INTERNATIONAL DATA SPACES ASSOCIATION

Making the Dataspace Protocol an international standard

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International standardization is fundamental to data space development

Harnessing the power of data is no longer optional but essential for success in business, politics, and society. However, to truly unlock its potential, we must handle data with utmost care. When collecting, processing, and sharing data, we need to prioritize trust and data sovereignty[1].

Data spaces are digital environments designed for the trusted sharing and management of data among various participants. Data spaces can enable more efficient implementations of advanced services and solutions based on data. Data spaces guarantee data sovereignty to participating individuals and organizations, allowing data holders to control the terms and conditions by which the data is re-used.

Data spaces have the potential to make business, economies, and life dramatically better. They are a paradigm shift for the way we share data – and they are a prerequisite to make the data economy and game changers like artificial intelligence happen.

But we at IDSA already back in 2017 observed that all these amazing things are not happening, at least not at the speed and scale we want and hope for. What was missing? A technology that integrates key processes common to all data spaces into a robust framework, following best practices, regardless of region, sector, use case, business model, or applicable legal regulations. Those are processes like exchanging information about what kind of data is available, negotiating a contract, and proceeding to the actual data exchange. What we

[1] https://internationaldataspaces.org/why/data-sovereignty

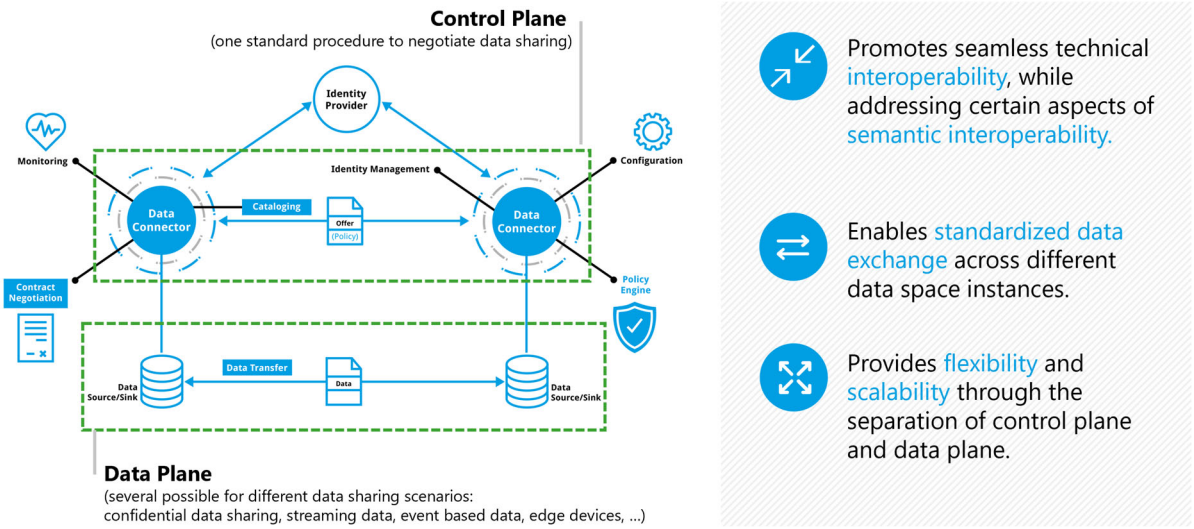
were missing is a data space protocol, better, the IDSA Dataspace Protocol[2]. This challenge affected all organizations participating and providing services in data spaces.

Beyond common practices, we recognized that only standardized technology could provide organizations with sufficient confidence to invest in learning and implementing these new solutions. International standards are instrumental in addressing such challenges.

