INTERNATIONAL DATA SPACES ASSOCIATION

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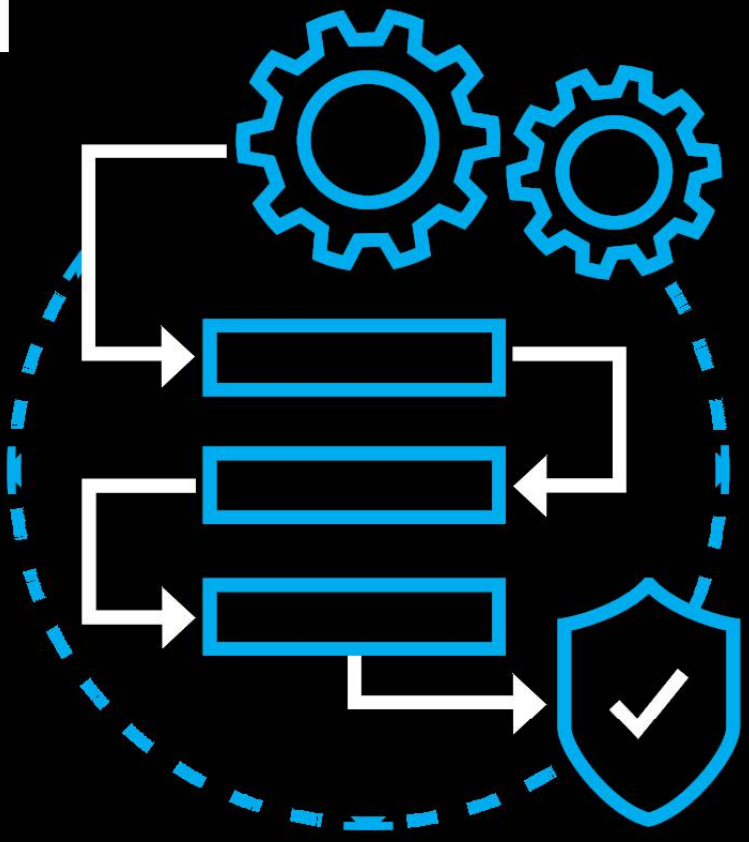
Data Spaces Standardization Landscape – Europe and International



- ● Position Paper of members of the IDS Association and of the IDS-Industrial Community
- ○ Position Paper of bodies of the IDS Association
- ○ Position Paper of the IDS Association
- ○ White Paper of the IDS Association

Foreword

Standardization is essential for enabling operational data spaces and achieving the objectives of European and international data strategies. This paper highlights the role of IDSA in translating regulatory goals into practical, certifiable tools through active engagement in standardization activities.

It outlines the convergence of key frameworks—such as the IDS architecture, the Rulebook, the Dataspace Protocol, and emerging international standards—while emphasizing the importance of the European Standardization Request under the Data Act and the ongoing activities of CEN-CENELEC JTC 25. By mapping the current landscape and identifying existing gaps, this document provides a foundation for future technical alignment and collaboration.

The paper positions IDSA as a key connector between industry implementation and standardization.

Through its engagement with industry stakeholders, technology providers, and standardization bodies, IDSA translates real-world implementation experience into formal standards, ensuring that emerging specifications are both technically robust and practically applicable.

The insights presented are informed by working groups, project experience, and regulatory dialogue, and are intended to guide the next phase of technical and policy development. At the same time, IDSA supports the adoption of these standards across industry, helping to bridge the gap between standard specification development and large-scale deployment.

Broad stakeholder involvement—particularly through initiatives such as the Data Space Adoption Forum[1]—will be essential to scaling trusted and interoperable data sharing solutions across Europe and beyond.

[1] *Data Space Adoption Forum, available at https://internationaldataspaces.org/data-space-adoption-forum/*

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1 Executive summary

This paper explains the strategic importance of standardization developing and implementing data spaces, with a particular focus on the role of the International Data Spaces Association (IDSA) and its alignment with European and international standardization initiatives.

Data spaces rely on shared standards to enable secure, interoperable, and sovereign data sharing between organizations. This paper highlights key technical and governance-related areas where standards are essential: data discovery, identity and access management, semantic interoperability, contract negotiation, and conformity assessment. It is based on work by IDSA and its members, who have developed core components such as the IDS Reference Architecture, the Dataspace Protocol, and the IDSA Rulebook.

The paper also surveys the current standardization landscape, including ongoing efforts within ISO/IEC JTC 1 SC38, CEN-CENELEC JTC 25, the IEEE P3800 working group, and initiatives like the European Trusted Data Framework. It underscores the impact of regulations such as the EU Data Act, the Data Governance Act, and the AI Act, which introduce new requirements for interoperability, trust, and technical infrastructure in data exchange.

This paper reflects the state of the art of standardisation activities as of April 2026. We intend to keep this work updated and invite participants and readers to provide comments and engage in open discussions to identify remaining gaps and areas where further work is needed. These contributions will be considered in future updates of the paper. In parallel, we plan to extend the analysis of regulations and standardisation activities to other regions beyond Europe.An analysis of standardization gaps reveals the need for further work in metadata governance, usage control, ontology alignment, and cross-sector interoperability. This gap analysis is intended to inform about the ongoing efforts of CEN-CENELEC JTC 25 and related committees.

Overall, the paper positions IDSA as both a contributor and a connector, bridging industry practice and regulatory objectives and offering guidance to standardization bodies based on real-world implementation experience.

2 Motivation and scope of the paper

IDSA is well-positioned to communicate developments in data space standardization, especially within ISO/IEC JTC 1/SC 38 – Cloud Computing and Distributed Platforms, and CEN-CENELEC JTC 25 Data Management, Dataspaces, Cloud and Edge. The IDSA community has a strong interest in these topics and seeks further information. The paper aims to offer general information and guidance for a broad audience. This includes references to publicly available sources from ISO/IEC, CEN-CENELEC, and the European Commission, as well as IDSA documents that contribute to data space standardization.

In addition, and reflecting the international perspective of IDSA, the paper introduced in chapter 5 and international perspective on data space development. While Europe plays a

lading role in shaping architectures and governance frameworks, relevant initiatives, mostly in Japan and China, are also emerging globally. For this reason, we understand these developments are essential to address challenges related to interoperability, regulatory alignment, and trusted cross-border data exchange.

2.1 Scope and purpose of the document

The objective of this report is to highlight the critical importance of standardization within data spaces, emphasizing its role in enabling trusted data sharing, interoperability, and operational efficiency.

The report presents a vision to shape the future data economy through the development of international standards for data spaces. These standards are vital to ensure sovereign and trustworthy data sharing, particularly as demanded by European stakeholders. Moreover, they enable interoperability across the global landscape, which is indispensable for fostering a connected and efficient data ecosystem.

Standardization plays a pivotal role in the global exchange of data. It harmonizes technical specifications, reducing barriers to data sharing and enhancing global trade. Businesses benefit from standardization as it helps by reducing costs, facilitates entry into global markets, and ensures the delivery of high-quality products. Additionally, standardization supports innovation, minimizes research and development risks, and promotes environmental sustainability. To stay competitive, companies must influence regulations and adapt to market trends, both of which are facilitated by active participation in standardization efforts.

Standards are also recognized as a key tool for reducing technical barriers to trade. According to the WTO Agreement on Technical Barriers to Trade (TBT), international standards enhance production efficiency and facilitate international trade, provided that technical regulations are not used to create unnecessary obstacles [WTO TBT Agreement, Articles 2 and 4[2]]. The European Commission also emphasizes that avoiding unjustified trade restrictions is essential for maintaining a strong, transparent, and rules-based multilateral trading system[3].

The motivation behind this data spaces standardization paper is to serve as a comprehensive reference, capturing the latest developments and insights in the field to build awareness and alignment among the IDSA community and other stakeholders, ensuring a unified understanding of key data spaces standardization aspects. In addition to its strong focus on European initiatives, the report incorporates an international perspective, acknowledging the growing number of global approaches to data sharing, interoperability, and governance. The report also aims to identify gaps in existing standards that should be addressed by IDSA and standardization committees, thereby fostering improved standardization efforts.

[2] *World Trade Organization. Agreement on Technical Barriers to Trade, Articles 2 and 4. Available at: https://www.wto.org/english/docs_e/legal_e/tbt_e.htm#art4*
[3] *European Commission. Technical Barriers to Trade. Available at: https://policy.trade.ec.europa.eu/help-exporters-and-importers/accessing-markets/technical-barriers-trade_en*

The paper is intended for data spaces experts, stakeholders, projects, initiatives, and standardization committees. Experts will find it a valuable resource for enhancing their knowledge of both European and international developments. Stakeholders, including businesses and European Commission (EC) projects, as well as international initiatives, can use it to align strategies with standards. Standardization committees focused on areas such as artificial intelligence, interoperability, and cybersecurity may benefit from these insights when integrating data spaces standards into broader regulatory frameworks.

Help us improve this paper

This paper can be updated in the future based on feedback and comments received after publication, especially regarding gaps in data space standardization. If you have any suggestions or comments on the paper, please provide them using this link:

IDSA Position Paper on Standardization | Feedback

2.2 Scope of data space standardization

2.2.1 The need for standardization in data spaces

The standardization of data spaces is essential to ensure interoperability, trust, and efficiency in data sharing ecosystems. Key areas of standardization include foundational concepts and terminology, the core functions required for data space operation, and technical specifications and protocols needed to achieve interoperability. The International Data Spaces Association (IDSA) plays a central role in this effort by defining and developing the specifications that enable trustworthy and interoperable data sharing.

2.2.2 Key areas of standardization in data spaces

While data spaces are domain-agnostic and cross-sectoral by nature, they require a common, horizontal foundation of standards to enable trusted data sharing. These horizontal standards must be complemented by domain-specific standards that address sector-specific requirements. This report focuses on the key areas of common standardization in data spaces, without aiming to be an exhaustive list.

Data space principles and characteristics

A clear definition of what constitutes a data space is essential for a shared understanding among stakeholders. This includes principles such as full autonomy and digital self-determination over their data, decentralization, and neutrality[4], which distinguishes data spaces from traditional data-sharing approaches.

[4] *Steinbuss, S., Spiekermann, M., Koen, P., The Data Space Manifesto, International Data Spaces Association, 2025* https://doi.org/10.5281/zenodo.15190876

Establishing trust

Trust is a foundational requirement in data spaces, ensuring that data providers and consumers can interact securely. Standardization is necessary for identity management, trust frameworks, participant authentication, and access control policies.

Semantic interoperability through ontologies and vocabularies.

Different organizations and sectors often use different data models and vocabularies. To enable meaningful data sharing across domains, standardization is required in semantic models, including ontologies and vocabularies specific to data spaces.

Data discovery

For an efficient data economy, participants must be able to discover relevant data assets. This requires standardized metadata models and indexing mechanisms that support efficient search and retrieval.

Data contract negotiation and agreement.

Participants must be able to negotiate data-sharing terms. This includes specifying policies, terms of use, and execution procedures. Standardized specifications are needed to define common formats and protocols that allow entities to publish data offers, negotiate agreements, and manage access to the data.

Interoperability

To prevent fragmentation and enable connectivity, participants must interact in an interoperable way - both within individual data spaces and across multiple data spaces. This requires adherence to shared standards and protocols.

Governance framework

Data spaces rely on governance frameworks that define policies, roles, decision-making structures, and accountability mechanisms based on participant's requirements. While governance itself may not be standardized, IDSA can contribute by providing templates, guidelines, and best practices.

Conformity with technical regulations and standards

The conformity of data space participants with the applicable regulations and standards is critical. Standardization must support conformity assessment schemes, which form the basis for certification mechanisms. These ensure that participants, components, and connectors comply with security, interoperability, and legal requirements. Such processes build trust and promote widespread adoption.

AI and data spaces

The integration of Artificial Intelligence (AI) within data spaces introduces additional requirements beyond those needed for basic data sharing. AI systems rely on access to large, diverse, and high-quality datasets, which must be exchanged and processed in a way that preserves trust, sovereignty, and compliance with applicable regulations. Data spaces therefore need to support mechanisms for controlled data access, transparent data usage policies, and verifiable data provenance to ensure that AI models are trained and deployed responsibly. Furthermore, interoperability between data space components is essential to enable AI services to operate across organizational and sectoral boundaries. By addressing AI Act and Data Act requirements, data spaces can provide a trusted environment that enables the development and deployment of AI applications while respecting data sovereignty and fostering cross-ecosystem innovation. IDSA has started a Task Force: Data spaces & AI, to join to the Task Force mailing group and participate in the meetings, please fill in this form[5]: this task is for IDSA members only. To become a member, you can visit this page[6] and download the membership application form[7].

[5] *AI and Data Spaces Task Force / Interest Form, available at* https://forms.office.com/pages/responsepage.aspx?id=NNZGs_usx0K9RPFVfuibGz1qA21VHyZEj6dyjHL7iBdUNDFEMVFZUkpNSjU0TUdLWk5XWVYzNTBLSi4u&route=shorturl

[6] *IDSA, Become a member, available at* https://internationaldataspaces.org/we/become-a-member/

[7] *IDSA, Membership Application Form, available at* https://internationaldataspaces.org/wp-content/uploads/dlm_uploads/2025-IDSA-Membership-Application-Form-EN-7.pdf

Non-covered areas in IDSA standardization

Data governance and internal data management. Activities such as data quality assurance, internal data policies, and enterprise access controls are essential prerequisites for enabling data sharing. However, they fall outside the scope of IDSA's standardization efforts, as they are typically managed internally by organizations according to their specific needs and regulations.

Internal data governance for participants in data spaces. It refers to the processes through which organisations adapt their internal policies, procedures, and operational practices to comply with the rulebooks and requirements of the data spaces they participate in. However, considering the relevance of internal data governance for the scalability and sustainable adoption of data spaces, and its relation to discussions within the DS Adoption Forum, it may be worth considering whether this topic should be further reflected or addressed within IDS assets in the future.

Data quality is the degree to which data and its metadata are accurate, reliable, and fit for their intended use within a given context. At present, IDSA does not define specifications for data quality.

Data usage practices. IDSA does not standardize operational aspects of data usage, such as how data is processed. It also does not define provenance models or enforce data usage guidelines.

Data trading and marketplaces. While data sharing in data spaces is inherently peer-to-peer, intermediaries and marketplaces may offer optional value-added services for data trading. As these are not core to the data space architecture, they fall outside the scope of IDSA standardization.

Cybersecurity and information security. While not directly standardized by IDSA, cybersecurity and information security are essential for trusted data sharing. These aspects are typically addressed through established frameworks and models for managing security risks and protecting data infrastructures.

Emerging technologies (Artificial Intelligence and digital twins, IoT). While connected to data spaces, these technologies are not standardized by IDSA.

Reference architecture. The IDS-RAM is a conceptual framework that is not intended for standardization, as it operates above the level of concrete software architectures.

Domain-specific standards. IDSA does not cover domain-specific standards, such as sector-specific data spaces, industrial semantics, or metadata models.

2.3 Standardization gaps in data spaces

This chapter presents an initial assessment of gaps in data space standardization. These gaps are identified based on ongoing activities in various working groups and the European Commission's standardization request. This work will continue under the scope of CEN-

CENELEC JTC 25 (see chapter 4.4 CEN-CENELEC JTC 25 and specially subchapter 4.4.3 What's next).

2.3.1 Guiding principles for data spaces standardization.

Key concepts and characteristics in data spaces that require standardization include establishing trust, governance and interoperability frameworks, metadata definitions, data discovery, contract negotiation, data sharing and usage, observability, semantic models and vocabularies, and communication protocols.

To determine which aspects of data spaces should be standardized, it is important to apply clear criteria that distinguish between elements requiring precise technical specifications and those better suited to broader, more flexible standardization approaches.

Some components—such as the **control plane** defined in the Dataspace Protocol—require detailed technical specifications to enable interoperability across different data spaces. Standardizing these elements ensures consistency in data sharing, access control, and governance across platforms and governance frameworks.

Conversely, aspects like the **data plane**, which involves various data communication protocols, may benefit from a more flexible, multi-standard approach. Given the diversity of existing protocols, mandating a single one would be impractical. A more adaptive framework that accommodates multiple standards allows diverse implementations to coexist and interoperate.

By following these guiding principles, stakeholders can prioritize standardization efforts to better reflect the complexity and needs of evolving data ecosystems.

2.3.2 Standardization gaps for data economy

This chapter identifies key standardization needs and existing gaps across areas such as data governance, data discovery, data sharing, usage policies, data spaces interoperability, data quality and master data, as well as cloud and edge computing.

