INTERNATIONAL DATA SPACES ASSOCIATION

# International Data Spaces

## Global standards for trusted data sharing

# *From data silos to data spaces*

Sharing data is no longer optional. The demand for transparency is growing: Supply chains must be documented, digital product passports are on the way, and regulated markets require verifiable proof of origin, production, and other key aspects. At the same time, every company faces the same concern: *what happens to my data once it leaves my system?*

In the past, the answer was centralized platforms acting as trusted intermediaries. But that trust often came at a price: vendor lock-in, dependency, and, in the worst case, loss of control — precisely the opposite of what users wanted to achieve.

Today, instead of sending data to someone else's platform, it remains where it belongs – under your own control. Participants in a data space agree on a common set of rules, whether defined by the participating companies themselves or by regional policies, to name just two examples.

For you, this means:

- Your data stays on your infrastructure.
- The Dataspace Protocol ensures that data space participants have a common baseline to communicate about rights and conditions.
- Data usage control, logging of transactions are built in, so every use of data can be controlled, traced, and verified.

How it works in practice from the perspective of a data consumer:

1. **Find:** Browse the catalogues that contain the available data, the metadata, and the data usage terms.
2. **Negotiate and agree:** The data provider defines purpose, duration, and restrictions digitally. Thanks to machine-readable agreements the negotiation happens machine-to-machine and paves the way to automatically enforceable digital contracts.
3. **Use:** Make use of the shared data only for the agreed purpose. Thanks to the trust mechanisms in a data space, the data provider can be confident that the rules are being respected when their data is used.
4. **Prove:** Compliance with data contracts is observed, irregularities are reported. Audits are conducted, disputes are resolved based on facts, not assumptions.

In a data space, data providers can trust that their partners will handle the data responsibly and that they get value for the shared data, all based on usage conditions that they define. Consumers, on the other hand, can trust that the data they utilize comes from a trustworthy source — and this can be observed in the whole value chain.

The International Data Spaces Association (IDSA) is committed to establishing standards for data spaces, ensuring that the features mentioned above are indeed built into every data space by design. Within a defined governance framework, these standards guarantee self-determined, secure data sharing between participants.

***The International Data Spaces Association (IDSA) is a non-profit, consensus-based, member-driven organization focused on establishing and promoting standards for data spaces. IDSA's core contributions are the Dataspace Protocol, the IDSA Rulebook and the IDS Reference Architecture Model (IDS-RAM). Together, these resources support the creation of interoperable and scalable data spaces that enable trustworthy data sharing across industries and borders. Since its inception in 2016, IDSA has grown to include almost 200 members from over 30 countries, all collaborating to advance the development and adoption of data spaces globally.***

# *A global movement for trustworthy data sharing*

IDSA turns the idea of trustworthy data sharing into practice. We promote a world where organizations keep control over their data while sharing it safely and effectively.

Our goal is to make data spaces work everywhere. We drive innovation, awareness, and global adoption by defining the technical foundations that make trustworthy data sharing possible. Together with our community, we create the standards that make trustworthy data sharing possible across technical, semantic, organizational, and legal levels.

Data sovereignty is central to this mission. It determines who controls and takes responsibility for data along its journey. The degree of control may vary, but the rules must always be clear, transparent, and enforceable. These rules define how data is used, who can access it, and under what conditions.

IDSA does not define these rules. We provide a framework that helps others apply and enforce them. Governance authorities, operators, service providers, governments, and companies use this framework to describe their data policies with clarity and consistency. The Data Space Connector brings these policies to life. It ensures that all data shared between data space participants adheres to the agreed terms and that trust is maintained in every interaction.

Whether you're a "User" leveraging data spaces as a participant for business value or a „Maker" creating data spaces and providing services within them, we invite you to join us in advancing data space practices and technology. Our goal is to push for trustworthy data spaces that empower every industry to use data in a sovereign manner.

- If you are a Maker, becoming a member of our association is compelling. You will join our 190+ members across businesses, organizations and government institutions from over 30 countries worldwide. Members are at the center of our work, creating the knowledge and assets we make available to industry and the public. Membership gives you access to all our activities.
- If you are a User, you can subscribe to our Data Space User Group instead of becoming a member. Launched in May 2025, the User Group gives you access to the subset of activities designed specifically for your needs and offers streamlined access to essential IDSA assets.

# Building global data spaces

Data spaces are already transforming how organizations share and use data. The next step is to connect them across regions and industries so that trusted data sharing becomes truly global.

Sharing data inside one company is already a challenge. Extending this exchange across borders adds new layers of complexity. Rights and obligations must be clear, and technical systems must be reliable. Above all, participants need trust, control, and accountability.