We benefit from standardization in other technological fields every day, whether we are aware of it or not. For example, when we fly to a foreign country and turn our mobile phone back on, we expect it to connect to the local communications network and make calls seamlessly. That is not magic, but the result of years of effort of academia, government, and industry converging to create and use standards

The Dataspace Protocol – a baseline for data space interoperability

The Dataspace Protocol is not just a technical innovation; it is a strategic enabler for the data-driven economy. The DSP orchestrates the necessary steps for two or more parties to share data, including requesting a catalogue, negotiating a contract, and managing the transfer process. Its impact could be as profound as the protocols that shaped the internet like the Internet Protocol (IP)[3], transforming fragmented and isolated networks into a global, interconnected one. Similarly, the GSM standard[4] revolutionized global mobile telephony. Just as these protocols laid the foundation for the Internet and modern communications, the Dataspace Protocol will lay the foundation for trustworthy and sovereign data sharing – unlocking new opportunities for collaboration and innovation in various sectors.



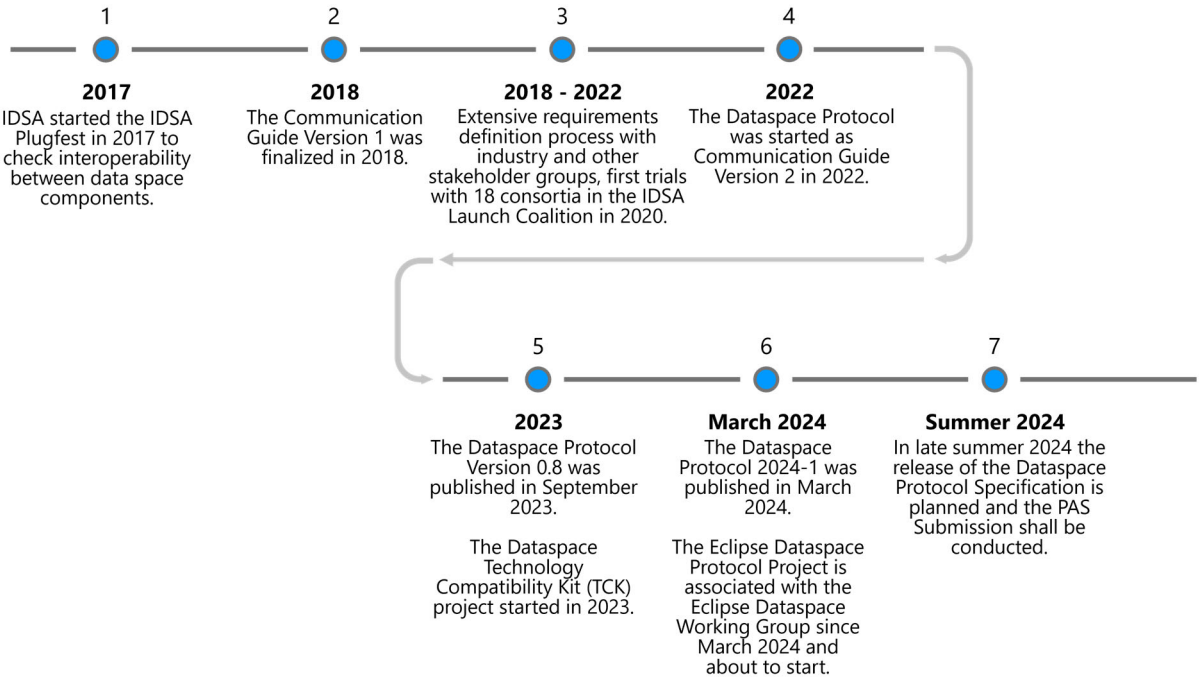
Dataspace Protocol – technical innovation and strategic enabler

[2] https://internationaldataspaces.org/offers/dataspace-protocol-overview
[3] https://www.ietf.org
[4] https://www.gsma.com

Getting technology standardized is not straightforward; it requires choices. This paper describes the choices IDSA made and why they – in our view – form the best path to standardized data space technology. Throughout this journey, we address various challenges and advocate for clarity and transparency in developing this crucial technology.