IDSA is actively addressing many of these gaps, based on real-world needs from its members' data space implementation. This work is ongoing, and further investigations will help identify additional standardization opportunities. The IDSA Data Space User Group[8] or Data Space Adoption Forum[9] provides a valuable forum for end users to contribute requirements based on practical challenges and priorities. Key standardization gaps include:

- **Metadata governance and discovery**: The need for standardized governance frameworks for metadata (e.g., DCAT profiles) and protocols for data discovery and event notifications.

[8] https://internationaldataspaces.org/data-space-user-group/
[9] *Data Space Adoption Forum (DSAF) available at:* https://internationaldataspaces.org/data-space-adoption-forum/

- **Trust frameworks**: Standardized trust frameworks are key to secure, interoperable data spaces. They prevent fragmentation and enable cross-domain trust through shared rules for identity, credentials, and certification.
- **Trusted data sharing**: Rulebooks, secure exchange protocols, and alignment with trust-related initiatives, including identity and credential frameworks.
- **Data usage**: Gaps in ontology governance, data quality criteria, consistent policy implementation, and standards for data usage monitoring.
- **Interoperability**: To enable full cross-sector and cross-border interoperability, common conceptual frameworks, maturity assessment tools, and architectures that support digital sovereignty within the EU are needed.

2.3.3 About the European Commission's standardization request.

The current Standardization Request (SReq) M/614 from the European Commission addresses Article 33(1) of the EU Data Act (Regulation (EU) 2023/2854)[10]. This article defines essential requirements for interoperability in data spaces, including:

- data formats and structures,
- metadata and vocabularies,
- APIs and access mechanisms,
- interoperability of tools such as smart contracts for data sharing.

The Standardisation Request was officially accepted in July 2025 by CEN, CENELEC and ETSI, and work is currently ongoing within the relevant technical committees[11].

The SReq calls on CEN, CENELEC, and ETSI, to develop seven European standardization deliverables, which include:

- Four European standards—two of which are intended for citation in the Official Journal of the European Union (OJEU) to support legal implementation of Article 33.
- Three technical specifications.

These deliverables aim to support fair access to and use of data, as outlined by the Data Act, and to promote balanced value distribution among participants in the European data economy. The table below outlines the proposed deliverables and the adoption timelines by the standardization bodies:

[10] *Regulation (EU) 2023/2854 (Data Act), OJ L 2023/2854, 22.12.2023 [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_2023028 54]*

[11] *CEN/CLC/JTC25Data Space work programme. Available at https://standards.cencenelec.eu/ords/f?p=205:22:::::FSP_ORG_ID,FSP_LANG_ID:3485479,25&cs=1C056A0731BBA8E0462A4FF4326F88FB7*

Table 1: list of new European standards and European standardization deliverables to be drafted and deadlines for their publication.

	Reference information	Publication
1	Harmonised standards on Trusted Data Transactions Part 1: Terminology, concepts and mechanisms	1 June 2026
2	Harmonised standards on Trusted Data Transactions Part 2: Trustworthiness requirements	1 November 2026
3	Harmonised standards on Trusted Data Transactions Part 3: Trustworthiness requirements	1 May 2027
4	Technical specification(s) on a data catalogue implementation framework	1 March 2026
5	Technical specification(s) on an implementation framework for semantic assets	1 September 2026
6	European standard on a quality framework for internal data governance	1 March 2027
7	Technical specification(s) on a maturity model for Common European Data Spaces	1 September 2026

Further details can be found in chapter 4.2 European Trusted Data Framework.

2.4 Data Spaces and Trusted Data Transactions.

The Figure 1 illustrates a layered approach to data ecosystems, distinguishing between data sharing models based on proprietary solutions to fully autonomous organizations in data spaces. Traditional proprietary data sharing relies on centralized platforms, where a single entity controls the business logic and trust context, leading to limited interoperability and potential vendor lock-in. In contrast, data spaces introduce a decentralized approach in which autonomous participants—acting as data providers, consumers, or both—define and enforce data sharing policies to establish mutual trust. An extended model, referred to as data spaces with Trusted Data Transactions (TDT), incorporates additional roles such as data intermediaries, as defined in the Data Governance Act, which enhance the economic and operational aspects of data exchange without altering the fundamentally peer-to-peer architecture. Overall, the figure emphasizes a shift from centralized, proprietary trust models toward federated, interoperable ecosystems where trust emerges from shared standards, policies, and decentralized technologies.

Data spaces and Trusted Data Transactions (TDT)

This diagram illustrates a layered approach to data ecosystems, distinguishing between pure data space, data spaces extended with intermediary-based services, standalone TDT implementations, and proprietary trusted data-sharing systems.

Data Spaces: At its foundation, a data ecosystem can only be considered a true data space if it complies with key international standards that ensure interoperability and trust. These include ISO/IEC 20151 for participant interaction, the ISO/IEC DIS 26450 Dataspace Protocol (DSP) for communication, and the ISO/IEC DIS 26451 Decentralized Claims Protocol (DCP) for identity and trust verification. Together, these standards establish the technical foundation necessary for trusted, sovereign, and interoperable data sharing.

Data Spaces and TDT: Data spaces built on these foundations can integrate additional capabilities, such as data-intermediary services as defined in the DGA, to facilitate data exchange between participants. These elements do not define a data space themselves but act as extensions that enhance its functionality. On top of these layers, data spaces can support value-added services such as data marketplaces, data monetization, and observability solutions. These services do not modify the core interoperability of the data space but operate across all layers.

Trusted Data Transactions (TDT), as defined in CEN-CENELEC JTC25, are not core data space standards. Instead, they apply specifically to data intermediary services as defined in the DGA, which facilitate data exchange. TDT implementations can be used independently of the underlying data space architecture. As such, they should be understood as part of a separate layer of value-added services rather than as intrinsic components of the data space itself.

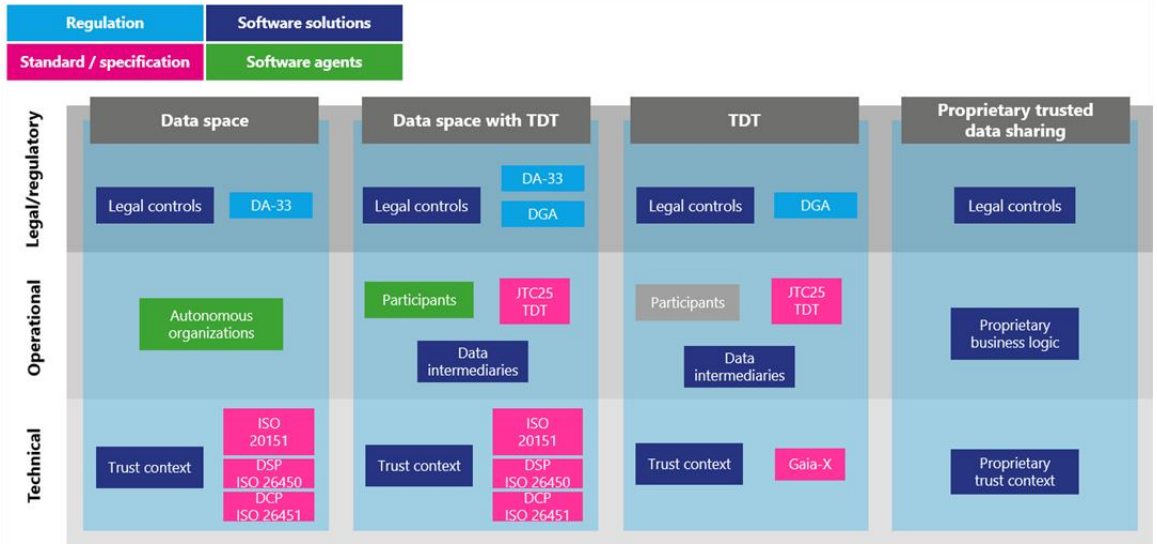

Figure 1: Layered architecture of data ecosystems[12]

[12] *Source: IDSA*

3 Key international standards for data spaces

3.1 Overview

IDS architecture, Rulebook and related technologies have contributed to and aligned with multiple standardisation activities. These efforts aim to translate architectural concepts and operational practices developed within data space initiatives into formal international standards, ensuring broader adoption, interoperability, and long-term sustainability.

Several relevant initiatives are currently being developed within ISO/IEC JTC 1 Information technology[13], particularly under Subcommittee SC 38 Cloud Computing and Distributed Platforms[14]. Complementary work is also being carried out within the IEEE standards ecosystem, where initiatives such as the IEEE 3800 series and IEEE P1988 explore architectures and interoperability mechanisms for distributed and federated systems.

The following sections provide an overview of selected standardisation activities that are particularly relevant to data spaces and trusted data sharing infrastructures

3.2 ISO/IEC DIS 20151-1: dataspaces concept and characteristics

3.2.1 Introduction

ISO/IEC FDIS 20151-1 is a draft international standard titled “Dataspace Concepts and Characteristics”. Its goal is to define core data space concepts and essential characteristics in a way that applies to all organizations[15].

The development was launched at the end of 2023 as a new project in ISO/IEC JTC1/SC38 under WG6. ISO/IEC JTC 1/SC 38 WG 6 is a working group under the Joint Technical Committee on Cloud Computing and Distributed Platforms, focused on developing standards for data sharing and data spaces. Its work supports global interoperability, trust, and governance in distributed digital systems[16].

Throughout 2024, several working drafts were produced, culminating in a committee draft. The development of this standard is closely aligned with the International Data Spaces Association, the Data Spaces Support Centre, the Eclipse Dataspace Working Group, and other relevant initiatives.

The IDSA has played a crucial role in laying the groundwork for this standard. While it has developed foundational documents such as the IDS Reference Architecture Model[17], the IDSA

[13] *ISO/IEC JTC1, available at https://www.iso.org/committee/45020.html*
[14] *ISO/IEC JTC 1/SC 38 Cloud computing and distributed platforms. Available at: https://www.iso.org/committee/601355.html*
[15] *ISO&IEC FDIS 20151/1, available at https://www.iso.org/standard/86589.html*
[16] *Cloud computing and distributed platforms webpage. Available at https://jtc1info.org/technology/subcommittees/cloud-computing/*
[17] *IDS Reference Architecture Model 4.0. Available at: https://docs.internationaldataspaces.org/ids-knowledgebase/ids-ram-4*

Rulebook[18], and Dataspace Protocol[19], these serve as guidance rather than formal standards. ISO/IEC 20151-1 aims to formalize these concepts by clearly defining data spaces, their core characteristics, and optional features – helping to close existing gaps in standardization.

3.2.2 Status and expected timeline

Status: Under development
Stage: FDIS [50.00][20]
Edition: 1

The standard advanced to the enquiry stage in spring 2025, under ISO/IEC JTC1/SC38 WG6. As of November 25, 2024, the standard had reached the Draft Internal Standard (DIS) stage and, on May 12, 2025, entered the Enquiry stage - meaning a draft is now under review and subject to voting within the committee. This phase involves extensive collaboration among international experts to ensure the standard addresses critical aspects such as data sovereignty, interoperability, and trust in data-sharing ecosystems.

Now the standard stage is on final text received, or FDIS registered for formal approval. The final publication of ISO/IEC DIS 20151-1 is expected in Q4 2026. Once released, it will provide industries and government stakeholders with standardized guidance for implementing trusted data-sharing solutions, making a significant step toward formalizing data space concepts and enabling secure, efficient data exchange across sectors.

3.2.3 Scope

The value generated through data has become a central element of modern economies and is now embedded across all areas of an organization's operations—from supply chains and marketplaces to the regulatory ecosystem. While organizations can manage the quality and trustworthiness of their own data, they increasingly depend on data from external sources. Likewise, the data they generate is often consumed by others.

To maintain consistent quality and trust across these complex ecosystems, a reliable, standardized method for sharing data is essential.

Data spaces enable trusted data sharing by combining multi-organization agreements with supporting software infrastructure. They offer clear descriptions of the data available for sharing and under what terms may be used, creating transparency that empowers both data providers and consumers to make informed decisions. This improves operational efficiency and strengthens data governance.

ISO/IEC JTC 1/SC 38, which focuses on cloud computing and distributed platforms, is developing ISO/IEC DIS 20151-1 to define the foundational concepts and key characteristics of data space. The standard is intended for all types of organizations, regardless of size or sector.

[18] *IDSA Rulebook. Available at: https://internationaldataspaces.org/idsa-rulebook/*
[19] *Dataspace Protocol DSP Version (RC-4). https://eclipse-dataspace-protocol-base.github.io/DataspaceProtocol/2025-1-RC4/*
[20] *ISO stage codes. https://www.iso.org/stage-codes.html*

The graphic below illustrates the essential features and components of data spaces. These include clearly defined data descriptions and usage terms, support for interoperability, mechanisms to maintain control, build trust, and ensure transparency. And key technical functions such as policy management, semantic modeling, and communication protocols to ensure secure and effective data exchange.

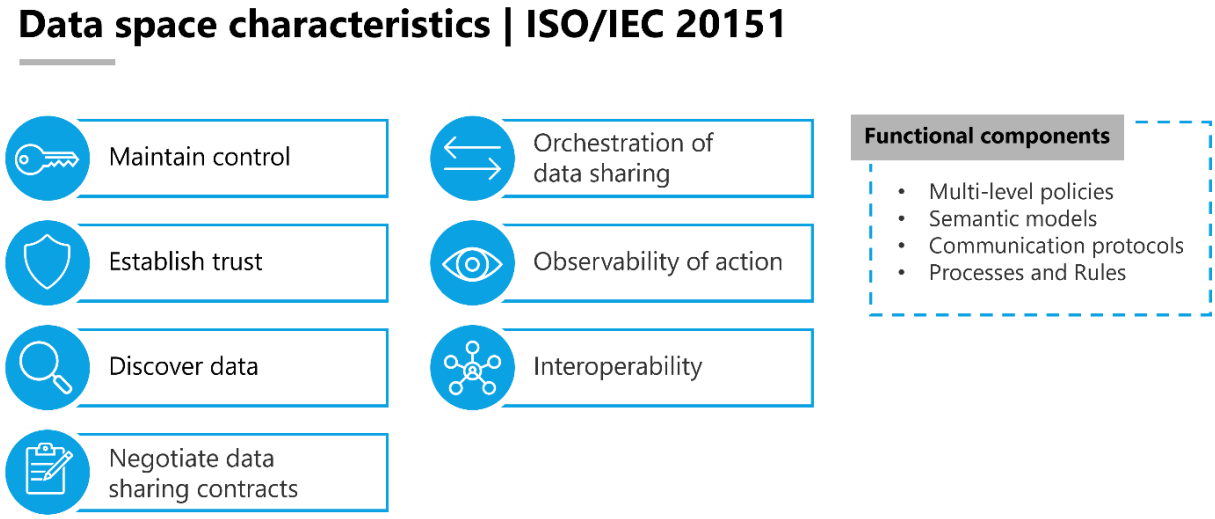

Figure 2: Dataspace characteristics on ISO/IEC DIS 20151[21]

3.2.4 Why is this important

ISO/IEC DIS 20151-1 Dataspace concepts and characteristics covers the fundamental aspects of data spaces, as described in the IDSA Rulebook[22]. It connects the topic of data spaces to other relevant work, such as organizational autonomy and organizational interoperability, while most importantly defining the core concepts that distinguish data spaces from other data-sharing models—such as data lakes or traditional Electronic Data Interchange (EDI).

Building on this foundation, ISO/IEC DIS 20151-1 identifies the need to further define multi-level policy frameworks, which are essential to enabling trusted interactions throughout a data space. Policies operate at various levels—from access control policies to contract-level policies that define usage terms and obligations. These policies are central to implementing attribute-based trust across participants. The standard also underscores the importance of semantic interoperability, which relies on shared semantic models and vocabularies from various perspectives.

[21] *Source: IDSA*
[22] *IDSA Rulebook. Available at: https://docs.internationaldataspaces.org/ids-knowledgebase/idsa-rulebook/idsa-rulebook/3_functional_requirements*

3.3 ISO/IEC DIS 26450 Eclipse Dataspace Protocol (DSP)

3.3.1 Introduction

ISO/IEC DIS 26450, titled *"Information technology—Eclipse Dataspace Protocol"*[23] is a specification designed to facilitate interoperable data sharing between entities in a data space. It defines the schemas, message exchanges, and interaction protocols required to publish data, negotiate agreements, and access datasets under usage control. The specification ensures technical interoperability between participants by describing system interactions in a protocol-agnostic, extensible way, while enabling bindings to standard web technologies such as HTTP/HTTPS.