These questions are not limited to one region. Europe, Japan, Brazil, and many others are shaping their own data space initiatives. International cooperation is essential to connect these approaches, prevent fragmentation, and build scale. Only then can data spaces deliver real economic and societal value.

For global data spaces to work, interoperability and data sovereignty must go hand in hand. Interoperability connects technical, semantic, organizational, and legal layers. Data sovereignty ensures that data space participants remain in control of their data, defining how it may be used and under which conditions.

The IDSA framework brings these two elements together. The IDS-RAM, the IDSA Rulebook, and the Dataspace Protocol provide the technical and governance foundations. The Data Space Connector ensures that these rules are enforced in practice, ensuring both compliance and trust among data space participants worldwide.

## *IDS Reference Architecture Model (IDS-RAM)*

The IDS-RAM is the foundational framework of a data space. It ensures that all components work together seamlessly and that data spaces operate as intended.

The IDS-RAM defines the key building blocks and requirements needed to create a data space. It provides a structure for designing and implementing data-sharing solutions while enabling technical and semantic interoperability across different implementations. This includes specifications for Data Space Connectors, data models, and security mechanisms, as well as guidelines for data governance.

It also supports stakeholders throughout the decision-making process by taking their specific requirements and perspectives into account. Its modular design allows for different types and patterns of data spaces, depending on use cases and objectives.

From establishing the business rational and functional requirements to structuring information models, implementing processes, and selecting the right systems, the IDS-RAM serves as a guide. It helps participants identify common ground, understand potential barriers to implementation, and make informed design choices.

## *IDSA Rulebook*

The IDSA Rulebook serves as a foundational guide for organizational interoperability within data spaces. It offers detailed recommendations that enable organizations to harmonize their business processes – for seamless collaboration and data sharing across different entities.

The IDSA Rulebook serves as a guide for implementing the IDS Reference Architecture Model, provides a foundation to create data spaces and helps data space initiatives define their rules, governance, and legal basis for data sharing. The goal is to clarify: How do you set up a data space? What is mandatory to include? How can it be made trustworthy?

## *IDS Certification*

IDS Certification builds trust and ensures interoperability in the data economy. Data spaces work best when participants use certified Data Space Connectors that meet high security and interoperability standards. This helps everyone share data safely and confidently.

The IDS Certification verifies that a connector complies with the IDS architecture and fulfills defined trust and security criteria. It guarantees that data exchange between organizations is reliable, traceable, and sovereign.

With the final release of the Dataspace Protocol 2025-1, the IDS Certification Scheme is evolving to include automated interoperability testing based on the Dataspace Protocol's Technology Compatibility Kit (TCK). This will extend certification from security and trust to verified protocol compliance.

By choosing certified Data Space Connectors, organizations can rely on a proven foundation for data sharing that allows them to focus on identifying meaningful use cases and creating real business value.

## *Data Space Connectors*

Participants in a data space use a Data Space Connector to share data securely and with trust. This software connects different systems, platforms, and organizations so that information flows smoothly while data providers remain in control.

Connectors provide data sharing services and enforce the rules for data usage, set by the data provider. They manage access, apply usage policies, and ensure cybersecurity. In practice, they make shared data usable for innovation across many domains, for example in digital twins, artificial intelligence, or industrial analytics.

Data sharing requirements differ between sectors and technologies. Connectors for IoT environments may serve different purposes than those for enterprise platforms. Therefore, ensuring that all connectors communicate reliably is essential. The Dataspace Protocol defines how they interact and helps prevent new data silos by aligning communication standards.

With common standards in place, data spaces can grow and connect worldwide. They support collaboration based on trust and create a fair environment where every participant can share data with confidence and purpose.

### *The key to data spaces is the connector*

- **Connects participants in a data space –** to share, utilize, benefit from data.
- Ensures trust **through IDS Certification** and **cyber security assessment**.
- Connects to **trust frameworks** and **identity management.**
- Includes **identity & policy management**, ensures **data usage control**.
- Guarantees **interoperability**.
- Understands and enforces **data usage policies**.
- **Master** for other connectors of diverse feature sets.

# Dataspace Protocol

The Dataspace Protocol is the core technical element of a data space. It ensures interoperability between participants by defining standard protocols and mechanisms for data sharing. This enables smooth communication between systems and devices.

The Dataspace Protocol also supports the use of common vocabularies and ontologies. This improves semantic interoperability and makes sure data can be understood in the same way across different environments.

The specification follows the functional requirements of the business processes described in the IDSA Rulebook and reflects agreed industry needs. One of IDSA's goals is to advance the DSP toward ISO standardization, including a Publicly Available Specification (PAS).