Responding to the need for a specification for interoperable data spaces

The members of IDSA began designing technology for data spaces in our working groups and committees in 2017, so that the Dataspace Protocol could be ready to start the standardization process in 2024. What happened during those seven years? The diagram below offers a brief history of how we got here. The Dataspace Protocol in itself is quite lightweight – but it is the essence of the last seven years of IDSA work and therefore the IDSA Reference Architecture Model (IDS-RAM)[5] and the IDSA Rulebook[6] are at the core of it. We condensed all the knowledge, requirements and findings in this streamlined protocol so that it guarantees the benefit of much more comprehensive features that come with the whole IDSA framework.



Timeline of IDSA assets and activities leading to the Dataspace Protocol Specification

The European Union's Data Act[7] will enter into force in September 2025 – just over one year from the publication of this paper. The new legislation specifies criteria for participants in data spaces to allow data to flow within and between data spaces, implying the use of harmonized interoperability standards. As it happened with other European legislation

[5] https://internationaldataspaces.org/offers/reference-architecture/
[6] https://docs.internationaldataspaces.org/ids-knowledgebase/v/idsa-rulebook.
[7] https://digital-strategy.ec.europa.eu/en/policies/data-act

before this, the Data Act will raise the bar worldwide in how it both guarantees the rights of people and organizations over the data being processed, while enabling fair and self-determined data practices in businesses. This is great progress towards sovereign and trusted data sharing. However, it leads to a timing challenge for Europe, which needs mature and open data space technology, and fast. That is the call the IDSA answered by developing the Dataspace Protocol, for Europe and beyond.

From specification to global recognition: setting the scene for a successful international standard

Among the options offered to us by the main Standardization Development Organizations, in the following, we outline the path IDSA chose for the Dataspace Protocol. This helps us to provide full visibility of our choices and rationale, so that our members and our wider audience – made of entrepreneurs, academics, policymakers, data sharing experts, and practitioners anywhere in the world – can understand them. We also have the ambition to offer re-usable models and learnings for the other organizations that are active in specifying and developing technology for data spaces, so they can understand the importance of standardization and join us.

The Association felt compelled to offer our specifications to the international community and to embark on the demanding processes standardization requires. The following rationales and constraints are considered:

Rationale 1 – a standard is needed

A common foundation for interoperability in data spaces is greatly needed. Data spaces facilitate data sharing under certain human- and machine-readable agreements.

Rationale 2 – concepts are ready for standardization

By addressing the requirements from the industry of the so-called “control plane”, the IDSA specifications for the Dataspace Protocol are the solution to a foundational problem in data space design and implementation. IDSA’s mission does not end with achieving standardization for the protocol. Indeed, it is a starting point for further developments that build on top of its foundation.

Rationale 3 – legislation calls for standards

The European Union's Data Act[8] is the first significant legislation to specify criteria for participants in data spaces to allow data to flow within and between data spaces, that imply the use of harmonized interoperability standards. It will enter into force as soon as September 2025, affecting the Union's 27 countries and any business operating in their market, worth USD ~17 trillion - the third biggest in the world after the US and China.

The European legislator's pioneering stance could become a great premise for the development of sovereign and trusted data sharing in the Union's states – and it could be a pattern for other economic areas. However, it leads to a timing challenge, as it requires mature and open data space technology soon.

Constraint 1

The Dataspace Protocol was originally a specification created by our association's members. In opening up those specifications, our members demand that IDSA continues leading their maintenance and development. This is considered a necessary guarantee to protect the values and design principles behind the Protocol.

Constraint 2

IDSA does not write code. The association relies on many expert operators in the market to transform our specifications into workable implementations used in software and services every day.