3.3.2 Status

Status: Under development
Publication: Expected Q4 2026
Stage: DIS ballot initiated: [40.60]
Edition:1
Number of pages: 44
This version (2025-1) of the Dataspace Protocol specification[24] is a release of the specification and considered to be stable. Further changes shall not affect conformity. All changes made to the specification can be reviewed in the GitHub repositories - up to and including 2024-1 under the governance of the International Data Spaces Association and with the Eclipse Dataspace Working Group ever since (see 3.8 About ECLIPSE Dataspace WG and JTC 1 PAS Transposition Process for more information).

3.3.3 Scope

The Dataspace Protocol[25] defines how metadata is used to enable data sharing between autonomous entities. It specifies how datasets are advertised via catalogues, how usage conditions are expressed as policies, how agreements are negotiated, and how datasets are accessed through transfer processes. It does not cover the data transfer protocol itself.

[23] *ISO/IEC DIS 26450. Available at: https://www.iso.org/es/contents/data/standard/09/35/93502.html*
[24] *Dataspace Protocol – 2025-1 is available at: https://eclipse-dataspace-protocol-base.github.io/DataspaceProtocol/2025-1-err1/*
[25] *Eclipse Dataspace Protocol is available at: https://projects.eclipse.org/projects/technology.dataspace-protocol-base*

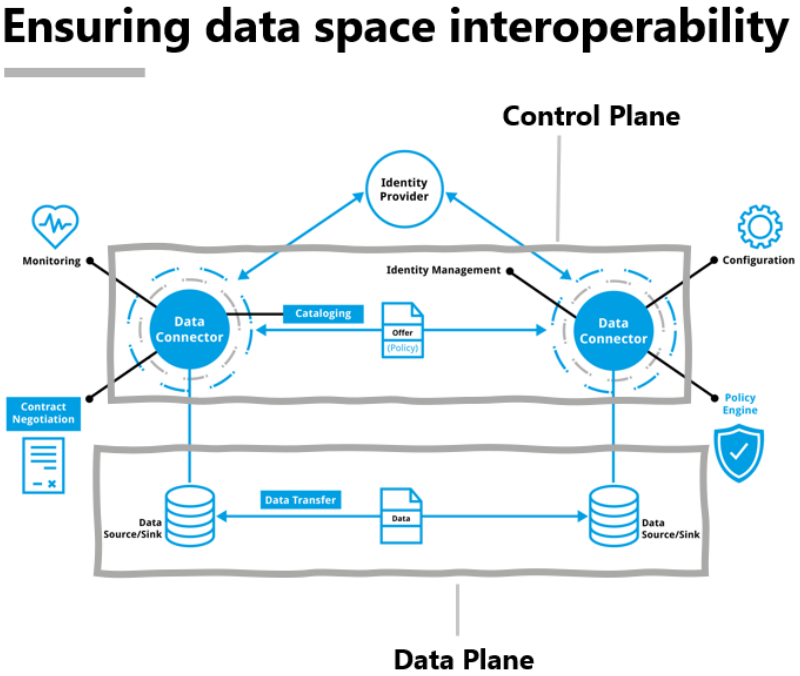

Figure 3: ISO/IEC DIS 26450. Dataspace Protocol[26]

3.3.4 Why is this important

Dataspace Protocol (DSP) is key to enabling interoperable and trustworthy data sharing across participants in a dataspace. It defines a common language and standardized interaction rules for publishing data, negotiating agreements, and enforcing usage conditions, ensuring that all parties can understand and work with each other consistently.

At the same time, DSP remains flexible, allowing adaptation to different use cases while maintaining interoperability. It has been developed based on real industry needs, addressing key gaps required for technical interoperability.

Its progression toward becoming an international standard (ISO/IEC DIS 26450) is a major step toward achieving global interoperability, ensuring consistent implementations and broader adoption across ecosystems.

3.4 ISO/IEC DIS 26451 Eclipse Decentralized Claims Protocol

3.4.1 Introduction

ISO/IEC DIS 26451, titled *"Information technology—Cloud computing and distributed platforms—Eclipse decentralized claims protocol"*[27]

[26] *Source: IDSA*
[27] *ISO/IEC DIS 26451. Available at: https://www.iso.org/standard/93503.html*

The Eclipse Decentralized Claims Protocol (DCP) extends the Dataspace Protocol (DSP) by providing a standardized way to manage organizational identities and establish trust between participants, while preserving privacy and reducing dependency on external intermediaries.

3.4.2 Status

Status: Under development
Publication date: Expected Q4 2026
Stage: DIS ballot initiated [40.60]
Edition:1
Number of pages: 38
Version 1.0.0 of the Decentralized Claims Protocol[28] specification is an official release and is considered stable. Future changes will not affect its conformity. All updates to the specification are documented and can be reviewed in the GitHub repository [29]. This specification is affiliated with the Eclipse Dataspace Working Group.

3.4.3 Scope

Eclipse Decentralized Claims Protocol defines how self-issued identity tokens are structured, how verifiable credentials are stored and presented, and how participants can request credentials from issuers. It enables trust establishment across multiple trust anchors, allowing participants to verify identities independently. It does not cover the definition of credential schemas, trust models, or policy vocabularies, which are handled by other specialized groups.

The figure below represents the Issuer-Holder-Verifier model, the Issuer creates a Verifiable Credential and gives it to the Holder, who can later present it to a Verifier. The Verifier decides which credentials it accepts, while the Holder chooses which ones to share. All participants rely on a Verifiable Data Registry to access information such as identifiers and credential schemas. They communicate using the protocols defined in the Dataspace Protocol and this specification.

[28] *Eclipse Decentralized Claims protocol 1.0.0, available at https://projects.eclipse.org/projects/technology.dataspace-dcp/releases/1.0.0*
[29] *GitHub Decentralized Claims Protocol DCP. Available at: https://eclipse-dataspace-dcp.github.io/decentralized-claims-protocol/v1.0-RC4/*

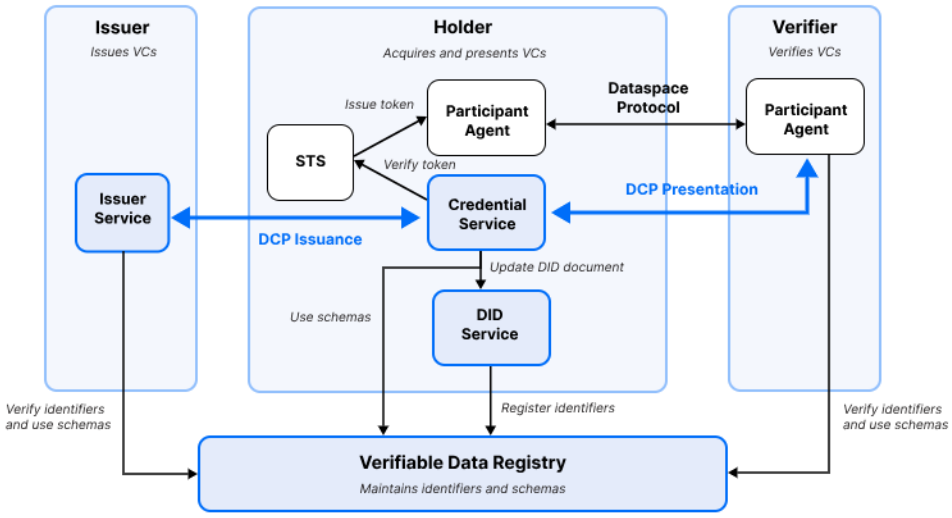

Figure 4. Information flow architecture[30]

3.4.4 Why is this important

The Decentralized Claims Protocol (DCP) is important for IDSA because it provides a concrete, interoperable way to operationalize decentralized identities and the trust mechanism that IDSA defines at the conceptual level. The DCP adds identity, attributes, and credential exchange, standardizing how identity is technically verified and reducing dependency on central identity providers or third-party verification.

Another important aspect of DCP is that it is designed to work with the DSP, meaning that DSP and DCP together form an operational interoperability stack for data spaces.

3.5 ISO/IEC TS 10866:2024 organizational autonomy & digital sovereignty

3.5.1 Introduction

ISO/IEC TS 10866:2024, titled *"Information technology—Cloud computing and distributed platforms—Framework and concepts for organizational autonomy and digital sovereignty*[31] is a technical specification that defines the intersection of digital sovereignty, organizational autonomy, and digital platforms. It provides a structured framework to help organizations and policymakers understand, implement, and manage these concerns within cloud services and distributed platforms.

3.5.2 Status and expected timeline

Status: Published

[30] *Source: Eclipse Dataspace WG*
[31] *ISO/IEC TS 10866:2024. Available at: https://www.iso.org/standard/83757.html*

Publication date: 2024-11
Stage: International Standard published [60.60[32]]
Edition: 1
Number of pages: 16
No further development is planned at this time. The document will undergo a systematic review three years after publication.

This technical specification, published in 2024, is available for purchase through recognized standardization bodies, including the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC).

3.5.3 Scope

This summary is based on the public introduction of this technical specification, available on ISO webpage. Organizational autonomy and digital sovereignty are complex, evolving topics that have gained importance as organizations address the challenges of sourcing and delivering digital capabilities in changing environments. Governments increasingly collaborate with industry to achieve digital policy goals while maintaining control and independence. These concerns also apply to private, public, and non-profit organizations, which may need to assert operational independence to achieve their own strategic objectives.

This document defines a framework for understanding and evaluating the implications of digital sovereignty requirements on organizations. It describes how digital platforms can be configured to strike a balance between external sovereignty constraints and internal autonomy needs. The framework can be applied by organizations or used by policymakers and regulators to assess the impact of sovereign-related requirements on organizations and industries.

The scope described above is based on publicly available information published by ISO. specifically, it refers to the official content provided on the ISO website[33].

The audience of this document includes:

1. Organizational leaders (e.g. Chief Information Officer, Chief Data Officer and Chief Compliance Officer), business or technical decision makers and digital platform architects responsible for aligning digital platforms with autonomy and compliance goals.
2. Policy makers and regulators who seek to understand the practical effects of sovereignty and autonomy requirements on organizations.

[32] *ISO stage codes, accessible at: https://www.iso.org/stage-codes.html*
[33] *ISO/IEC TS 10866:2023 – Information technology — Dataspaces — Organizational autonomy and digital sovereignty, accessible at: https://www.iso.org/obp/ui/en/#iso:std:iso-iec:ts:10866:ed-1:v1:en*

The standard applies to any organization and policymakers involved in cloud-based services and distributed platforms, offering guidance on how sovereignty issues intersect across multiple dimensions (see Figure 2).

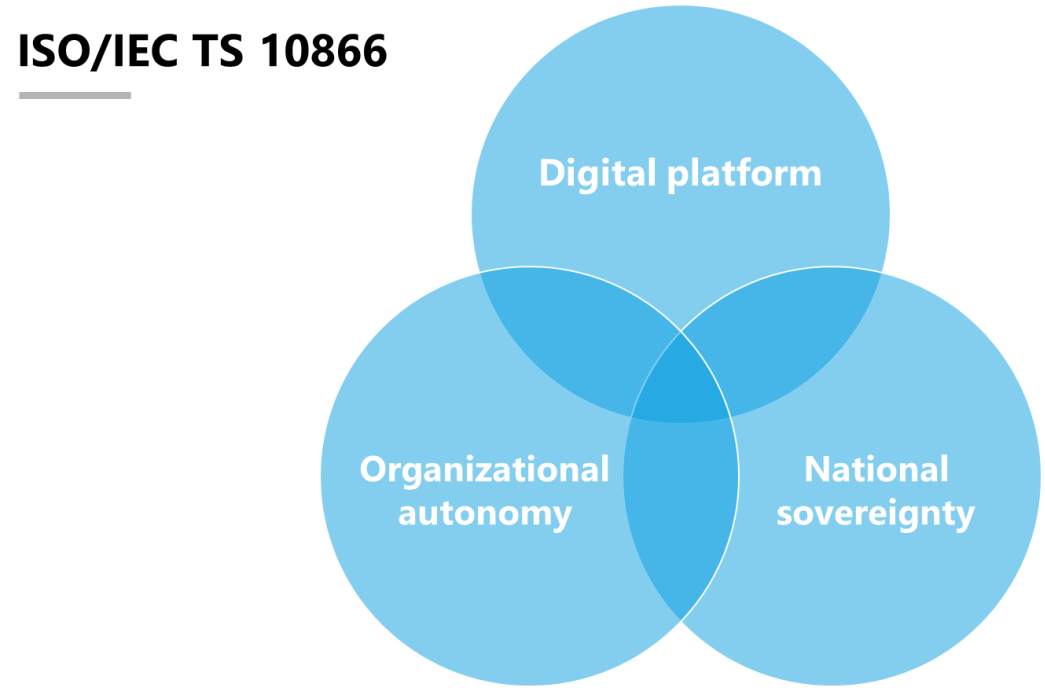

Figure 5: Digital sovereignty matters addressed by organizations[34]

This standard outline sovereignty challenges that are imposed by governments, affect all types of organizations (private, public, and non-profit) and impact the digital platforms that organizations use to meet their goals.

The document highlights:

- Core terms and concepts.
- Methods for assessing and defining organizational autonomy.
- Application of the framework with practical examples.

For more information or purchasing options, visit the ISO/IEC TS 10866 website[35]. Also, you can view the IDSA Tech Talk Understanding digital sovereignty and organizational autonomy (September 19, 2024)[36].

[34] *ISO/IEC TS 10866:2023 — Information technology — Dataspaces — Organizational autonomy and digital sovereignty, accessible at: https://www.iso.org/obp/ui/en/#iso:std:iso-iec:ts:10866:ed-1:v1:en*
[35] *ISO/IEC TS 10866:2024, available at https://www.iso.org/es/contents/data/standard/08/37/83757.html*
[36] *IDSA Tech Talk, 2024 available at https://internationaldataspaces.org/archive/*

3.5.4 Why is this important?

This standard helps organizations define how data is categorized, governed, and set usage conditions for data-sharing, ensuring compliance with legal, regulatory, and cross-border requirements. It provides a systematic approach to structuring digital capabilities in a way that aligns with sovereignty principles—critical for trusted data-sharing in data spaces.

As an example, in the food service supply chain, trusted data sharing is crucial for food safety, traceability, and regulatory compliance. ISO/IEC TS 10866 helps organizations define autonomy, classify data, and set policies for sensitive data such as ingredient sourcing and quality assurance. This supports secure, transparent data sharing from producers to regulators within a trusted data space.

This framework establishes a foundation for trusted data spaces, helping industries and governments manage cross-border data flows and comply with jurisdictional laws and international regulations. It defines access and security policies, supports industry-specific governance models, and addresses sovereignty-related concerns within data spaces. To manage sovereign data sharing effectively, organizations must align with government regulations, internal governance frameworks, and platform-specific requirements to ensure security, compliance, and interoperability.

The IDSA Rulebook[37] closely align with ISO/IEC TS 10866, emphasizing the role of sovereignty and organizational autonomy in data spaces. Key principles include:

- **Self-determined data usage**: Data sovereignty, ensure participants control how their data is accessed and used.
- **Organizational autonomy**: Each organization should independently decide how and with whom it shares data.
- **Control over data assets**: Participants must maintain ownership and define access and usage policies for their data in secure and trusted environments.

3.6 ISO/IEC 19941:2017 Interoperability & portability

3.6.1 Introduction

ISO/IEC 19941:2017[38] is an international standard that provides a common framework for understanding interoperability and portability in cloud computing. It defines key concepts, types, and relationships involved in enabling cloud services to work together and in supporting the movement of data and applications across different cloud environments. Targeted at cloud service customers (CSCs), cloud service providers (CSPs), and cloud service partners (CSNs), the standard clarifies how interoperability supports integration and service

[37] *IDSA Rulebook – Interoperability Chapter, available at https://docs.internationaldataspaces.org/ids-knowledgebase/idsa-rulebook*
[38] *ISO/IEC 19941:2017 Information technology — Cloud computing — Interoperability and portability available at https://www.iso.org/standard/66639.html*

composition, while portability addresses concerns such as vendor lock-in and migration efficiency.

Cloud computing is defined as a paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand. ISO/IEC 17788 and ISO/IEC 17789 provide the foundational context for this standard by outlining various types of interoperability and portability, their relationships to cloud activities and roles, and relevant cloud capabilities. By establishing shared terminology and structured guidance, ISO/IEC 19941 helps stakeholders evaluate and implement cloud solutions that support both their technical requirements and business objectives.