IDSA released version 2024-1 of the Dataspace Protocol at the beginning of 2024. It comes with a TCK – an automated test suite that helps developers check whether their implementation meets the specification. The TCK is the basis for interoperability testing and is being integrated into the IDS Certification Scheme.

The specification and its governance have been contributed to the Eclipse Dataspace Working Group. The group now maintains the protocol and coordinates future releases, including the current and stable version 2025-1.

## Eclipse Dataspace Working Group

To support the development of open-source software for data spaces we founded the Eclipse Dataspace Working Group (EDWG) with the Eclipse Foundation. Together with the other members of EDWG, we drive open collaboration and projects to build scalable, standards-based open source solutions and specifications for data spaces.

IDSA's work sets the organizational and technical foundation for data spaces, ensuring trust, interoperability, and data sovereignty. The Dataspace Protocol, central to this framework, facilitates interoperability and is moving towards an Eclipse Specification Project to expand participation and ensure high-quality standards.

This partnership signifies a strategic move to harness global developer contributions, making code sustainable and facilitating the creation of trusted data sharing frameworks. IDSA's goal is to make the Dataspace Protocol an ISO Standard.

By working with the Eclipse Foundation, IDSA accesses a vast network of open-source developers, accelerating the development of data spaces and contributing to a global scale of trusted data sharing and digital sovereignty.

# *Join the IDSA Working Groups – shape the future of data sovereignty*

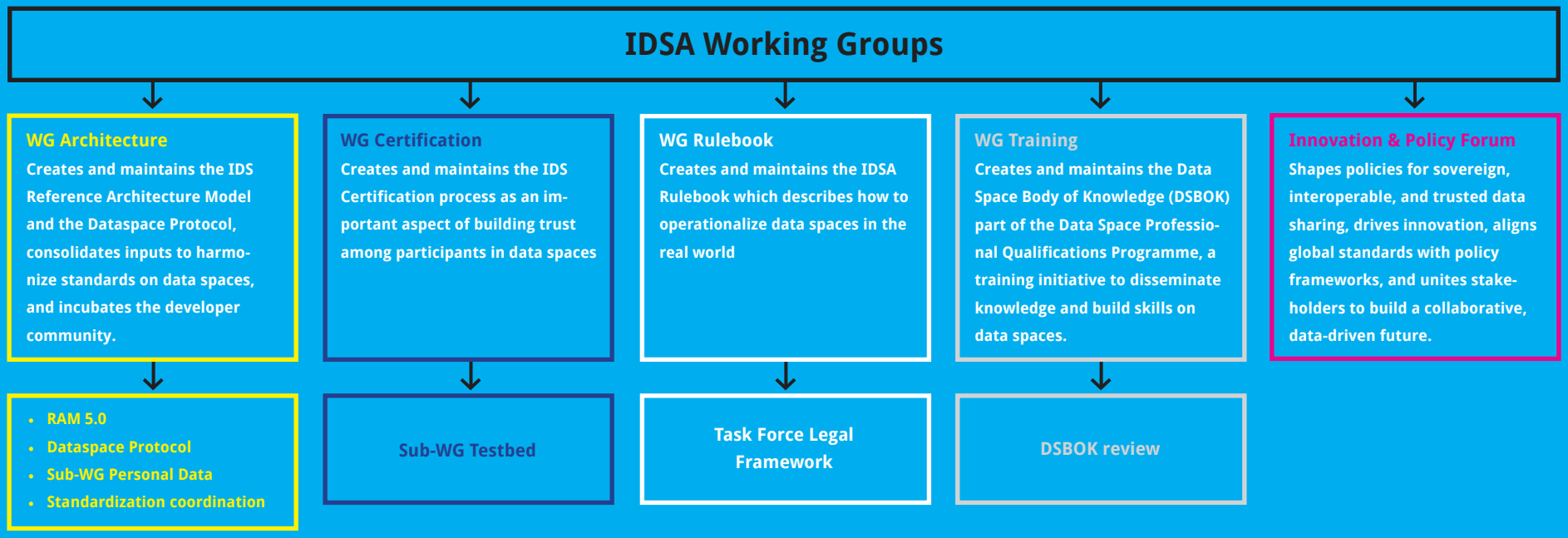
Our working groups are the innovation engines that drive data spaces forward. These collaborative teams develop the core frameworks, standards, and resources that are establishing IDSA as a leader in data spaces globally.

IDSA's work is organized across five working groups, each addressing critical aspects of data spaces and data economy development:

The working groups are further divided into several sub-working groups to allow a more detailed and specialized approach to tackling key topics and challenges.