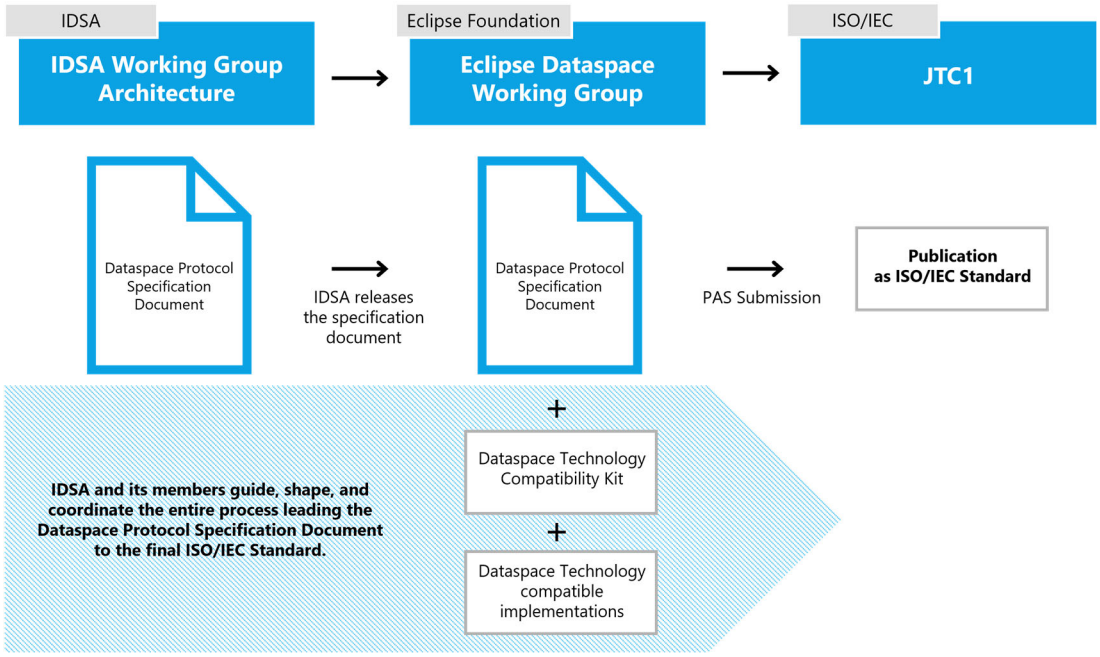
Constraint 3

International standards are a guarantee of stability and reliability in the challenging stages when a new technology goes through industrial adoption. By embarking on standardization, we want the Dataspace Protocol to provide the same.

Bringing the Dataspace Protocol from IDSA via Eclipse Foundation to ISO: Individual steps of the specification process and timeline

After highlighting the key rationales and the constraints, let's explore the standardization path of the IDSA Dataspace Protocol and have a look at the detailed steps of the specification process and how this standardization initiates further innovation and development on its foundation.

[8] https://digital-strategy.ec.europa.eu/en/policies/data-act



Overview of the standardization path for the IDSA Dataspace Protocol

The graph above outlines the standardization process for the Dataspace Protocol, moving through three key phases and organizations:

1. **IDSA Working Group Architecture (IDSA)**: The initial phase involves the development and structuring of the Dataspace Protocol by the IDSA Working Group Architecture.

2. **Eclipse Dataspace Working Group (Eclipse Foundation)**: In this phase, the protocol is handled by the Eclipse Dataspace Protocol Specification project, under the purview of the Eclipse Dataspace Working Group (EDWG), which includes the creation of the Dataspace Technology Compatibility Kit to ensure interoperability and compliance. From here it is submitted to ISO/IEC as a Publicly Available Standard (PAS).

3. **ISO/IEC Joint Technical Committee 1 (ISO/IEC)** The final phase involves the standardization process by the Joint Technical Committee (JTC1) committee under ISO/IEC, leading to the publication of the protocol as an official ISO/IEC standard.

Next are the detailed steps of the specification process and a status update:

1

(Done) IDSA created the **Dataspace Protocol specification document** on GitHub as an activity of the IDSA Working Group Architecture. (https://github.com/International-Data-Spaces-Association/ids-specification).