3.6.2 Status and expected timeline

Status: Published
Publication date: December 2017
Stage: International Standard to be revised [90.92]
Edition:1
Number of pages: 65
This standard is currently undergoing systematic review and is scheduled for an update in 2025 by ISO/IEC JTC1 SC38 WG6[39].

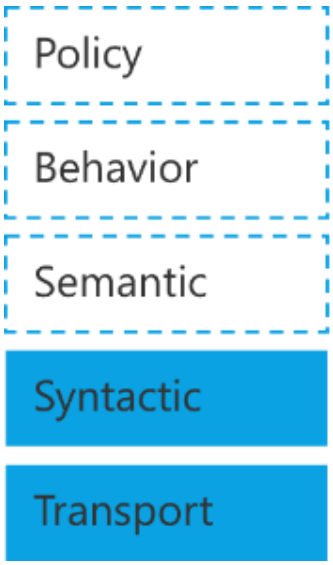

Figure 6: ISO 19941 – Cloud Computing Interoperability and Portability[40]

[39] *ISO/IEC JTC 1/SC 38 available at https://www.iso.org/committee/601355.html*
[40] *IDSA Rulebook – Interoperability in Data Spaces Chapter, available at https://kb.internationaldataspaces.org/external/rulebook/115_Interoperability_in_data_spaces/*

3.6.3 Scope

This document specifies the types of interoperability and portability in cloud computing, their interrelationships, and the common terminology and concepts used in discussing them—particularly in relation to cloud services.

It complements and builds upon related standards, including ISO/IEC 17788[41], ISO/IEC 17789[42], ISO/IEC 19086-1[43], and ISO/IEC 19944[44], with a particular emphasis on the cross-cutting aspects identified in ISO/IEC 17788 and ISO/IEC 17789.

The goal is to ensure that all parties involved in cloud computing, particularly CSCs, CSPs and cloud service partners (CSNs) acting as developers—share a common understanding of interoperability and portability tailored to their specific needs. This common understanding helps achieve real-world interoperability and portability by grounding discussions in unified terms and concepts.

Key aspects of ISO/IEC 19941:2017:

- **Interoperability:** The ability of two or more systems or applications to exchange information and make mutual use of the exchanged data.
- **Portability:** The ability to move data or applications from one cloud service to another or between a cloud service and a customer's system.

The standard introduces a facet model to describe the cloud interoperability, which includes five facets:

- **Transport interoperability**: Ensures information exchange over a shared communication infrastructure.
- **Syntactic interoperability**: Ensures that data formats are understood by participating systems.
- **Semantic data interoperability**: Ensures shared understanding of data meaning within a subject domain.
- **Behavioural interoperability**: Ensures the exchange produces the expected outcomes.
- **Policy interoperability**: Ensures alignment with applicable legal, organizational, and policy requirements.

3.6.4 Why is this important?

Interoperability at multiple levels is a core requirement for. It is not only about systems being able to communicate but also about organizations being able to collaborate effectively. ISO/IEC IS 19941 provides a structured approach to understanding interoperability through

[41] *ISO/IEC 17788 available at https://www.iso.org/obp/ui/en/#iso:std:iso-iec:17788:en*
[42] *ISO/IEC 17789 available at https://www.iso.org/obp/ui/en/#iso:std:iso-iec:17789:ed-1:v1:en*
[43] *ISO/IEC 19086-1 available at https://www.iso.org/standard/67545.html*
[44] *ISO/IEC 19944 available at https://www.iso.org/obp/ui/en/#iso:std:iso-iec:19944:ed-1:v1:en*

its facet model, helping distinguish between: technical aspects (e.g., handled by data space connectors), organizational dimension, and governance and policy-related aspects.

The standard also defines facets of data portability, which are critical to the goals of data space participants. True portability in data spaces includes not only the syntax and semantics of data but also the associated rights and obligations. Policies must be portable, machine-readable, and enforceable by data consumers and users to ensure compliant and trustworthy data exchange. The IDSA Rulebook reinforces this view. It defines interoperability as the ability of systems and organizations to exchange and use data based on shared standards, governance, and trust. It also introduces key elements like connectors, data contracts, and certification mechanisms that enable secure and sovereign data sharing.

3.7 About ISO/IEC JTC 1/SC38 and relevant resources

3.7.1 General and work plan

ISO/IEC JTC 1 Subcommittee 38 Cloud Computing and Distributed Platforms (ISO/IEC JTC 1/SC38) was established with a focus on distributed application platform and services. Its initial scope has evolved over time, now encompassing Cloud computing and distributed platforms.

Background on ISO and IEC. The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of international standards through technical committees established by each organization to address specific technical domains.

ISO and IEC technical committees collaborate in areas of mutual interest. Other international organizations - both governmental and non-governmental- that are in liaison with ISO and IEC also contribute to the development of standards.

In the field of information technology, ISO and IEC have jointly established ISO/IEC JTC 1 - Information Technology. In November 2009, JTC 1 created a new Subcommittee 38 (SC 38) with focus on Distributed Application Platform and Services.

3.7.2 Current scope of ISO/IEC JTC 1/SC 38

ISO/IEC JTC1/SC 38 acts as the **focus, proponent, and systems integration entity** for Cloud Computing and Distributed Platforms within JTC 1. It also provides guidance to JTC 1, IEC, ISO, and other organizations developing standards in these areas.

Work Program related to data spaces.

This document focuses on three specific items from ISO/IEC JTC 1/SC 38 WG6 Data, interoperability and portability[45] that are most relevant to data spaces:

- ISO/IEC DIS 20151 Dataspace concepts and characteristics
- ISO/IEC DIS 19941-1 Cloud computing Part 1: Interoperability and portability
- ISO/IEC AWI TR 25850 (20151-3) Use cases for dataspaces (expected publication 2026)
- ISO/IEC PWI 26189 (20151-2) Dataspace Trust Frameworks (NWIP expected soon)
- ISO/IEC PWI Switching by design

Also relevant from ISO/IEC JTC 1 SC38 WG5 "Stakeholders considerations":

- ISO/IEC PWI38011 Observability

Collaboration and Liaisons

The success of standardization efforts in this domain relies heavily on collaboration with external partners and other technical committees. ISO/IEC JTC1/SC 38 maintains strong relationships with key initiatives to ensure that its standards are high-quality, relevant, and aligned with broader developments in the data space ecosystem.

ISO/IEC JTC1/SC 38 has a liaison with CEN-CENELEC JTC 25—Data management, dataspaces, cloud and edge and it is actively engaged with the Eclipse Dataspace Working Group (EDWG) through a formal liaison with the Eclipse Foundation. To further integrate IoT and Digital Twin aspects into cloud-based data spaces, ISO/IEC JTC1/SC 38 also maintains a liaison with ISO/IEC JTC 1/SC 41 – Internet of Things and Digital Twin[46].

These collaborations help ensure alignment with related standards, including ISO/IEC 20151, and support the development of coherent, interoperable solutions across domains.

3.7.3 Why is this important?

The importance of ISO/IEC JTC 1/SC 38 for IDSA lies primarily in its truly global reach and legitimacy in standardization. As part of ISO/IEC JTC 1, it brings together representatives from around the world, ensuring that standards are not driven by a single region but reflect a broad international consensus. This is critical for IDSA, whose vision depends on interoperability and trust across borders. Moreover, ISO/IEC JTC 1 is uniquely positioned to respond to the growing global demand for standards in emerging technologies such as data spaces, with participation from more than 120 organizations worldwide. This wide representation guarantees inclusiveness and credibility. A clear example is the approval of ISO/IEC 20151, which involved contributions from multiple national bodies, demonstrating strong international alignment and reinforcing the potential for global adoption of IDSA-related standards.

[45] *Standards by ISO/IEC JTC1/SC 38 Cloud computing and distributed platforms, available at https://www.iso.org/committee/601355/x/catalogue/p/0/u/1/w/0/d/0*
[46] *ISO/IEC JTC 1/SC 41 Internet of things and digital twin available at https://www.iso.org/committee/6483279.html*

3.8 About ECLIPSE Dataspace WG and JTC 1 PAS Transposition Process

3.8.1 General and work plan

The objective of the Eclipse Dataspace Working Group is to foster the development and adoption of open-source solutions that enable organizations of all sizes to build and participate in dataspaces. It promotes collaboration to create scalable, modular, and industry-ready components based on open standards.

3.8.2 Current projects

The working group focuses on developing standards, supporting implementations, and onboarding open-source initiatives implementations, but assuring that all projects converge on a common goal to build an interoperable data spaces ecosystem:
Eclipse Dataspace Protocol (DSP)[47]: Defines the core communication standard that enables interoperable, trusted data exchange between participants in a dataspace through connectors, ensuring technical interoperability while leaving semantic, organizational, and legal aspects to the data space agreements. Latest release: 1.0.0 [23.07.2025]. Status: regular. Now pas to ISO, see Chapter 3.3 ISO/IEC DIS 26450 Eclipse Dataspace Protocol (DSP).
Eclipse Dataspace Decentralized Claims Protocol (DCP)[48]: Extends the Dataspace Protocol by enabling privacy-preserving, interoperable exchange of organizational identity and trust credentials while reducing reliance on centralized components and minimizing network disruption. Latest release: 1.0.0 [18.07.2025]. Status: regular. Now PAS to ISO see Chapter 3.4 ISO/IEC DIS 26451 Eclipse Decentralized Claims Protocol.
Eclipse Data Plane Core[49]: Provides multi-language SDKs and reference implementations to build interoperable data planes for transferring data within dataspaces. A Rust-based data plane implementation for transferring data over HTTP compatible with the Data Plane Signaling Specification. Status: Incubating.
Eclipse Data Plane Signaling[50]: Defines the communication protocol (APIs, message schemas, and state machine) used to coordinate and control data transfers between data planes. Status: Incubating.
Eclipse Data Rights Policies Profile (DRP)[51]: Specifies a standardized way to express and enforce data usage policies and rights within dataspaces to ensure compliant data sharing. Status: Incubating.
Eclipse Conformity Assessment Policy and Credential Profile[52]: Defines how policies and compliance requirements are represented and verified using verifiable credentials and standardized vocabularies. Status: Incubating.

[47] *Eclipse Dataspace Protocol 1.0.0 available at https://projects.eclipse.org/projects/technology.dataspace-protocol-base/releases/1.0.0*
[48] *Eclipse Dataspace Decentralized Claims Protocol 1.0.0 available at https://projects.eclipse.org/projects/technology.dataspace-dcp/releases/1.0.0*
[49] *Eclipse Data Plane Core available at https://projects.eclipse.org/projects/technology.dataplane-core*
[50] *Eclipse Data Plane Signaling available at https://projects.eclipse.org/projects/technology.dataplane-signaling*
[51] *Eclipse Data Rights Polices Profiles (DRP) available at https://projects.eclipse.org/projects/technology.dataspace-drp*
[52] *Eclipse Conformity Assessment Policy and Credential Profile available at https://projects.eclipse.org/projects/technology.dataspace-cap*

Eclipse Dataspace TCK[53]: Provides a modular test framework to verify that implementations comply with dataspace protocols and standards.
Eclipse Dataspace Components (EDC)[54]: Offers a framework and connector technology to enable secure, sovereign, and interoperable data exchange between organizations.
Eclipse Tractus-X[55]: – Delivers open-source reference implementations and tools to build scalable, interoperable dataspaces, especially for industrial ecosystems like automotive supply chains. Latest release: 26.03 [18.03.2026]. Status: regular.

For more information: https://dataspace.eclipse.org/projects/

3.9 About IEEE Data Trading Systems WG

3.9.1 General and work plan

The IEEE Data Trading System Working Group (DTSWG)[56] was established in June 2020 following work initiated under the IEEE Industry Connections Data Trading Program. The working group achieved a significant milestone by standardizing the architecture of the intermediary function, a critical component for enabling trusted data exchange within data spaces. This pioneering effort culminated in the publication of IEEE Std 3800-2024, *IEEE Standard for a Data Trading System: Overview, Terminology, and Reference Model*. As autonomous and distributed data federations, data spaces are expected to play a key role in the development of the digital economy by ensuring data sovereignty while enabling Data Free Flow with Trust (DFFT).

In addition to developing this foundational standard, the working group has promoted international collaboration through initiatives such as the International Open Forum on Data Society (IOFDS) and the co-organization of the Dataspaces Week together with the International Data Spaces Association, strengthening global cooperation among key stakeholders in the data spaces ecosystem.

IEEE Data Trading System Working Group (DTSWG)
Chair: Hiroshi Mano, Data Society Alliance
Secretary: Isamu Yamada, Data Society Alliance
Standards Committee - CES/DFESC – Digital Finance and Economy Standards Committee
Society - IEEE Consumer Technology Society

3.9.2 Current scope of DTS WG

The DTS Working Group is developing a set of complementary standards under the IEEE P3800 framework to enable interoperable and scalable data trading ecosystems, as outlined in the projects below.

[53] *Eclipse Dataspace TCK available at https://projects.eclipse.org/projects/technology.dataspacetck*
[54] *Eclipse Dataspace Components (EDC) available at https://projects.eclipse.org/projects/technology.edc*
[55] *Eclipse Tractus-X available at https://projects.eclipse.org/projects/automotive.tractusx/releases/26.03*
[56] *IEEE Data Trading System Working Group is available at https://sagroups.ieee.org/3800/*

Standard Working Group Details: Working Group DTSWG – Data Trading System Working Group

Standards Committee - CES/DFESC – Digital Finance and Economy Standards Committee Society - IEEE Consumer Electronics Society

3.9.2.1 IEEE Std3800-2024: Standard for a Data-Trading System: Overview, Terminology and Reference Model.

Standard for a Data-Trading System: Overview, terminology and reference model[57]. Defines a unified architecture for domain-independent data trading marketplaces, establishing common terminology, a reference model, and the roles and functions of key participants such as data providers, data users, and marketplaces. This has been already published as IEEE 3800-2024, here)

Standards Committee: CES/DFESC – Digital Finance and Economy Standards Committee
PAR Approval: 2020-06-03
Board Approval - 2024-09-26 Published

3.9.2.2 P3800.1 Standard for a data trading system: Protocol and object framework

This standard specifies a protocol and object framework for a data trading system based on an architecture provided in IEEE Std 3800-2024 standard. The Project Authorization Request (PAR) for this standard was approved in September 2024.

Standards Committee: CES/DFESC – Digital Finance and Economy Standards Committee
PAR Approval: 2024-09-26 Approved PAR[58]

3.9.2.3 P3800.2 Data Space Discovery Protocol

Data Space Discovery Protocol: This standard specifies a Data Space Discovery Protocol between a Data Trading System (DTS) operator and a Data Space Authority. The standard defines protocols and an object framework for the advertisement and discovery processes of data spaces. This enables DTS operators to discover appropriate data spaces and to be aware of the requirements and methods for participating in the target data space. The Project Authorization Request (PAR) for this standard was approved in December 2026.

Standards Committee: CTS/DFESC – Digital Finance and Economy Standards Committee.
PAR Approval: 2026-02-12

[57] *IEEE standard for a Data-Trading system is available at https://standards.ieee.org/ieee/3800/10298/*
[58] *P3800.1 PAR details is available at https://development.standards.ieee.org/myproject-web/public/view.html#pardetail/11971*

3.10 IEEE P3800 - Data trading systems

3.10.1 Introduction

The IEEE P3800-2024 [59] initiative plays a key role in developing frameworks for data transaction systems and data marketplaces, aiming to foster of fostering global collaboration on data exchange standards.

At the core of this initiative is the **IEEE P3800-2024 standard**, titled *Standard for a Data-Trading System: Overview, Terminology and Reference Model*, which was approved and published in September 2024. This standard defines common terminology, a reference model, and outlines the roles and responsibilities of key stakeholders, including data providers (DP), data users (DU), data trading system operators (DTS OP), and trusted third parties (TTP) to trade data through a domain-independent and principled marketplace. The reference model also describes the key objects handled within the system, such as datasets, trading terms, dataset attributes, data catalogues, benefits, and trust information.

3.10.2 Status and expected timeline

The IEEE P3800 family of standards includes:

- **IEEE P3800-2024 standard**, titled *Standard for a Data-Trading System: Overview, Terminology and Reference Model.*

- **IEEE P3800.1 –** This standard specifies a protocol and object framework for a data trading system based on an architecture provided in IEEE Std 3800-2024 standard.The Project Authorization Request (PAR) for this standard was approved in September 2024.