This structure ensures that members can engage with the areas most relevant to their expertise and interests while contributing to the broader goals of the IDSA community.

Your expertise – whether technical, business, legal, or operational – is vital to our continued success and impact.



# Global standards – the key to interoperability

Data spaces have the potential to revolutionize data sharing. But for companies to invest with confidence, they need assurance: Will their investment hold value in the future? The answer lies in standardization.

International standards ensure that data spaces remain stable, interoperable, and future-proof. By adopting standards that define the characteristics of data spaces or trusted data sharing, businesses worldwide gain technical clarity, reducing investment risks while ensuring sovereign and trustworthy data sharing. Without standardization, data spaces risk fragmentation and limited scalability.

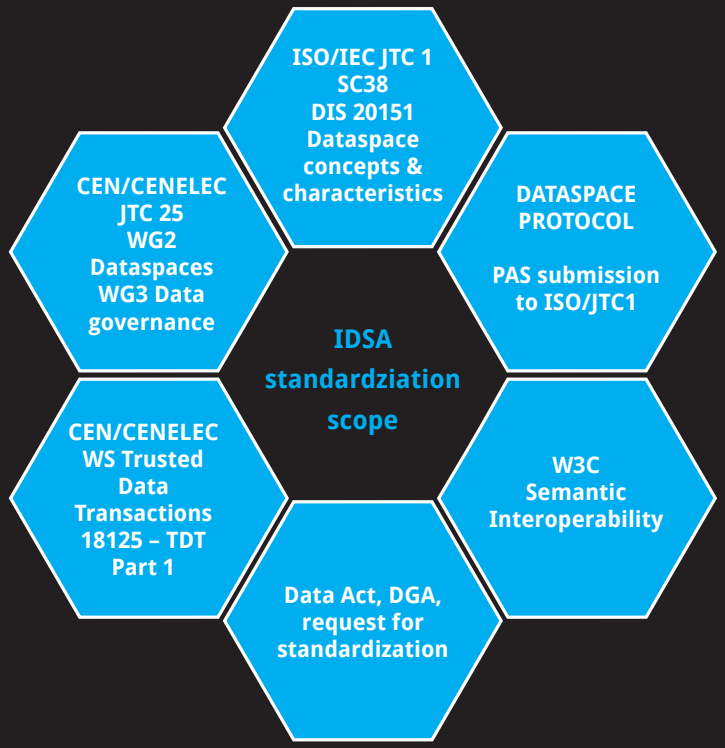
By aligning with internationally recognized frameworks, businesses can:

- Secure long-term ROI: Avoid costly rework and ensure interoperability across industries and regions.
- Reduced technical barriers: Lower costs and increase market accessibility.
- Ensure regulatory alignment: Comply with EU and global policies, including the European Data Act and the Data Governance Act.
- Accelerate market adoption: Leverage open-source solutions and proven industry standards.

## IDSA's role in driving global standards

IDSA has developed a comprehensive framework – a soft infrastructure – that defines the fundamental characteristics of data spaces. From the high-level guidance of the IDSA Rulebook to the implementation patterns and variants within the IDS Reference Architecture Model, to the streamlined Dataspace Protocol ensuring technical interoperability.

As a globally recognized, consensus-driven organization, IDSA brings its members together to co-create valuable resources through various working groups and collaborative activities. Standardization is central to our mission. Through collaboration with ISO, CEN/CENELEC, W3C, and the European Commission, we actively shape global standards for data spaces.




## ISO/IEC 20151

(Expected publication: late 2025): The IDSA Rulebook has paved the way for the development of ISO/IEC 20151, an international standard defining the key characteristics of data spaces. This standard is being developed by ISO/IEC JTC 1/SC 38, the committee responsible for cloud computing and distributed platforms. Now advancing to the Draft International Standard (DIS) stage, ISO/IEC 20151 will undergo review and voting by ISO

## Dataspace Protocol (DSP)

The DSP ensures seamless and standardized communication between data space participants. IDSA is working closely with the Eclipse Foundation to finalize the DSP specifications. This effort is coordinated through the Eclipse Dataspace Working Group (EDWG). The DSP specifications are accompanied by the Dataspace Protocol TCK and a compatible implementation. All of these components will be submitted to PAS ISO.

## W3C Semantic Interoperability

IDSA collaborates with W3C to address interoperability challenges, including co-organizing workshops to develop practical solutions for semantic interoperability in data spaces.

## European Commission standardization requests

To support the Data Act and the Data Governance Act, the European Commission has initiated the development of standards by CEN/CENELEC. These standards are intended to improve data sharing in the EU and ensure compliance, innovation and trust across sectors.