- The document is stable with the release of version 2024-1 in March 2024.
- Over time there will be changes according to class 1 and class 2. Class 3 and class 4 changes are not planned.[9]

2

(Done) IDSA has proposed the **Eclipse Dataspace Protocol specification project** (https://projects.eclipse.org/proposals/eclipse-dataspace-protocol) with Sebastian Steinbuss, CTO of IDSA, and Anil Turkmayali, Senior Project Manager at IDSA, as project leads.

3

(Done) The EDWG steering committee approved the creation of the **Eclipse Dataspace Protocol specification project**. Following this, the EDWG specification committee approved the Eclipse Dataspace Protocol specification project. Subsequently, the Eclipse DSP specification project was initiated.

4

(Ongoing) Once the project is created, IDSA will contribute the specification document to the Eclipse Specification Project.

IDSA will continue to maintain the document in the IDSA GitHub repositories. The Eclipse Foundation receives a fork (a copy) of the project repository.

5

(Info) To complete the Eclipse Specification Process (https://www.eclipse.org/projects/efsp/), a **TCK (Technology Compatibility Kit) project** and at least one compatible implementation are required. These projects need to be associated with the EDWG.

[9] https://docs.internationaldataspaces.org/idsa-organizational-handbook/organizational-handbook/technicaldocumentdevelopmentprocess#classes-of-changes

6

(Info) The TCK project is named **Eclipse Dataspace TCK** (https://projects.eclipse.org/projects/technology.dataspacetck) and was initiated by the Fraunhofer Institute for Software and Systems Engineering (ISST) in 2023. The project is led by James Marino (Catena-X) and Markus Spiekermann (Huawei). The TCK contains test cases designed to validate compliance with the specification document. Subsequently, all systems that pass the TCK will be interoperable within the scope of the DSP.

7

(Info) The first known compatible implementation is the **Eclipse Dataspace Components (EDC) project** (https://projects.eclipse.org/projects/technology.edc). This implementation is expected to successfully pass the TCK. The project is led by Markus Spiekermann (Huawei). Both projects, EDC and Dataspace TCK, are well aligned with each other and the specification document.

8

(Done) Both projects, Dataspace TCK and EDC, have been associated with the EDWG. With the contribution of the Specification Document to the Eclipse Foundation, all formal steps have been completed.

9

(Ongoing) The IDSA Working Group Architecture will continuously maintain the Dataspace Protocol Specification Document. All changes (class 3 and 4 as described in the IDSA Organizational Handbook[10] shall be brought to the Working Group Architecture for approval.

The IDSA community is not currently working on the next release of the DSP. A major update of the Specification will be initiated by the IDSA Working Groups. If changes shall be required, proper planning must be conducted.

10

(Planned) According to the Eclipse specification[11] process the release of the Dataspace Protocol Specification consists of three parts: Specification Document, TCK, and compatible implementation. This marks the second important milestone for the DSP, achieving a release as an Eclipse Specification. A release review[12] must be conducted first, including two steps:

- The Eclipse Foundation verifies formalities such as Intellectual Property.
- The content-related review is conducted by the EDWG Specification Committee.

[10] https://docs.internationaldataspaces.org/idsa-organizational-handbook/organizational-handbook/technicaldocumentdevelopmentprocess#classes-of-changes
[11] https://www.eclipse.org/projects/efsp
[12] https://www.eclipse.org/projects/efsp/#efsp-reviews-release

11 **(Planned)** The released specification can be submitted to ISO/IEC JTC1. EDWG will request the PAS submission process to ISO/IEC, which will be executed by the Eclipse Foundation. The approval process will be conducted by ISO/IEC JTC1.

12 **(Info)** The PAS Submission is in the Approval Stage FDIS – Final Draft International Standard1. The FDIS Ballot is 8 weeks long and may generate comments from the entire ISO/IEC community.

In summary, through this process, we achieved the following:

1. **A robust foundation**: The creation and stabilization of the Dataspace Protocol specification document and its subsequent contributions to the Eclipse Foundation mark the establishment of a robust foundation for interoperable data spaces.