- **IEEE P3800.2 –** This standard specifies a Data Space Discovery Protocol between a Data Trading System (DTS) operator and a Data Space Authority. The standard defines protocols and an object framework for the advertisement and discovery processes of data spaces. This enables DTS operators to discover appropriate data spaces and to be aware of the requirements and methods for participating in the target data space. The Project Authorization Request (PAR) for this standard was approved in December 2026.

  It is important to note that IEEE DTS WG operates under an individual project as follows,

  IEEE SA Individual Membership is designed for individuals and independent professionals interested in participating in standards development with IEEE SA. Membership is not a requirement for participation, yet it enables participants to ballot on standards and assume leadership roles in standards working groups.

[59] *IEEE Data-Trading System: Overview, Terminology, and Reference Model available at* https://standards.ieee.org/ieee/3800/10298/

Individual projects follow a set path from concept to completion; adhering to principles of due process, openness, and consensus building. These principles allow for equity and fair play in the development process. Individual participants act based on their qualifications and experience and cannot represent or act on behalf of an entity.

As a result, organizations such as IDSA cannot formally participate as representatives within this process. Nevertheless, the progress of this initiative is being actively monitored. However, a member of IDSA participates as an independent professional affiliated by IDSA.

The IEEE 3800-2024 standard, titled *Standard for a Data-Trading System: Overview, Terminology and Reference Model*, was officially published in 2024[60].

3.10.3 Why is this important?

The distinction between Data Trading Systems (DTS), as defined in IEEE 3800, and data spaces is crucial for avoiding conceptual and architectural misunderstandings in the design of data-sharing ecosystems. The IEEE 3800 standard defines a DTS as an intermediary-based architecture that enables data exchange through a marketplace. While this provides a structured and standardized approach to data trading, it should not be confused with the concept of data spaces. Data spaces, such as those based on the IDS Reference Architecture Model, are decentralized ecosystems governed by shared rules and governance frameworks that ensure data sovereignty, interoperability, and trust among participants. DTS introduces aneutral and fairness intermediary function for the participants of Data Spaces that maintains data sovereignty of participants—the DTS operator—that facilitates transactions between data providers and data users, butshall not collect, retain, central intermediary, neutral and fairness intermediary function for the partici, or sell data on their own to maintain the fairness and neutrality.

As illustrated in the chapter 2.4 Data Spaces and Trusted Data Transactions. (**Fehler! Verweisquelle konnte nicht gefunden werden.**). Data spaces span across legal, operational, and technical layers, whereas DTS primarily operates at the operational level as a data trading intermediary. This distinction is important because it clarifies that DTS does not provide the full set of capabilities required for a data space, particularly regarding governance and decentralized control.

Therefore, DTS should be understood as a complementary mechanism that can support specific functions—such as data trading—within data spaces, rather than as a standalone architecture capable of fulfilling the broader objectives of data spaces.

[60] *IEEE Standard for a Data-Trading System: Overview, Terminology, and Reference Model, available at* https://standards.ieee.org/ieee/3800/10298/

3.11 IEEE P1988 – Data space architecture framework with integrated privacy technologies

3.11.1 Introduction

The IEEE P1988 standard aims to define a Data Space Architecture Framework with Integrated Privacy Technology. The objective of this initiative is to establish a standardized architectural framework for data spaces that integrates privacy-preserving technologies directly into the design of data-sharing infrastructures. The standard focuses on enabling secure, trustworthy, and legally compliant data exchange across distributed environments by incorporating mechanisms that support privacy protection, governance, and interoperability between participants in a data space ecosystem.

The working group is chaired by Prof. Dong Liu under the IEEE Communications Society.

3.11.2 Status and expected timeline

Status: Active

Project type: IEEE Standard (New Project)

PAR approval date: 27 March 2025

Stage: Working Group development

Projected draft submission for initial IEEE SA Standards Committee ballot: April 2027

Projected completion date for submission to RevCom: October 2027

PAR expiration date: 31 December 2029

This standard is currently under development within the IEEE Standards Association and aims to provide a reference framework for privacy-integrated data space architectures.

3.11.3 Scope

In addition to technical privacy protection, IEEE P1988 addresses the challenge of legal continuity across jurisdictions, which is particularly relevant for cross-border data spaces. When data is exchanged across national or regional boundaries, it must remain governed by the legal framework of its country or region of origin. This raises key questions for data space implementations, including *how rules and obligations defined in one jurisdiction can be enforced when data is accessed or processed in another*.

The overall objective of IEEE P1988 is therefore to provide a framework that allows data spaces to combine privacy-enhancing technologies, governance mechanisms, and compliance processes, ensuring that data sharing remains secure, trustworthy, and legally compliant across jurisdictions.

3.11.4 Why is this important?

IEEE P1988 is important because it aims to embed privacy, governance, and interoperability directly into the architecture of data spaces, addressing key challenges related to trust and regulatory compliance. It also tackles the issue of legal continuity across jurisdictions, which is critical for cross-border data sharing and remains an open challenge in current data space implementations.

From the perspective of initiatives such as the International Data Spaces Association (IDSA), the scope of IEEE P1988 is highly relevant, as it aligns with ongoing efforts to enable trustworthy and sovereign data exchange. However, at its current stage, the standard lacks sufficient detail regarding its purpose, implementation approach, and alignment with existing architectures, making it difficult to assess its practical impact.

For this reason, it is important to closely monitor the evolution of IEEE P1988, particularly in terms of its coordination with IDSA assets and working groups. Ensuring alignment will be essential to avoid fragmentation and to promote interoperability across emerging data space ecosystems.

4 European data space standardization

4.1 Overview

There are three European Standardization Organizations (ESO):

- CEN (*Comité Européen pour la Normalisation*), responsible for all areas except electrotechnology and telecommunications,
- CENELEC (*Comité Européen de Normalisation Électrotechnique*) for electrotechnology,
- ETSI (*European Telecommunications Standards Institute*) for telecommunications.

Digitalisation topics are a typical area of overlap for which the ESOs have established various cooperation schemes. Standardization for the data economy and data interoperability is rapidly gaining traction. The Data Act, Data Governance Act, and Cyber Resilience Act are major drivers of this trend. At the same time, the European economy increasingly relies on the uninhibited flow and exchange of data.

4.2 European Trusted Data Framework standardisation request

4.2.1 Introduction to the standardization request.

The European Commission's 2024 Annual Union Work Programme (AUWP)[61] for European standardization introduces the "EU Trusted Data Framework" as a new priority action (Action

[61] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ%3AC_202401364&utm_source

10) to support the implementation of the Data Act (despite its name, the "Trusted Data Framework" does not refer to “trusted data” itself, but rather to “trusted data sharing”). This initiative aims to establish a trusted environment for data sharing across the European Union, increasing data availability and fostering innovation. It forms part of a broader strategy to build Common European Data Spaces in key sectors such as health, environment, energy, agriculture, and mobility.

This action calls for the development of a comprehensive set of standards to ensure secure and legally compliant data exchange among different parties, including data intermediaries and data altruism organizations. Specifically, it involves:

- Data catalogue standards to facilitate the publication and discovery of data assets.
- Semantic assets to enable seamless integration and use of shared data.

Common Key Performance Indicators (KPIs) to promote cross-domain interoperability, enhancing transparency and data usability. The development of these standards will be closely coordinated with the European Data Innovation Board and, where relevant, the Data Space Support Centre.

One of the key objectives of European standardization policy is to address interoperability challenges when combining data from different sources. To achieve this, the adoption of common standards and protocols is essential. The European Interoperability Framework and the Rolling Plan for ICT Standardization play a central role in advancing these efforts.

The standardisation request to the European standardisation organisations as regards a European Trusted Data Framework in support of Regulation (EU) 2023/2854 has been published[62]. This request seeks the creation of a unified European Trusted Data Framework, aligned with multiple regulations and initiatives aimed at improving the trustworthiness and interoperability of data ecosystems within the European Union (EU).

The request is based on Regulation (EU) 2023/2854[63], which establishes a framework for data interoperability across EU member states. In particular, Article 33 outlines essential requirements related to the interoperability of data, data sharing mechanisms, and services, as well as the establishment of common European data spaces. Furthermore, Article 33 mandates that one or more European standardization organisations be tasked with drafting harmonised standards to meet these interoperability requirements.

The following section provides a detailed explanation of the standardization request, highlighting its key elements, including the request itself, the proposed work items, the timeframe, and related initiatives.

[62] *C(2025)4135 - Standardisation request M/614 available at https://ec.europa.eu/growth/tools-databases/enorm/mandate/614_en*

[63] *Regulation (EU) 2023/2854 of the European Parliament and of the Council of 13 December 2023 on harmonised rules on fair access to and use of data and amending Regulation (EU) 2017/2394 and Directive (EU) 2020/1828 (Data Act). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202302854&qid=1739875543110*

4.2.2 Key aspects of the request

Essential interoperability requirements (Article 33):

Regulation (EU) 2023/2854 emphasizes the importance of ensuring the seamless exchange of data across various European data spaces. The request outlines the need for standards that guarantee the compatibility of data sharing mechanisms and services. These standards should address the technical, legal, and organisational aspects of data sharing, contributing to a more integrated European digital ecosystem.

Interoperability of data processing services (Article 35):

Article 35 of the regulation sets out specific requirements for the interoperability of data processing services and the creation of a central Union standards repository. The standardization request call for coordination with the repository initiative to ensure that selected standards are aligned with the overarching goals of data processing interoperability.

Artificial Intelligence and data governance:

The Artificial Intelligence Act (AI Act)[64] includes data governance provisions that are recognized as important factors shaping the European Trusted Data Framework. These provisions will influence how data is processed and shared, particularly in the context of AI-driven technologies. The request encourages consideration of the AI Act's requirements in the standardization process to ensure robust and consistent data governance.

European digital identity framework:

Regulation (EU) 2024/1183 (eIDAS 2.0) establishes a European digital identity framework aimed at providing harmonised electronic identification across the EU. This framework will support trusted data sharing by enabling reliable digital identities for both individuals and legal entities. The standardization request highlights the importance of integrating this infrastructure into the Trusted Data Framework to ensure secure data exchange.

Interoperable Europe Framework:

The Interoperable Europe Framework, reinforced by the Interoperable Europe Act[65], offers solutions for public sector interoperability, many of which can be applied to the private sector as well. The request stresses the need to consider interoperability solutions - such as those developed under SEMIC, in the development of the Trusted Data Framework to ensure that both sectors can seamlessly collaborate on data sharing

[64] *Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) (Text with EEA relevance)*

[65] *Regulation (EU) 2024/903 of the European Parliament and of the Council of 13 March 2024 laying down measures for a high level of public sector interoperability across the Union (Interoperable Europe Act)*

EU Rolling Plan for ICT Standardization:

The EU Rolling Plan for ICT standardization, developed in collaboration with the Multi-Stakeholder Platform for ICT standardization, provides a detailed overview of available European and international standards. This plan is critical in ensuring that the proposed standards for the European Trusted Data Framework are consistent with existing and emerging ICT standards.

Data Spaces Support Centre (DSSC):

The DSSC, a project funded under the Digital Europe Programme, is developing the "Data Spaces Blueprint[66]" to support the implementation of data spaces. The standardization request calls for the incorporation of elements from this blueprint to ensure that the resulting standards reflect current best practices and guidelines.

Consultations and coordination:

Various stakeholders, including the European Data Innovation Board (EDIB) and European Standardization Organisations (ESO), have been consulted throughout the process. Their input has been instrumental in shaping the direction of the standardization request. It is noted that the work addressed in this request falls within the competence of the ESO.

Public access to standards:

The *harmonised European standards* (*hENs*)[67] adopted as part of this request may be subject to access to documents requests under Regulation (EU) 1049/2001. The Court of Justice has recognised the overriding public interest in ensuring the disclosure of harmonised standards, particularly to promote transparency and accountability in the data-sharing ecosystem.

Data Interoperability report:

The final report[68] of the Data Interoperability workstream of the High-Level Forum on European standardization includes several recommendations to enhance interoperability within and across common European data spaces. This report has served as a foundation for the current standardization request.

The European Trusted Data Framework is a critical component of the EU's broader digital strategy. The standardization request emphasises the need for harmonised standards to address data interoperability, data governance, and trusted data sharing mechanisms across Europe. These efforts are supported by key EU regulations and initiatives, including the Digital Identity Framework, the AI Act, and the Interoperable Europe Framework. By integrating these elements, the Framework aims to create a secure and efficient environment for data exchange, driving innovation and strengthening the EU's digital economy.

[66] *DSSC Blueprint 3.0, available at https://blueprint.dssc.eu/*
[67] *'Harmonised standard' means a harmonised standard as defined in Article 2, point (1)(c), of Regulation (EU) No 1025/2012*
[68] *HLF Workstream 14 on Data Interoperability available at https://ec.europa.eu/docsroom/documents/58914*

The European Trusted Data Framework defines five standardization fields, as shown in the figure below (*Figure 7: Standardization request: European Trusted Data Framework*). The Trusted Data Transactions Harmonised standard consisting of:

- Part 1: Terminology, concepts and mechanisms
- Part 2: Trustworthiness requirements
- Part 3: Interoperability requirements

This standard enables participants in data spaces to comply with Article 33 of the Data Act, which defines essential requirements regarding the essential requirements regarding interoperability of data, of data sharing mechanisms and services, and Common European Data Spaces.

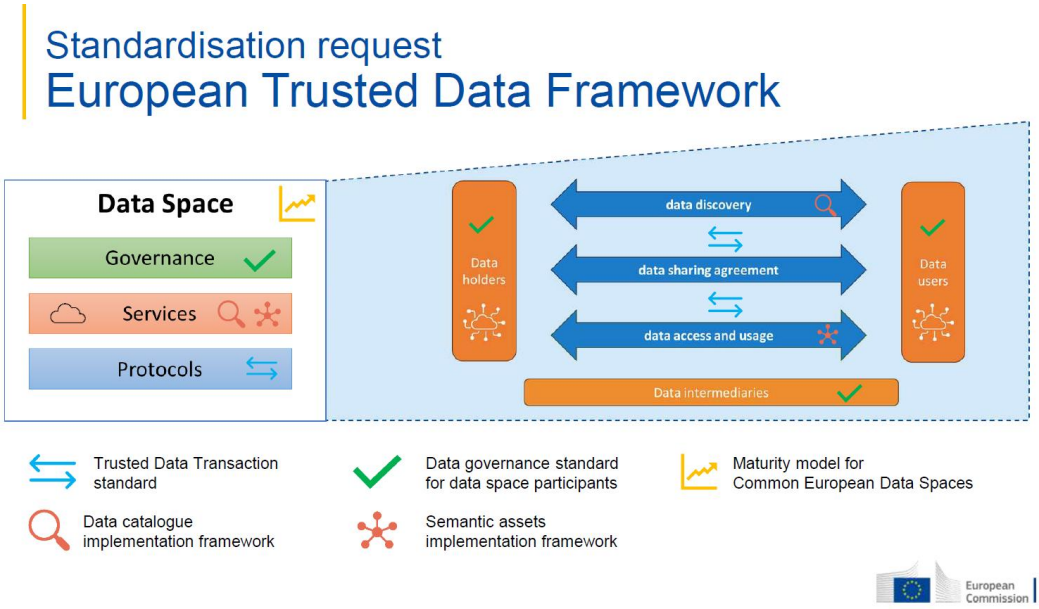

Figure 7: Standardization request: European Trusted Data Framework[69]

This graphic illustrates the **European Trusted Data Framework** in the context of a standardization request from the European Commission, focusing on how data spaces operate and are supported by specific standards.

The core components of a data space are Governance (rules, policies, and trust frameworks), Services (functional tools that enable key activities like data discovery and sharing), and Protocols (which ensure standardized, secure, and interoperable data transactions between participants).

Data spaces rely at the technical level on peer-to-peer mechanisms—such as policies and claims reconciliation—to establish trust between two participants, and, in some cases, data intermediaries are optional and operational at this level. They support business models, workflows, and value exchange but are not a prerequisite for trust at the technical layer.

[69] *European Commission draft standardisation request under Article 33 of the Data Act (EU 2023/2854).*

The standardisation request M/614[70] and its relevance.

The European Commission issued the standardisation request M/614 to support the implementation of Article 33 of the EU Data Act, which establishes essential requirements for interoperability of data, data-sharing mechanisms, and common European data spaces. Article 33 defines interoperability as a core requirement, including the use of standardized data formats, metadata, APIs, and mechanisms enabling automated data exchange across systems and participants.