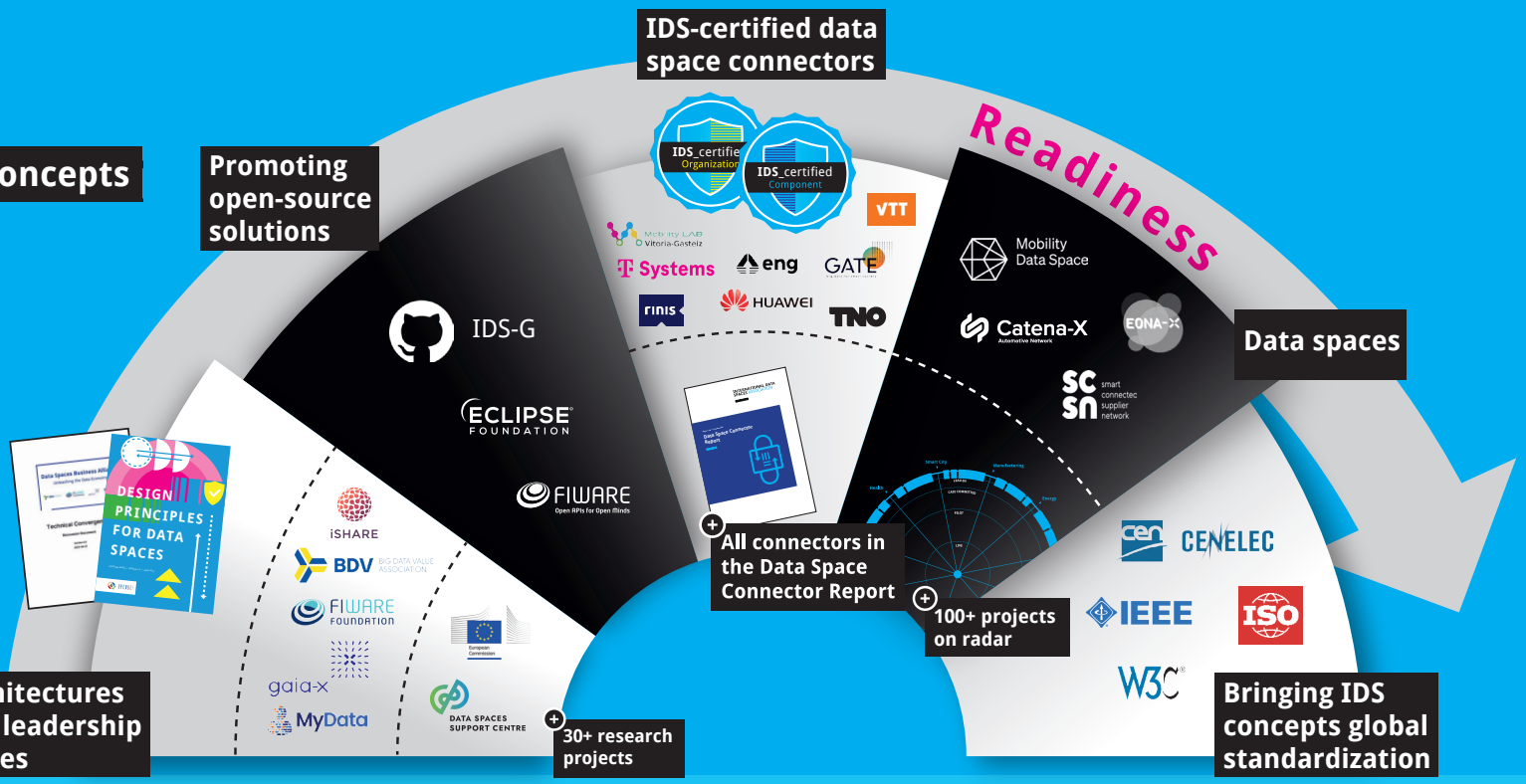
## CEN/CENELEC Trusted Data Transactions (CWA 18125:2024)

This workshop aims to support the creation of standards that ensure secure and reliable data transactions across various sectors. The agreement serves as a pre-standardization effort, providing a common framework that can be used independently of specific architectures or technical implementations to foster interoperability and trust in data sharing ecosystems.

## CEN/CENELEC JTC 25

This committee develops standards for data management, dataspaces, cloud, and edge computing. Two relevant working groups include:
WG2: Focuses on standards for trusted data transactions and harmonization within European data spaces.
WG3: Works on data management and governance, including standards for data catalogs, ontologies, and quality assessment.

