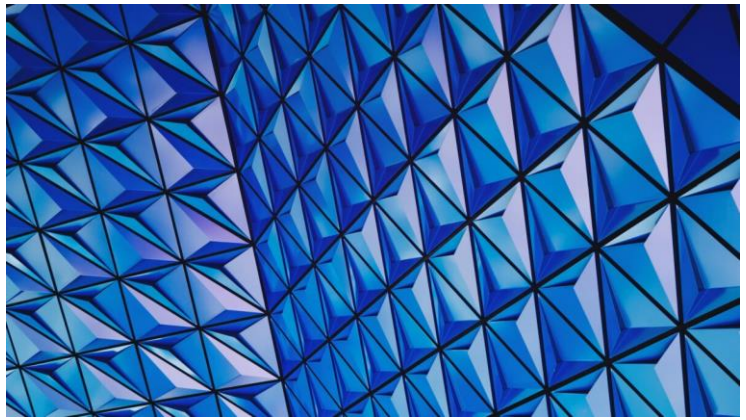
Standardization for Data Space Interoperability

Interoperability Within and Across Data Spaces

Specification



IDS Association publishes stable version of Dataspace Protocol

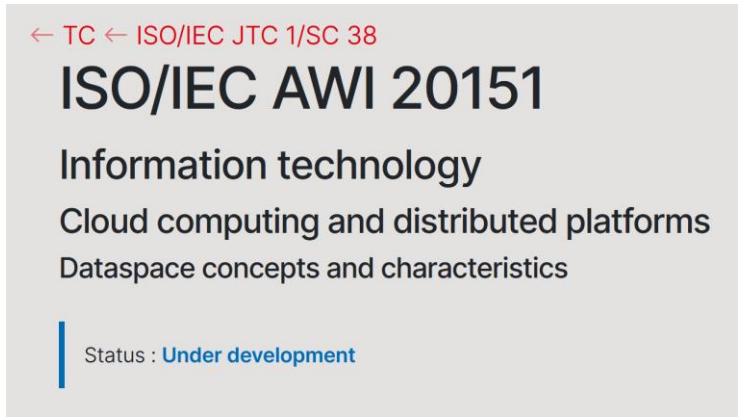
- Foundation for intra- and inter-data space interoperability
- Specification on GitHub
- See https://tinyurl.com/4a5ebfeh

Open-Source Software

Eclipse Dataspace Working starts on 3 November 2023

- Coordination of the various data space projects (EDC etc.)
- Members, amongst others, amadeus, Catena-X, Fraunhofer, Gaia-X, IDS Association, Microsoft, T-Systems
- See https://tinyurl.com/4md4c9c5

Standardization



ISO/IEC AWI 20151 registered as new project on 23 December 2023

- Basic data space characteristics
- Foundation for further standards
- See https://tinyurl.com/9jhdvzux

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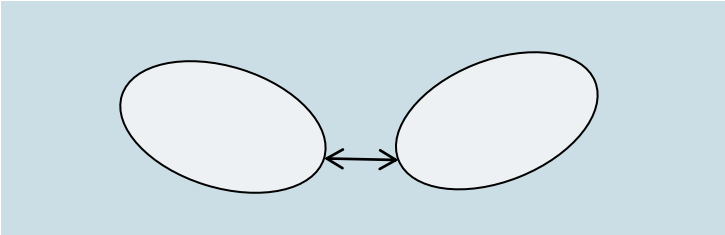
Patterns for Inter-Data Space Interoperability

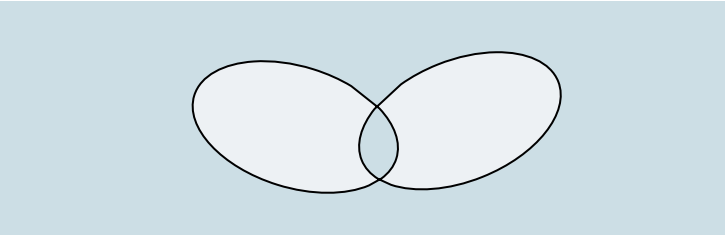
Interoperability Within and Across Data Spaces

Integration of Separate Data Spaces



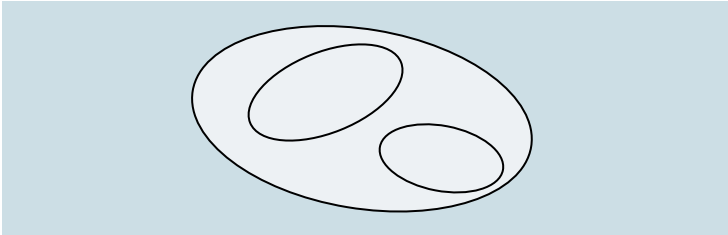
- Interoperability achieved by mapping and integration on all interoperability framework layers, i.e.
  - Legal
  - Organizational
  - Semantic
  - Technical
- **Affects all data space participants** in all data spaces seeking to share data across data spaces

Overlapping Data Spaces



- Mapping as well needed on all interoperability layers
- Some integration tasks to be done by **intermediaries** which are part of both data spaces, e.g.:
  - Identity schemata
  - Cataloguing
- Data sharing on semantic and syntactic level to be achived by mapping/integration on data space participant level

Nested Data Spaces



- Data spaces are part of one »higher order« data space
- All aspects of an interoperability framework are **inherited by nested data spaces**

NB: Work-in-progress.

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Thank you very much!

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