To operationalize these requirements, the Commission mandates the European Standardisation Organizations (CEN, CENELEC, and ETSI) to develop harmonised standards and technical specifications. These standards are intended to provide interoperable frameworks, common practices, and technical foundations for trusted data sharing across sectors and borders.

In particular, M/614 requires:

- The development of interoperable frameworks for common standards and practices
- The drafting of one or more harmonised European standards to ensure compliance with Article 33

This standardisation effort represents a key step in translating the legal requirements of the Data Act into concrete technical and operational implementations for data spaces.

Reference information	Deliverable Title	Adoption-timeline-by ESOs[71]	
1	Harmonised standards on Trusted Data Transactions — Part 1: Terminology, concepts and mechanisms	2026-06-01	CEN CENELEC
2	Harmonised standards on Trusted Data Transactions — Part 2: Trustworthiness requirements	2026-11-01	CEN CENELEC
3	Harmonised standards on Trusted Data Transactions — Part 3: Interoperability requirements	2027-05-01	CEN CENELEC
4	Technical specification(s) on a data catalogue implementation framework	2026-03-01	ETSI
5	Technical specification(s) on an implementation framework for semantic assets	2026-09-01	ETSI
6	European standard on a quality framework for internal data governance	2027-03-01	CEN CENELEC
7	Technical specification(s) on a maturity model for Common European Data Spaces	2026-09-01	CEN CENELEC
7	Technical specification(s) on a maturity model for Common European Data Spaces	2026-09-01	CEN CENELEC

Figure 8: Standardization deliverable roadmap according to request M/614[70]

[70] *C(2025)4135 – Standardisation request M/614, see: https://ec.europa.eu/growth/tools-databases/enorm/mandate/614_en*

4.2.3 Work items and time frame

The European Committee for standardization (CEN), the European Committee for Electrotechnical standardization (CENELEC), and the European Telecommunications Standards Institute (ETSI) are tasked with drafting new European standards and standardization deliverables. These activities, illustrated in Figure 9: Timeline for adoption by ESOs support Article 33 of Regulation 2023/2854 (the Data Act). The responsible technical bodies and the execution timetable are specified to ensure alignment with the requirements outlined in Article 1: *Request for standardization activities.*[71]

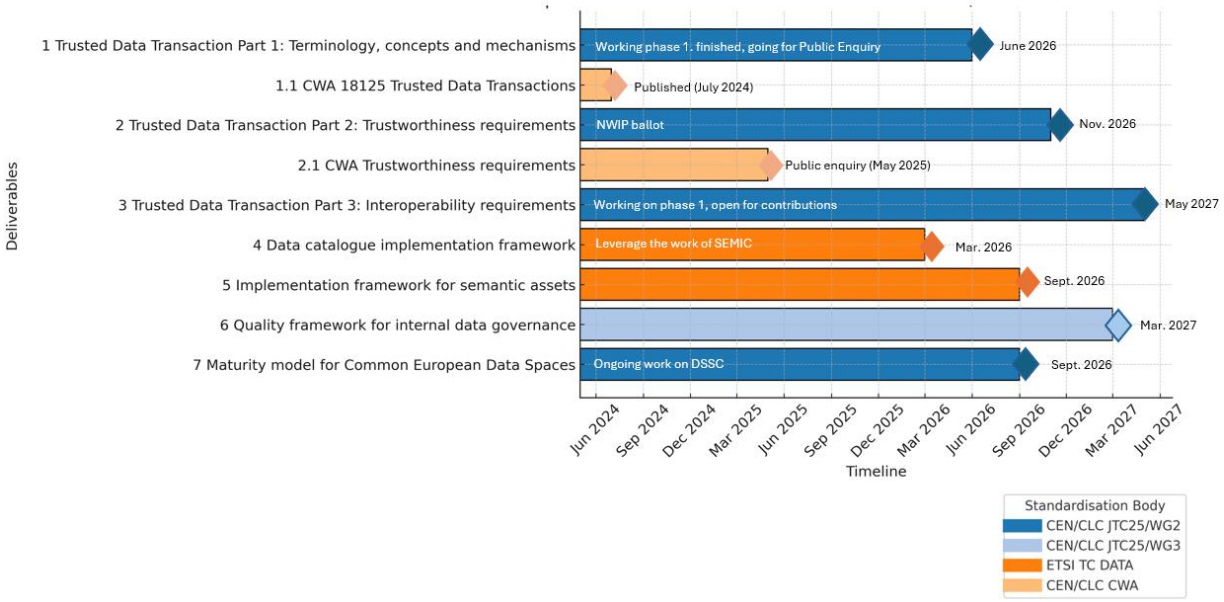

Figure 9: Timeline for adoption by ESOs[72]

4.2.4 Related work

CEN, CENELEC and ETSI shall prepare joint work programmes outlining all the standards and European standardization deliverables referred to in the standardization request, along with the responsible technical bodies and a timetable for executing the requested activities in accordance with the specified deadlines (see Figure 7: Standardization request: European Trusted Data Framework for details). The responsible technical bodies should ensure appropriate representation and effective participation of the relevant stakeholders, including small and medium-sized enterprises (SMEs) and societal stakeholders.

[71] *C(2025)4135 – Standardization request M/614, available at https://ec.europa.eu/growth/tools-databases/enorm/mandate/614_en-*
[72] *Castellvi, S. (2025). Standardisation request timeline by ESOs as part of the IDSA standardisation activities presentation.*

The standardization request also ensures that European standards and standardization deliverables comply with a set of requirements, taking into account, where appropriate, the work of the Data Spaces Support Centre and Interoperable Europe.

4.3 New legislative framework

4.3.1 Introduction

The European Union has been actively developing a regulatory framework to ensure data sovereignty and enhance competitiveness in the global data economy. This framework includes several key legislative measures, such as Data Act (DA), the Data Governance Act (DGA), the AI Act (AIA), the Digital Markets Act (DMA), and the Digital Services Act (DSA). These regulations aim to harmonize data practices across EU member states, ensuring compliance with EU laws and standards related to security, data protection, and consumer rights.

A cornerstone of this framework is the Data Act, which seeks to harmonize access to and use of data across the EU. Following the Data Governance Act, the Data Act represents the second pillar in establishing the framework for the Common European data space (see *Figure 4*).

The Data Act introduces measures to foster the development of interoperability standards for data-sharing and data processing services, in alignment with the EU Standardization strategy.

This effort is directly connected to the work of data space initiatives such as IDSA, which will play a major role, having already developed frameworks, reference architectures, and protocols that can serve as blueprints for common standards.

4.3.2 Data Act

The Data Act[73] is a law designed to enhance the EU's data economy and foster a competitive data market by making data - particularly industrial data - more accessible and usable. It aims to encourage data-driven innovation and increase data availability. The Data Act establishes data access and data rights for the users of connected devices. The Data Act expresses a clear preference for standards to be developed by the EU standardization bodies.

Data Act provides harmonized rules for accessing and using data, which directly support the development of data spaces. It ensures that users of connected products can access the data generated through their use of the product or related services. Additionally, data holders are required to make this data available to users.

Another key aspect of the Data Act is fostering trust in data sharing. It is essential to implement safeguards that allow citizens, public sector bodies, and businesses to maintain control over their data.

[73] *Regulation (EU) 2023/2854 on harmonised rules on fair access to and use of data (Data Act) is available at https://eur-lex.europa.eu/eli/reg/2023/2854/oj*

Standardization and semantic interoperability play a crucial role by offering technical solutions that enable seamless interoperability within and across common European data spaces. These data spaces may be sector-specific, cross-sectoral, or designed for common interoperable frameworks, standards and services, scientific research, or civil society initiatives. This regulation set out essential interoperability requirements in Article 33.

The Data Act[74] was published on December 22, 2023 and will become applicable on 12 September 2025.

4.3.3 Data Governance Act

The Data Governance Act (DGA)[75] establishes a framework for data reuse by public sector bodies and introduces data intermediation services. It emphasizes the importance of neutrality and trust in data sharing, and supports data altruism, where data is voluntarily shared for the common good. The Act also sets up the European Data Innovation Board to promote standardization and interoperability.

4.3.3.1 Standardization and interoperability in the DGA

The complexity of the EU's regulatory environment presents challenges, particularly in aligning new regulations with existing laws on data protection, competition, and intellectual property. The lack of standardized terminology further complicates interpretation and interoperability. Despite these challenges, both the Data Act (DA) and the Data Governance Act (DGA) are critical for standardization within B2B data spaces, though their relevance extends beyond this scope.

Throughout the DGA, the term "standards" is sometimes used more loosely to refer to ethical standards or values, which are distinct from technical standards. Ethical standards in the DGA are related to maintaining high scientific ethics and ensuring data security. However, the DGA also underscores the importance of standardization for enabling interoperability between data intermediaries, data altruism organisations, and related entities, including data spaces that may not formally qualify as intermediaries. The regulation highlights the necessity for both domain-specific and cross-domain data and metadata standards, as well as standardised data formatting.

Despite this emphasis, the DGA does not directly advance the creation of technical standards. Instead, it establishes the European Data Innovation Board (EDIB), tasked with facilitating the development of industry standards and promoting interoperability. This board aims to bridge the gap between the current needs for standardization and the practical steps needed to achieve it.

[74] *Regulation (EU) 2023/2854 available at https://eur-lex.europa.eu/eli/reg/2023/2854*
[75] *Regulation (EU) 2022/868 of the European Parliament and of the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act) available at https://eur-lex.europa.eu/eli/reg/2022/868*

4.3.3.2 Challenges and prospects

The DGA and DA present several challenges, including broad definitions and the need for practical solutions aligned with national laws. One of the key challenges highlighted by the DGA is achieving legal interoperability- developing a common understanding of the evolving legal environment and facilitating the implementation of balanced policy objectives. The complexity of the EU's legal framework, which spans national, horizontal, and sector-specific regulations, necessitates clear guidelines and adaptable policies. The DGA's focus on standardization, therefore, extends beyond technical specifications but also about creating a cohesive legal and regulatory landscape that supports data interoperability and reuse.

The International Data Spaces Association (IDSA) has developed the Dataspace Protocol, a standardized framework to integrate key processes common to all data spaces, and a reference architecture that can serve as blueprints for common standards. The Data Spaces Support Centre (DSSC) will play a pivotal role in providing aligned support for common EU data spaces, ensuring that the EU's data economy is both competitive and sovereign. Building on these initiatives, the EU's strategy should aim to ensure interoperability and define specifications of future infrastructure agreements.

To better understand the scope of the DGA regarding data intermediaries and their role within data spaces, we recommend reading the IDSA paper "*Reflections on the DGA and Data Intermediaries*"[76].

4.3.4 AI Act

Data space technology plays a key role in fulfilling the requirements of the EU and the Standardization Request for the AI Act. As the AI Act emphasizes the need for strong data governance, robust management procedures, and high-quality dataset in AI systems, data spaces offer a concrete solution. They provide a structured framework for how data is accessed, shared, and trusted among participants, ensuring transparency, control, and accountability.

By embedding mechanisms for data provenance, traceability, and usage control, data spaces directly support the validation of AI-related processes and compliance with regulatory standards. Their technical components—such as connectors and ecosystem services—enable the enforcement of policies and verification of claims, aligning closely with the Act's focus on trustworthy AI.

As a result, data spaces are already being referenced in European standardization efforts as foundational infrastructure for meeting AI regulatory requirements.

[76] *Hilberg S., Steinbuss S. (eds.), Reflections on DGA and Data Intermediaries, International Data Spaces Association, October 2023 available at https://internationaldataspaces.org/wp-content/uploads/Reflections-on-the-DGA-and-Data-Intermediaries.pdf*

If you want to know more about how data spaces can support AI Act implementation, read the following document: *Data Spaces for the AI Act – Analysis of the Standardization Request Regarding the European AI Act in the Context of Data Spaces*[77].

4.4 CEN-CENELEC JTC 25

The Joint Technical Committee 25 of CEN and CENELEC, titled "Data Management, Dataspaces, Cloud and Edge", is tasked with developing standards to support the widespread adoption of digitalization and the establishment of a fully functioning Single Digital Market for the EU. The goal is to ensure the European industry becomes more efficient, productive, competitive, and fully integrated in the global digital market.

4.4.1 Scope and purpose

The scope of CEN-CENELC JTC 25[78] focuses on standardization in the area of data management, dataspaces, cloud and edge, including:

- Data governance, data quality, and data lifecycle management.
- Interoperability, portability, and switchability.
- Organizational frameworks and methodologies, including IT management systems.
- Processes and products evaluation schemes.
- Smart technology, objects, distributed computing devices, and data services.

JTC25 is structured into four working groups (WGs), each focusing on specific areas:

- WG 1: Advisory Group - Supports collaboration among members and with relevant stakeholders. It also establishes liaison with other technical committees, such as the ISO/IEC JTC 1/ SC 38 or the ETSI TC Data.
- WG 2: Dataspaces - Addresses topics specific to dataspace as outlined in the Standardization Request related to the Data Act, incorporating findings from the CWA on Trusted Data Transaction.
- WG 3: Data Management and Data Governance - Covers the remaining topics from the Standardization Request, focusing on DCAT, ontologies, and data management.
- WG 4: Cloud and Edge Undertake preparatory work for the anticipated Standardization Request in this area.

The CEN-CENELEC JTC25 was kicked off in September 2024 in Brussels, Belgium[79]. The second plenary meeting was conducted in February 2025 in Milan, Italy. The JTC 25 Working Groups have established their respective work programmes.

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[77] *Wisselink F., Steinbuss S., Koen P.: Data Spaces for the AI Act – Analysis of the Standardization Request Regarding the European AI Act in the Context of Data Spaces, International Data Spaces Association, March 2024 available at* https://internationaldataspaces.org/wp-content/uploads/Reflections-on-the-DGA-and-Data-Intermediaries.pdf

[78] *CEN/CLC/JTC 25 Work programme, available at* https://standards.cencenelec.eu/ords/f?p=205:22:::::FSP_ORG_ID,FSP_LANG_ID:3485479,25&cs=1C056A0731BBA8E0462A4FF4326F

[79] *CEN and CENELEC. (2024, September 25). CEN and CENELEC launch a new technical committee on Data Management, Dataspaces, Cloud and Edge. Available at* https://www.cencenelec.eu/news-events/news/2024/brief-news/2024-09-25-jtc-25

4.4.2 Status

A key focus of the committee is the development of the Trusted Data Transactions (TDT) standard series:

- EN 18235-1:2026 Trusted Data Transactions Part 1[80]. (Status: In publication)
- prEN 18235-2 Trusted Data Transactions Part 2[81]. (Status: Under Approval)
- prEN 18235-3 Trusted Data Transactions Part 3[82] (Status: Under drafting)

In parallel, the committee is developing:

- CEN/CLC/TS 18331 Maturity assessment of CEDS[83]. (Status: Under Approval)
- prEN 18352 Quality framework for internal data governance for participants in data spaces[84] (Status: Under Enquiry)

As these standards are still progressing through the European standardisation process, the detailed technical specifications are not yet publicly available. However, the publicly presented work illustrates the ongoing effort to establish a coherent European standardisation framework enabling trusted, interoperable and governance-driven data sharing across sectors.

4.4.3 What's next?

In addition to the development of the Trusted Data Transactions (TDT) standard series, several new preliminary work items (PWIs) have been launched to address emerging needs identified during the implementation of the European data strategy. These new projects focus on strengthening the technical and governance foundations required for operational data spaces.

Current work includes the following initiatives:

- PWI Data quality in data spaces
- PWI Trust frameworks for data spaces- European specific context and approach.
- PWI Overview and architecture of standards in support of the European Trusted Data Framework
- prCEN/TS XXX Cloud computing - Switching and interoperability in a European context

[80] *EN 18235-1:2026 TDT – Part 1: Terminology, concepts and mechanisms, available at* https://standards.cencenelec.eu/ords/f?p=205:110::::FSP_PROJECT:82029&cs=15FF93F75076C003E50E64B1427E59477
[81] *prEN 18235-2 TDT – Part 2 Trustworthiness requirements, available at* https://standards.cencenelec.eu/ords/f?p=205:110::::FSP_PROJECT,FSP_LANG_ID:82007,25&cs=1CEDF2C921DAABDD0CE803E0A8F155E56
[82] *prEN 18235-3 TDT – Part 3: Interoperability requirements, available at* https://standards.cencenelec.eu/ords/f?p=205:110::::FSP_PROJECT,FSP_LANG_ID:81918,25&cs=1BBBD8E4A09FF49AEFCF80DCF84EB2819
[83] *CEN/CLC/TS 18331:2026 available at* https://standards.cencenelec.eu/ords/f?p=205:110::::FSP_PROJECT,FSP_LANG_ID:82502,25&cs=18B42FBAEEA40C2E2A117D051714887BF
[84] *prEN 18352 Quality framework for internal data governance for participants in data spaces, available at* https://standards.cencenelec.eu/ords/f?p=205:110::::FSP_PROJECT:82029&cs=15FF93F75076C003E50E64B1427E59477

4.5 CEN Workshop Agreement Trusted Data Transaction

The CEN Workshop Agreement (CWA) on Trusted Data Transaction85 is a pre-standardization workshop that was launched mid 2023 with the goal to prepare for and accelerate the creation of standards.