# *IDSA on its way to international standards*




**IDS assets**

- Scope and responsibility of IDSA
- IDS RAM
- IDS Certification
- IDS Testbed
- Dataspace Protocol
- IDSA Rulebook
- Professional Qualification Program

# IDSA as part of data space ecosystems in the edge-cloud-continuum

Data spaces are no longer a vision: more than 200 are already running, all built on IDSA concepts. The relevant technologies are in place and moving toward broad commercial offerings. Global standardization guarantees industry-grade quality and wide adoption.

IDSA's reach is international: hubs and research centers anchor data spaces in all relevant economic regions. Through strong partnerships with initiatives such as JDTF, Gaia-X, and iSHARE, IDSA complements its own standards with federated infrastructures – together creating a full stack for data sharing with trust.

By providing shared principles, global interoperability, and trusted governance, IDSA ensures that data spaces become a worldwide instrument for innovation and growth.

Derived from the needs of its stakeholders (data space authorities, cloud service providers, user organizations), IDSA pursues the following distribution of work:

- **Gaia-X and iSHARE deliver specific trust frameworks for data space participants.**
- **Fiware, OPC-Foundation, Industrial Digital Twin Association (IDTA) and other prominent players deliver semantic models for data sharing.**
- **MyData and Solid add a perspective on sharing of personal data.**

These initiatives share the goal of cross-domain application and provide a baseline for individual data space initiatives.

## *Joining forces*

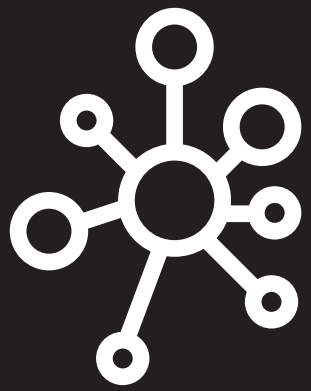
The Data Spaces Support Centre (DSSC) is funded by the European Commission and contributes to the creation of the Common European Data Spaces. It provides guidance and support to enable trustworthy, sovereign, and secure data sharing, fully aligned with EU values and regulations, and supports both the European economy and society.

The European ambition for its data spaces is to ultimately foster the emergence of a Common European Data Space, where interoperability and the use of standards eliminate all barriers to data application and data-driven innovation.

The DSSC was conceived in the context of and supports the implementation of the European Strategy for Data. It coordinates relevant EC actions on sectoral data spaces to ensure they develop coherently, are interoperable, and benefit from economies of scale through common practices and components.

At the heart of this effort, IDSA contributes its expertise in architecture, governance, and interoperability, ensuring that data spaces across sectors can connect seamlessly. Through its standards and framework, IDSA helps make the European vision of a coherent, interoperable data ecosystem a reality.

# *Fostering global collaboration: IDSA hubs, competence centers and labs*



To promote collaboration on a global scale, we have broken barriers and crossed borders. IDSA's network of disseminators advances the mission of sovereign data sharing.

Our internationalization efforts are based on three key multipliers: hub facilitators, competence centers and research labs.

Hub facilitators act as knowledge centers in their country and coordinate the activities of the entire IDSA network there. 13 hubs across Europe and Asia are established, each orchestrating the collaborative efforts of IDSA members and partners.

Competence centers, the second pillar, focus on data spaces in specific domains, and bring expertise and skills to the IDSA ecosystem. With five competence centers now operating across Europe and Asia, IDSA has created a network specializing in various aspects of data sharing.

The third pillar, research labs, are projects hosted by scientific organizations. These labs develop IDS-based components and technologies that can be adopted by the market. The first research labs were launched in Shanghai and Tokyo.

The growth of data spaces around the world reflects our commitment to collaboration and data sharing across languages and cultures. Our expansion extends beyond Europe and establishes a presence in key regions such as Shanghai, Tokyo, Beijing and Malaysia.

In addition, the IDSA Ambassador program comprises data space experts and enthusiasts who champion sovereign data sharing principles. These ambassadors are spreading the message of IDSA wherever they go, contributing to the global dissemination of data space concepts and practices.

As IDSA continues to expand its reach and influence, the organization anticipates exciting developments in collaboration with stakeholders, governments, and ecosystems.