2. **Transparency for and engagement of our members**: The process has been transparent, with active engagement from various stakeholders, ensuring that the standards developed are both inclusive and comprehensive.

The long game: global adoption of data spaces

The main goal of the IDSA is data sovereignty and its global adoption through data spaces. With the standardization of the Dataspace Protocol well on its way, there is still plenty to do. When the Dataspace Protocol is approved by ISO/IEC JTC1 and published by the end of 2024, the next step is fostering adoption.

More specifically:

1. **Finalize ISO/IEC Standardization**: Complete the approval process to publish the Dataspace Protocol as an official ISO/IEC standard, providing stability and reliability for widespread adoption.

2. **Promote Adoption and Implementation**: We will collaborate with and encourage technology providers, policymakers, and industry leaders to drive market recognition and implementation of the protocol. Within IDSA's ongoing general dissemination activities, at our many event formats (like the Data Spaces Discovery Days, Tech Talks, Data Spaces Dialogues, etc.), in our digital channels, through the planned showrooms and in our extended ecosystem of partners and supporters, the adoption and implementation of the Dataspace Protocol will be a priority topic.

3. **Certify compliant connector implementations**: When a participant's IT systems engage with a data space, the software component typically referred to as the "connector" – a combination of various capabilities or the participant agent – is the main implementation where the functionality offered by the Dataspace Protocol becomes actual running software and services. The reliability and interoperability of a connector are instrumental to the seamless onboarding and successful participation

in a data space. Since 2022, IDSA has been operating the IDS Certification Scheme[13] aimed at certifying the interoperability, compatibility, and trustworthiness of connectors. With the completion of standardization, the IDS Certification Scheme will evolve to assess interoperability modules based on automated testing. By enabling adopters to choose from a series of certified connectors, we will ensure that their efforts are focused only where they are needed: on identifying the best use cases for data sharing that support their objectives and entrepreneurship.

While preserving the stability of the ISO standard, IDSA will continue curating the Dataspace Protocol Specification Document, listening to the feedback of the users, addressing any required changes and integrating them into future revisions of the standard.

What happens next?

The International Data Spaces Association calls upon anybody with stakes in data spaces to support the continued development and global adoption of data spaces for the collective good of the economy and society.

The standardization of the Dataspace Protocol is not the end but the beginning of a transformative journey towards trusted and sovereign data sharing. The whole set of assets our association has developed this far – such as our Reference Architecture Model, the Rulebook, etc. – will continue developing and improving. Some of these will mature to the point of deserving standardization, too.

Here is what we need **you** to do:

Market adoption of data spaces is needed. To achieve this, industry-grade software solutions and services with high stability and reliability, and future backward compatibility are required. Built them!

If you lead the development of practices and technologies for data sharing, embark on the necessary standardization processes. It is essential to develop, and drive trusted and sovereign data sharing.

Developing data spaces is compelling. The best way to support us is to become a member of IDSA[14], participate in our community activities or donate.

[13] https://internationaldataspaces.org/offers/certification/
[14] https://internationaldataspaces.org/become-a-member

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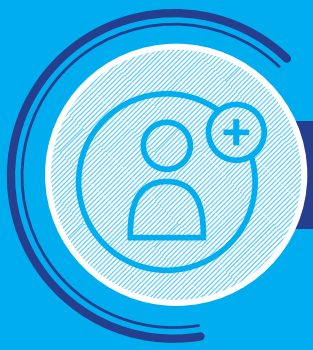
We can only succeed together

Join and support IDSA

Innovation relies on investment. If you like what you see in this document, support us !



Join the data space pioneers

Become a member of IDSA!
Play a vital role in working groups, actively contributing to technical blueprints, governace framework, and the standardization process.

www.internationaldataspaces.org /we/become-a-member

Invest in the future

Donate!
Your contribution will directly support and sustain our high-quality initiatives and activities like the Dataspace Protocol.

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