4.5.1 Scope and purpose

The CEN Workshop Agreement (CWA) on Trusted Data Transaction is closely aligned with the European Trusted Data Framework and directly supports the ongoing standardisation effort led by CEN/CENELEC Joint Technical Committee JTC 25, Working Group 2 (WG2) on Dataspaces. The outputs initiated within the CWA serve as a foundational step, with the intention that these deliverables will be further developed and formalised within JTC 25/WG2.

Objectives and scope:

- Establish terminology, describe concepts and mechanisms in the field of data sharing to form a foundational understanding on which trusted data transactions can be based.
- Identify attribute-based criteria for the decision-making framework that defines how to build trust in data transactions.
- Remain independent of architectural choices or technical implementations.
- Be applicable in any scenario where stakeholders need to establish trust for the purpose of data exchange.

4.5.2 Part 1: Concepts, terminology, and mechanisms

CEN Workshop Agreement Trusted Data Transaction- Part 1. Concepts, terminology, and mechanisms were published in July 2024 on the CEN/CENELEC website[86]. The purpose of this document is to provide terminology, concepts, and mechanisms in the field of data exchange, with a focus on trusted data transactions. These elements are intended to support the development of standards that enable trusted data transactions. The terminology, concepts, and mechanisms outlined form the basis for identifying key dimensions and criteria that contribute to trust in a data transaction between participating parties. Importantly, these foundations apply regardless of specific architectural choices or technical implementations.

The scope of data transactions covers the full process of sharing data in a trusted way between participants in a data space. This process is divided into three main phases, each with its own steps and activities:

1. Granting rights and publication: This phase involves the definition and enforcement of usage rights, consent mechanisms, and the publication of available data offerings.

[85] *CEN and CENELEC. (2024, January 16). CEN Workshop on Trusted Data Transaction launched to support the EU Data Strategy. Available at https://www.cencenelec.eu/news-events/news/2024/workshop/2024-01-16-data-transactions*
[86] *CEN Workshop Agreement Trusted Data Transaction, CWA 18125:2024 E, available at https://www.cencenelec.eu/media/CEN-CENELEC/CWAs/RI/2024/cwa18125_2024.pdf*

2. Discovery and negotiation: Participants search for relevant data assets and engage in negotiation processes that may include data usage conditions, pricing, or access modalities.
3. Data exchange or sharing: Once an agreement is reached, the actual transfer or access to the data is performed under agreed-upon trust and governance mechanisms.

These phases are illustrated in Figure 10: Scope of data transaction, which provides a high-level overview of the roles, components, and interactions across the data transaction lifecycle.

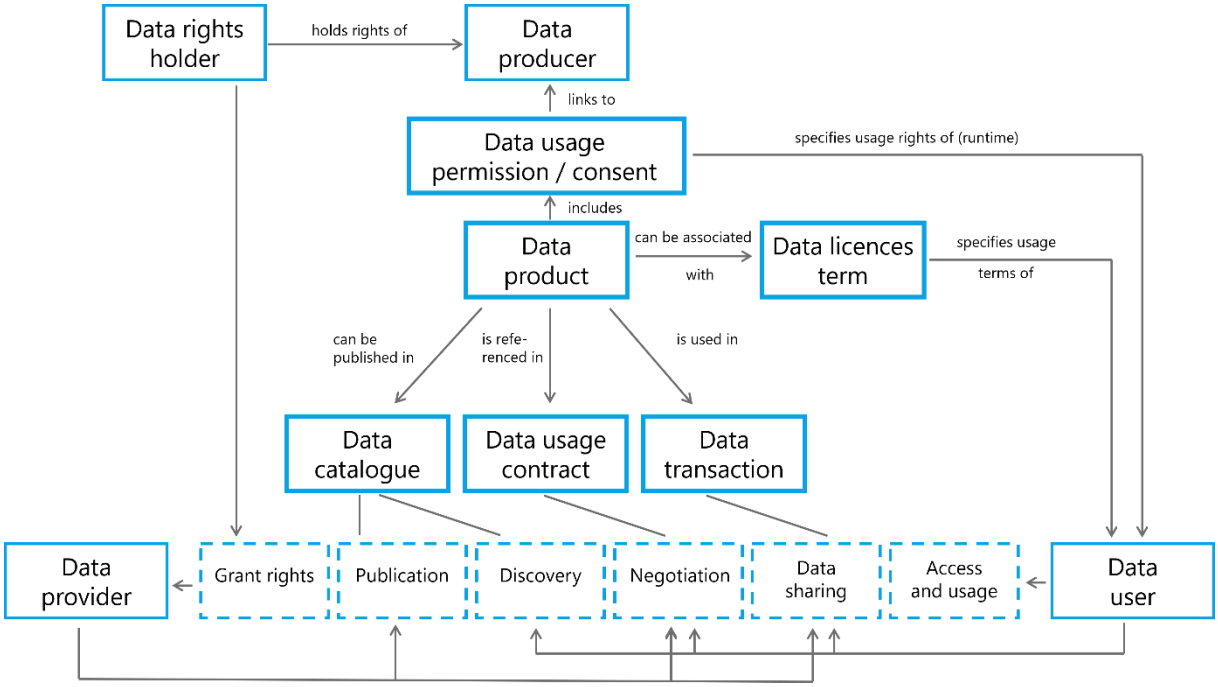

Figure 10: Scope of data transaction[87]

Data Product Concept

A data product typically combines three main elements, see *Figure 11: Data product concept*:

- Data: the actual datasets being shared.
- Metadata: information describing the data, enabling discovery, understanding, and reuse.
- Services: mechanisms or interfaces that allow users or systems to access and interact with the data.

Metadata plays a central role in enabling data discovery and interoperability. It supports functions such as:

[87] *Source: CWA 18125:2024 'Trusted data transaction – part1'*

- Publication and discovery through data catalogues (e.g., using DCAT application profiles).
- Syntax and semantics, including semantic models and vocabularies that enable consistent interpretation of data.
- Data rights and licence terms, which define how the data can be accessed and used.

Within data spaces, these elements support data governance and management in multi-stakeholder environments, enabling trusted data sharing between organizations. Data products can therefore be published in data product catalogues, where they become searchable and accessible for potential data users.

Implementation tools and artefacts may support the creation, publication, and management of data products across the data space ecosystem.

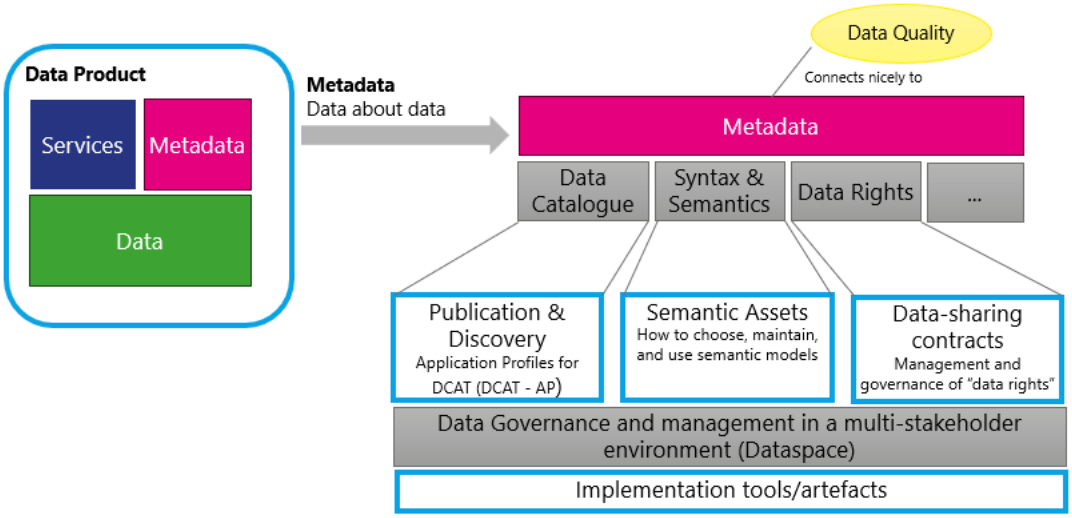

Figure 11: Data product concept[88]

4.5.3 Part 2: Trustworthiness requirements

The CEN Workshop Agreement *"Trusted Data Transaction – Part 2: Trustworthiness Requirements*[89]*"* defines the trustworthiness requirements necessary to establish trust in support of trusted data transactions across digital ecosystems. The document outlines a set of foundational principles - such as transparency, traceability, accountability, and data quality- which serve as the basis for building trust throughout the data transaction lifecycle.

It includes both general requirements that apply across all phases of a trusted data transaction, as well as specific requirements tailored to each phase, including granting rights, data publication and discovery, negotiation, data sharing and exchange, and access and usage control. These requirements aim to ensure that data can be securely and reliably in an

[88] *Source: IDSA*
[89] *CEN-CENELEC. (2025, April 10). CEN Workshop Agreement – Trusted Data Transaction: Part 2 – Trustworthiness Requirements (Public Review Version). Available at https://www.cencenelec.eu/media/CEN-CENELEC/News/Workshops/2025/2025-04-10_TDT_Part2/cen-ws-tdtpart2_versionpublicreview2025048.pdf*

interoperable environment, while also respecting legal, ethical, and organizational obligations.

"Trusted Data Transaction – Part 2: Trustworthiness Requirements - Annex 1 provides an informative overview of trust frameworks, emphasizing their role in aligning technical standards with governance and legal policies. This alignment supports the development of trustworthy data spaces and enables consistent trust among participants.

4.6 ETSI TC DATA

The ETSI Technical Committee on Data (TC DATA)[90] has been established to provide expertise in data infrastructures, services, and applications. Its primary goal is to develop data solutions that support services for IoT, telecommunications systems, and other industries. This initiative aims to advance data-driven technologies and foster the development of new industry standards in line with the European Data Governance Act, the European Data Act, and the European Trusted Data Framework.

4.6.1 Scope

TC DATA develops deliverables to support the deployment and operation of distributed solutions for data collection, integration, sharing and management, including security and testing.

The distributed solutions considered by TC DATA include data infrastructures, data products, data access services, and application interfaces (APIs) in the ICT domain. These are intended for use by both machines and human users, as well as their virtual representations. These solutions address the three dimensions of distributed data processing:

1. Connectivity (data in transit)
2. Storage (data at rest)
3. Compute (data in process)

TC DATA is also committed to addressing European policy and regulatory requirements, including standardization needs in the areas of data interoperability, semantic interoperability, ontologies, and data governance. It also engages with other regulatory bodies to ensure that the output supports relevant global, regional, and national requirements.

Additionally, TC DATA is responsible for contributing technical inputs to ETSI's responses to EU Standardization Requests and other government requests concerning data solutions. It also provides technical content for ETSI deliverables related to the European Data Act and to the data-related aspects of the European AI Act.

[90] *ETSI COMS TEAM. (2025, February 17). ETSI launches a Technical Committee on Data Solutions (TC DATA) to support data interoperability and governance. Retrieved from https://www.etsi.org/newsroom/press-releases/2496-etsi-launches-a-technical-committee-on-data-solutions-tc-data-to-encourage-the-adoption-of-new-standards-in-line-with-the-european-data-governance-act*

It also cooperates with other European and international standards organizations active in the data solutions domain to avoid duplication of efforts and promote harmonization, through partnership agreements

4.6.2 Areas of Activity

TC DATA is currently contributing to the European Commission Standardization Request related to the Data Act, in collaboration with CEN/CENELEC JTC 25, with particular focus on:

- Data discovery mechanisms, including data catalogues
- Metadata exchange and semantic interoperability

Recent deliverables include:

- ETSI TS 104 200 – Data Solutions (DATA); Proof of Concept Framework
- ETSI TR 104 409 – Data Act (Art. 33) Requirement and References Analysis
- ETSI TR 104 410 – Data Act (Art. 33) Standardization Suggestions

These publications analyse how existing standards and technologies (e.g., oneM2M, SAREF, and NGSI-LD) can support the implementation of the EU Data Act, particularly Article 33 on interoperability of data sharing mechanisms, and identify areas where further standardization is required.

5 Global developments in data spaces standardisation

5.1 Overview

While Europe has taken a leading role in shaping data space architectures and governance frameworks, other regions around the world are also advancing their own approaches to trusted data sharing, interoperability, and data governance.

Understanding these international developments is essential for enabling trusted cross-border data exchange. Differences in regulatory frameworks, technical standards, and governance models can create challenges for interoperability and compliance when data flows across jurisdictions. Identifying these requirements and understanding how different countries approach data sharing is, therefore, a key step toward building globally interoperable and trustworthy data ecosystems.

5.2 Standardization in Japan

A national policy framework has been established to promote cross-sector data collaboration and to build a trustworthy, human-centered digital society in Japan. These policies emphasize the importance of interoperability, governance, and international standardization as key enablers of the smooth utilization of data, both domestically and across borders, and have a significant influence on institutional design and approaches to standardization.

Based on this policy framework, Japan has internationally advocated the concept of "*Data Free Flow with Trust (DFFT)*[91]" and has taken a leading role in promoting trustworthy, rules-based cross-border data flows. DFFT symbolizes Japan's proactive role in shaping global data governance.

To implement these policy directions both domestically and internationally, Japan has developed domestic legal frameworks that support the trustworthy use of data (Section 5.2.1), as well as cross-cutting design principles and guidelines for a digital society (Section 5.2.2). Furthermore, practical implementation is being advanced through concrete initiatives involving government bodies, industry, and a wide range of stakeholders (Section 5.2.3). In addition, through engagement in international standardization activities and the establishment of international points of connection (Section 5.2.4), Japan is contributing to the development of a globally trusted data space.

5.2.1 General Legal Regulations Related to Data Utilization

This section outlines the general legal frameworks in Japan that underpin data use and interoperability.

[91] *Data Free Flow with Trust (DFFT), available at* https://www.digital.go.jp/en/policies/dfft

Basic Act on the Formation of a Digital Society[92]

This Act aims to realize a fair and inclusive digital society through the use of digital technologies and data. It defines the responsibilities of the national and local governments and establishes basic principles for digital governance. The Act promotes the digitalization of public administration and data linkage across systems and positions the accuracy and timeliness of data in information systems and public foundational databases (base registries) as key policy priorities.

It also emphasizes the importance of ensuring the smooth circulation of information among diverse stakeholders (including data standardization), enabling public access to information held by national and local governments, and maintaining data accuracy and currency in information systems and base registries.

Act on the Advancement of Government Administration Processes That Use Information and Communications Technology (Digital Procedures Act)[93]

This Act aims to enhance and streamline administrative procedures and operations by leveraging information and communications technology. It requires establishing measures to ensure data quality and rapid, accurate data linkage between information systems as part of government system development plans.

The Act also provides a framework for the government to formulate plans for the development and improvement of public foundational databases, and for national administrative bodies to implement those plans accordingly.

Under this Act, the national government is also responsible for developing a government cloud infrastructure and promoting the use of cloud services by national and local governments. In addition, it institutionally supports procedural simplification and the once-only principle, including the elimination of notification requirements when corporate registration information is obtained through data linkage by administrative authorities.

Where necessary, the Act allows for cooperation with the National Printing Bureau and the Information Technology Promotion Agency (IPA).

Act on the National Printing Bureau, Independent Administrative Agency[94] *and Act on Facilitation of Information Processing*[95]

These two Acts establish the roles and legal mandates of the organizations responsible for effectively implementing the development and improvement of public foundational databases and administrative information systems under the Digital Procedures Act. The Act on the National Printing Bureau enables the Bureau to process, record, store, and provide

[92] *Basic Act on the Formation of a Digital Society, available at https://www.japaneselawtranslation.go.jp/en/laws/view/4447/en*
[93] *Act on the Advancement of Government Administration Processes That Use Information and Communications Technology (Digital Procedures Act), available at https://www.japaneselawtranslation.go.jp/en/laws/view/4747/en*
[94] *Act on the National Printing Bureau, Independent Administrative Agency, available at https://www.japaneselawtranslation.go.jp/en/laws*
[95] *Act on Facilitation of Information Processing, available at https://www.ipa.go.jp/en/*

data that constitute public foundational databases. The Act on Facilitation of Information Processing institutionally positions the Information Technology Promotion Agency (IPA) as a key body for promoting information processing–related activities, including the development of standards and guidelines for data standardization.