# *Driving impact with the Data Spaces Radar*

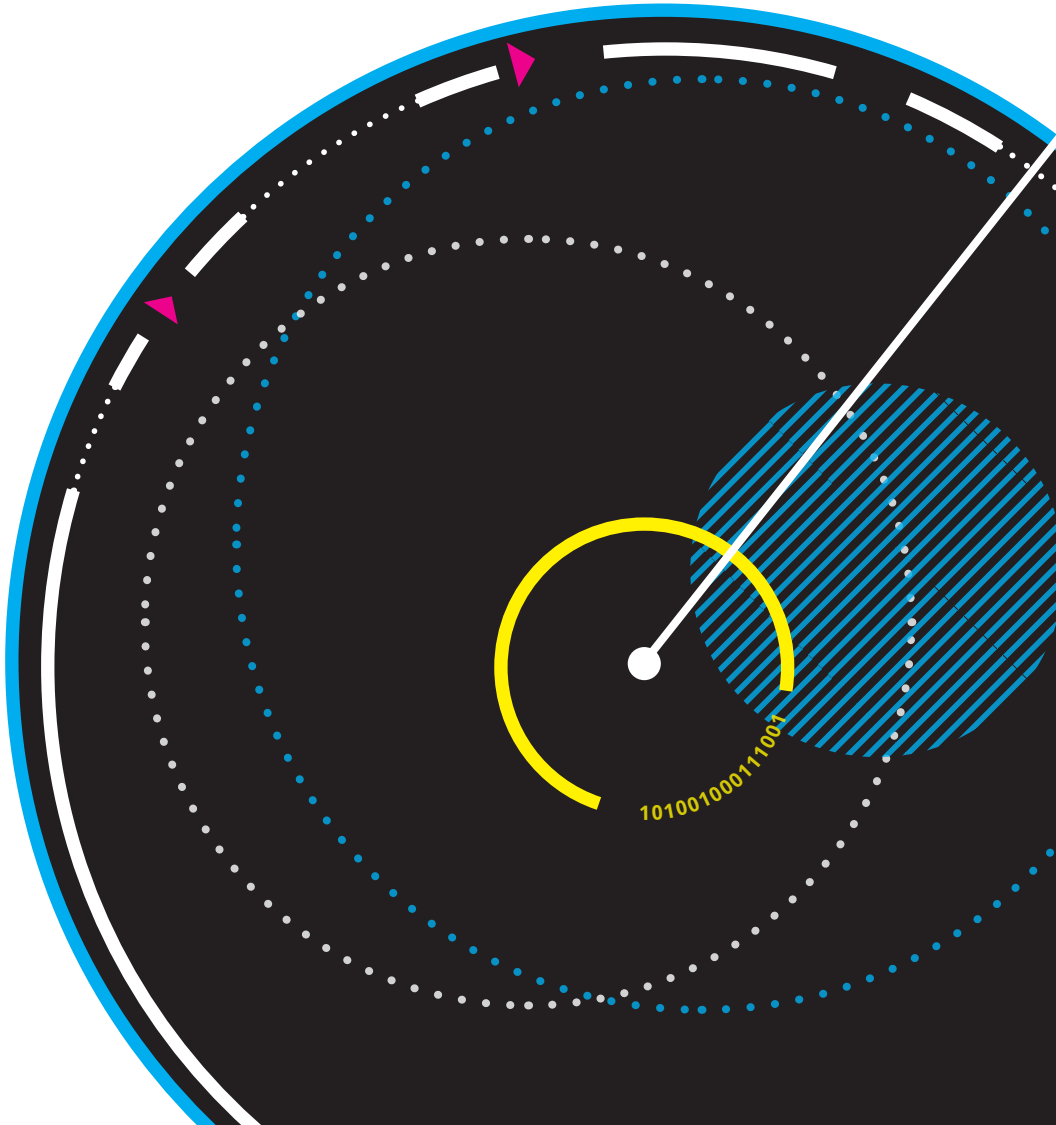
More than three years ago, we introduced the Data Spaces Radar, a tool that quickly gained attention and adoption in the data space world. The radar has been instrumental in collecting and cataloging diverse data spaces – with over 200 entries recorded.

This publicly accessible tool offers a panoramic view of data spaces initiatives worldwide. It provides insights into sectors, locations, and the development stages of these initiatives, ranging from initial use cases to fully operational data spaces in production.

By showcasing real-life success stories collected through a user-friendly online form, the Data Spaces Radar aims to inspire. But it also serves as a guide for project teams, aiding them in selecting the most suitable technologies for their data space endeavors. It fosters a platform for sharing knowledge and experiences, encouraging reflection on technology decisions.

The Data Spaces Radar assesses the development stage of each initiative, categorizes them into business, organizational and technical aspects, forming the foundation for a comprehensive evaluation.

The business and organizational categories include business models, governance, and legal frameworks. The technical categories cover aspects such as access control, trust, identity management, and data interoperability.



# *Impressive success stories in the data economy*

The IDS standard has led to impressive impact stories across industries worldwide. By fostering sovereign and trustworthy data sharing, IDS has unlocked new opportunities for innovation and collaboration. Here are some examples.

## *Mobility Data Space*

The Mobility Data Space (MDS) addresses the pressing issue of mobility, both as a widely used service and a contributor to climate change. It aims to foster sustainability in transportation. Initiated by Germany's federal government in 2019, today over 200 stakeholders from various sectors create an open data space which enables the use of mobility data in real time.

The MDS goes beyond the use of traditional vehicle data. It covers a wide range of information, including mobile network data, insurance data, weather data, and administrative data. This comprehensive approach allows for holistic solutions in mobility management, from optimizing traffic flow to improving public transport services.

The data space is built upon the IDS Reference Architecture, which enables data providers to specify and control conditions for data usage, fostering confidence regarding origin and quality of the data. Through IDS-based data connectors, the MDS seamlessly integrates both open and private data, becoming a digital distribution channel for innovative, data-driven mobility solutions.

Deutsche Bahn's forthcoming provision of parking occupancy data is an example of the practical applications of the MDS. Such mature use cases highlight the platform's versatility. The IDS standard underpinning the MDS ensures data remains with the participants while enabling collaboration through standardized connectors.

Crucially, the MDS operates on the principle of community-driven data sharing. Working groups establish rules and standards for its sharing, allowing a collaborative environment where participants share insights and success stories. This community-centric approach not only strengthens the MDS but also contributes to the wider adoption of IDS standards across industries.

## *Catena-X*

Catena-X signifies a shift towards a more connected and data-driven future for the automotive sector. It embodies IDS core principles, emphasizing data sovereignty and collaboration to drive industry-wide progress.

Leading companies such as Daimler, BMW Group, Volkswagen, Volvo, SAP, and Siemens AG have endorsed this initiative, signaling a move towards collective action in an industry known for its intense competition.

Catena-X prioritizes responsible, transparent, and sustainable supply chains, which are critical for navigating disruptions that can impact global supply networks. The adoption of the Eclipse Connector underscores Catena-X's commitment to sovereign data sharing, empowering companies to maintain control over their data while participating in a multi-cloud environment. This approach allows businesses of all sizes, including SMEs, to equally integrate into the network, providing access to the benefits of data sharing.

Catena-X shows the potential of data sharing guided by IDS principles. Through an open ecosystem approach, it fosters industry-wide collaboration, beyond conventional boundaries. As emphasized by Hagen Heubach of SAP, interoperability and openness are key elements of this transformation, laying the groundwork for collaboration to drive innovation and resilience across the automotive sector.

## *SCSN*

The Smart Connected Supplier Network (SCSN) emerges as a resilient and productive solution for high-tech manufacturing vulnerable to delays in supply chains. The delay of a single component can halt production, resulting in significant losses.

TNO, in collaboration with KMWE, Brainport Industries, and Batchford, responded to this need by conceiving the SCSN. This initiative fosters collaboration and resilience.

Traditionally, manufacturers operate distinct systems, which hinders seamless communication throughout the supply chain. SCSN, built upon IDS architecture, bridges this gap by facilitating communication among partners. This system of systems empowers stakeholders to track critical information, forecast deliveries, and share technical product data with ease.

SCSN's benefits are manifold, promising productivity increase while avoiding vendor lock-ins associated with conventional supply chain software. Leveraging IDS standards, SCSN ensures instant data access and transparent communication.

The success of SCSN in the Netherlands sparks plans for an European expansion under the banner of „Market 4.0." Collaborations with partners in France, Spain, and Japan signify a global embrace of SCSN's transformative potential.

## *Eona-X*

Eona-X is set to transform mobility, transport, and tourism through sovereign data sharing. With a focus on driving collaboration and efficiency, this initiative marks a big shift in how these sectors operate in the digital age.

Eona-X addresses a wide range of means of transportation such as airplane, bus, train, car, and bicycle, but also hospitality and tourism points of interest such as museums, natural sites, local events and services and activity spots. The key is to ensure data sovereignty and nurture trade. The creation of a large data and services catalog will allow new use cases – to improve the travel experience and the processes of the stakeholders.

Key industry players, including Amadeus Group, SNCF, Air France, and KLM, are leading the way alongside newcomers such as Echo and Help. Together, they form a diverse consortium committed to leveraging data for the collective benefit of the ecosystem.

The goal is to build a trusted data space to improve services for users and stakeholders in mobility, transport and tourism and create new business opportunities.

As Eona-X gains momentum, efforts focus on practical implementation and tangible impact. Through prototype demonstrators, the initiative shows the potential of data sharing in enhancing travel experiences and security measures.

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