Basic Act on the Advancement of Public and Private Sector Data Utilization[96]

This Act is a fundamental law that aims to enhance public convenience and strengthen industrial competitiveness by promoting the active use of data held by national and local governments and the private sector, while ensuring appropriate data management. Under this Act, the government formulates a Basic Plan for the Advancement of Public and Private Sector Data Utilization and promotes initiatives such as open data, data standardization, and the development of data-sharing and interoperability infrastructures in a comprehensive and systematic manner.

5.2.2 Legal Systems and Guidelines for Digital Society

Building on the general legal framework for data use described in the previous section, Japan has established cross-sectoral legal frameworks and guidelines to realize a trustworthy digital society. These frameworks place particular emphasis on protecting individual rights, fairness, and governance.

Act on the Protection of Personal Information (APPI)[97]

The APPI serves as the fundamental law governing the collection, use, and provision of personal data in both the public and private sectors. Its purpose is to protect individuals' rights and interests while enabling responsible data utilization.

The Act includes provisions on specifying the purpose of use, implementing security control measures, and regulating third-party data provision. It also emphasizes the utility of personal data while protecting individual rights and interests through mechanisms such as data anonymization and pseudonymization, thereby supporting industrial innovation and improving citizens' quality of life.

My Number Act (Act on the Use of Numbers to Identify a Specific Individual in Administrative Procedures)[98]

This Act aims to enhance the efficiency and sophistication of administrative procedures while ensuring the proper handling of specific personal information, through information sharing using My Number (Individual Number) and Corporate Number, as well as identity verification using the My Number Card.

[96] *Basic Act on the Advancement of Public and Private Sector Data Utilization, available at* https://www.japaneselawtranslation.go.jp/en/laws/view/3534/en
[97] *Act on the Protection of Personal Information (APPI), available at* https://www.ppc.go.jp/en/legal/
[98] *Act on the Use of Numbers to Identify a Specific Individual in Administrative Procedures (My Number Act), available at* https://www.digital.go.jp/en/policies/mynumber

The 2025 amendments expanded the scope of administrative affairs that can utilize "My Number", including those related to national qualifications.

The 2023 amendments clarified the Digital Agency's role in ensuring the accuracy of specific personal information and enabled the introduction of the next-generation "My Number Card" and the integration of card functions into smartphones, thereby improving both usability and trustworthiness.

Act on Electronic Signatures and Certification Business[99]

This act establishes the legal framework for electronic signatures and specified certification services and aims to promote the distribution of information through electromagnetic means and information processing. It defines the requirements for the presumption of authenticity of electronic signatures and the certification framework for certification service providers.

Unfair Competition Prevention Act[100]

This act aims to protect trade secrets, including technical information, prevent their misappropriation and unfair use, and maintain a fair competitive environment for data transactions through mechanisms such as the limited provision data framework. It plays an important role in protecting non-personal information, such as corporate data, in the digital era.

Copyright Act[101]

This Act protects the rights of creators over literary, artistic, and other creative works while also defining the lawful scope for their use, reuse, and distribution. In particular, in digital environments, it provides a legal framework that enables the legitimate use, sharing, and utilization of copyrighted works contained in data or databases, thereby balancing creation and distribution.

Act on the Promotion of Research, Development, and Utilization of Artificial Intelligence–Related Technologies (AI Act)[102]

The AI Act is a framework law that aims to comprehensively and systematically promote the entire lifecycle of artificial intelligence—from research and development to social implementation—and to improve citizens' lives and the sound development of the national economy.

The Act establishes an AI Strategy Headquarters within the government and formulates an AI Basic Plan, promoting initiatives such as research and development, ensuring appropriateness, human resource development, and international cooperation. It also grants

[99] *Act on Electronic Signatures and Certification Business, available at https://www.moj.go.jp/ENGLISH/information/rotlf-12.html*
[100] *Unfair Competition Prevention Act, available at https://www.japaneselawtranslation.go.jp/en/laws/view/3357/en*
[101] *Copyright Act of Japan, available at https://www.japaneselawtranslation.go.jp/en/laws/view/3949/en*
[102] *Act on Promotion of Research and Development and Utilization of Artificial Intelligence-Related Technologies, available at https://www.gov-online.go.jp/hlj/en/november_2025/november_2025-08.html*

the State authority to request the submission of materials and other forms of cooperation, while defining the responsibilities of the State, business operators, and other relevant actors, as well as the framework for their cooperation.

Antimonopoly Act[103]

This Act aims to promote free and fair competition and to protect consumer interests by prohibiting private monopolization, unreasonable restraints of trade, and unfair trade practices.

The Act provides the legal foundation for the enforcement of competition policy, including oversight and enforcement by the Japan Fair Trade Commission, and supports the development of a sound and competitive market environment.

Basic Policy on the Ideal Structure of Data Utilization Systems[104]

This policy outlines the Japanese government's basic approach to building a data-driven society in which data and AI reinforce each other in a virtuous cycle. It emphasizes protecting individual rights, responsible risk management, and ensuring transparency and trust.

The policy establishes principles for data collection, use, and sharing in line with existing laws, while promoting legal reforms, such as amendments to the Act on the Protection of Personal Information. It also serves as a foundational policy guideline for fostering public–private collaboration and international data flows, aiming to balance trust and convenience.

Basic Plan on Artificial Intelligence[105]

This plan serves as Japan's national policy framework for AI, aiming to pursue trustworthy AI and make Japan the country where AI is most easily developed and utilized worldwide. It is structured around three main principles: (1) balancing the promotion of innovation with risk response; (2) agile (flexible and prompt) response; and (3) integrated domestic and international policy promotion.

The plan aims not only at AI development and utilization, but also at leading international governance to enhance trustworthiness, and at improving industrial structure, institutions, and human resources for AI implementation.

Taken together, these acts and basic policies form the core legal framework for trustworthy data utilization and digital transformation in Japan. They are complemented by sector-specific and enabling laws that provide practical foundations for interoperable, secure, and reliable digital government and data-driven services.

[103] *Antimonopoly Act, available at https://www.jftc.go.jp/en/policy_enforcement/ama/index.html*
[104] *Basic Policy on the Ideal Structure of Data Utilization Systems, available at https://www.lexology.com/library/detail.aspx?g=3e83e8f2-c0a1-4a16-97a8-ca394b0e2c44*
[105] *Artificial Intelligence Basic Plan (Japan), available at https://www8.cao.go.jp/cstp/ai/ai_plan/aiplan_eng_20260116.pdf*

In addition, the following laws are relevant: Telecommunications Business Law[106]; the Act on Promotion of Competition for Specified Smartphone Software[107]; the Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Senders[108]; the Act on Making Payments That Become Part of the National Revenue by the Method Using Information and Communications Technology[109]; the Act on Registration of Deposit or Savings Accounts for Swift and Secure Payment of Public Benefits[110]; the Act on Management of Deposit and Saving Accounts by Use of Individual Numbers based on the Will of Depositors[111]; the Act on Utilization of Telecommunications Technology in Document Preservation, etc. Conducted by Private Business Operators, etc.[112]; the Act on Standardization of Local Government Information Systems[113]; the Act on Dissemination and Promotion of Electronic Commission[114]; and the Act on Certification Business of Local Governments in Relation to Electronic Signatures[115].

In addition to the legal framework, Japan has developed policy guidelines and reference materials to address emerging digital challenges. Examples include the Contract Guidance on Utilization of AI and Data (v1.1)[116], AI and Copyright Concepts[117], the Guidelines for AI Businesses (v1.1)[118], and the Checklist for Contracting on AI Utilization and Development[119], which together promote transparency, accountability, and lawful use of data and AI. Collectively, these frameworks aim to realize a secure, interoperable, and innovation-oriented digital ecosystem grounded in public trust.

5.2.3 Initiatives

To translate the legal frameworks and guidelines presented in the preceding sections into concrete social implementation, Japan has been advancing a wide range of initiatives and collaborative efforts involving the government, industry, academic institutions, and other stakeholders.

For example, the Council for the Promotion of Digital Society[120], established within the Digital Agency, defines cross-ministerial priorities for building a digital society, while the Digital

[106] *Telecommunications Business Act, available at https://www.soumu.go.jp/english/*
[107] *Act on Promotion of Competition for Specified Smartphone Software, available at https://www.jftc.go.jp/en/*
[108] *Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Senders, available at https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/*
[109] *Act on Making Payments That Become Part of the National Revenue by the Method Using Information and Communications Technology, available at https://www.digital.go.jp/en/*
[110] *Act on Registration of Deposit or Savings Accounts for Swift and Secure Payment of Public Benefits, available at https://www.digital.go.jp/en/*
[111] *Act on Management of Deposit and Saving Accounts by Use of Individual Numbers based on the Will of Depositors, available at https://www.digital.go.jp/en/*
[112] *Act on Utilization of Telecommunications Technology in Document Preservation Conducted by Private Business Operators, available at https://www.soumu.go.jp/english/*
[113] *Act on Standardization of Local Government Information Systems, available at https://www.digital.go.jp/en/*
[114] *Act on Dissemination and Promotion of Electronic Commission, available at https://www.digital.go.jp/en/*
[115] *Act on Certification Business of Local Governments in Relation to Electronic Signatures, available at https://www.soumu.go.jp/english/*
[116] *Contract Guidance on Utilization of AI and Data (v1.1), available at https://www.meti.go.jp/english/*
[117] AI and Copyright Concepts, available at *https://www.bunka.go.jp/english/*
[118] *Guidelines for AI Businesses (v1.1), available at https://www.meti.go.jp/english/*
[119] *Checklist for Contracting on AI Utilization and Development, available at https://www.meti.go.jp/english/*
[120] *Council for the Promotion of Digital Society, available at https://www.digital.go.jp/en/*

Administrative and Financial Reform Conference[31] advances the modernization of administrative and fiscal systems through digital means.

In the area of AI policy, the Conference on AI Strategy[121] and the Conference toward AI Network Society[122] serve as platforms for promoting responsible AI use and establishing ethical frameworks. The Hiroshima AI Process[123], including the reporting framework for compliance with the International Code of Conduct, which began operation in February 2025, also represents an important international initiative led by Japan.

A notable milestone in the evolution of Japan's data ecosystem is the emergence of the Open Data Spaces initiative[124][125]. This collaboration was launched in 2025 by the Data Society Alliance (DSA), the Information Technology Promotion Agency (IPA), the Robot Revolution and Industrial IoT Initiative (RRI), and the University of Tokyo. The initiative positions Open Data Spaces as a common technical foundation for data space projects in Japan, aiming to align projects such as Ouranos Ecosystem[126], DATA-EX[127], and other data-sharing initiatives under this shared framework. IPA serves as the secretariat, ensuring the initiative's sustainability and facilitating cross-sector coordination.

In addition, a broader partnership has been formalized under the name Japan Data Space Alliance (JDSA)[128]. Four organizations—DSA, the Digital Policy Forum Japan (DPFJ), the Japan Digital Trust Forum (JDTF), and RRI—have agreed to use the name "JDSA" as the collective identity for their collaborative efforts to accelerate social implementation of data spaces and strengthen international engagement from Japan.

5.2.4 Topics Related to Standardization

Against the backdrop of the development of domestic institutional frameworks and the progress of related initiatives, Japan has also been undertaking important efforts within international data standardization frameworks. In particular, Japan has been expanding its contributions to international standardization in the fields of data transactions and interoperability frameworks.

The IEEE SA Data Trading System Working Group (DTSWG)[129] has published IEEE 3800-2024[130], which defines the reference model and terminology for Data Trading Systems (DTS), and is currently developing IEEE P3800.1[131], a protocol and object framework building upon these

[121] *Digital Administrative and Fiscal Reform Conference, available at https://www.kantei.go.jp/en*
[122] *Conference toward AI Network Society, available at https://www.soumu.go.jp/english/*
[123] *Hiroshima AI Process, available at https://www.mofa.go.jp/policy/economy/hiroshima_ai_process.html*
[124] *Open Data Spaces Initiative, available at https://www.ipa.go.jp/en/*
[125] *Open Data Spaces Initiative (collaboration announcement), available at https://www.ipa.go.jp/en/*
[126] *Ouranos Ecosystem, available at https://www.ouranos-ecosystem.org/en/*
[127] *DATA-EX (Data Exchange Platform Initiative), available at https://www.data-ex.or.jp/en/*
[128] *Japan Data Space Alliance (JDSA), available at https://www.data-society-alliance.org/en/*
[129] *IEEE SA Data Trading System Working Group (DTSWG), available at https://standards.ieee.org*
[130] *IEEE Standard 3800-2024 – Data Trading System Reference Architecture and Terminology, available at https://standards.ieee.org*
[131] *IEEE P3800.1 Data Trading System Protocol and Object Framework (Draft Standard), available at https://standards.ieee.org*

outcomes. In recognition of these pioneering efforts, DTSWG was awarded the IEEE SA Emerging Technology Award 2025[132].

In light of these developments, Japan is also advancing a proposal within DTSWG to standardize a Data Space Discovery Protocol between DTS Operators and Data Space Authorities. Through the International Organization for Federated Data Spaces (IOFDS)[133], stakeholders are being encouraged to participate in this international standardization activity.

These initiatives demonstrate Japan's active engagement in shaping global standards for trustworthy, interoperable, and data-sovereignty-respecting data exchange and connect international frameworks—such as European data space protocols and the IDSA architecture—with domestic initiatives.

5.3 Standardization in People's Republic of China

In China, the National Data Administration (NDA, also known as the National Data Bureau) was established under the National Commission for Development and Reform[134]. The establishment of the NDA was proposed in March 2023 as part of a series of reforms adopted by the National People's Congress. By definition, the NDA's role is to help safeguard data security, boost the digital economy's growth, and promote high-quality integrated development of the digital economy and traditional industries. On the 28th July 2023, Mr. Liu Liehong[135] was appointed as the first director of the NDA, and the office was officially opened on the 25th of October 2023. According to the plan established by the agency, the NDA is responsible for "coordinating and promoting the construction of data infrastructure, coordinating the integration, sharing, development and utilization of data resources". The NDA is also responsible for regulating and promoting the digital economy and implementing a national market-based allocation of data factors.

In December 2023, the NDA has initiated public consultations of the new data strategy for China under the working title "Data Factors-X—Three-Year Action Plan (2024-2026)"[136]. The main task is to activate the potential resulting from data processing and exchange. Digital data is an inherent element which enriches the country's human and capital resources. The strategy refers to standards both in the field of smart cities, as well as services and data exchange between sectors. Below there is reference of the call for standardization quoted from "Data Factors-X" (machine translation from Chinese):

- Promote the joint construction and governance of smart cities and accelerate the interaction of data standards in various fields such as smart cities management and service.

[132] *IEEE SA Emerging Technology Award 2025, available at https://standards.ieee.org*
[133] *International Organization for Federated Data Spaces (IOFDS) is available at https://iofds.org/*
[134] *South China Morning Post "China's proposed National Data Bureau to become a powerful tool for Beijing to ratchet up development of digital economy, analysts say"*
[135] *https://www.ndrc.gov.cn/fzggw/wld/llh/*
[136] *https://www.ndrc.gov.cn/hdjl/yjzq/202312/t20231215_1362671.html*

- Promote scientific research institutions, leading enterprises, and technical service providers to build common data resource libraries for industry and high-quality datasets for AI foundation model training. Strengthen the supply of public data resources and support the pilot operation of public data authorization in key areas. Improve the standard system of data, strengthen the development of foundational standards for data collection, management and security, coordinate the development of industry standards, and revise and improve the standards for data management capabilities assessment.

Mr. Liu has also provided his perspective on country's data policy: "At present, data have become one of the production factors in comparing with land, labor, capital, technology, etc. , and have gradually been integrated into all aspects of production and life, profoundly affecting and reconstructing the economic and social structure, and becoming a key strategic resource that affects global competition in the digital economy era . [...] It is necessary to build a data infrastructure that adapts to the characteristics of data factors, promotes the circulation and utilization of data, and gives full play to the value and utility of data. According to preliminary research in the industry, data infrastructure is a new type of infrastructure that provides integrated data aggregation, processing, circulation, application, operation, and security services to the society with the support of network, computing power and other facilities from the perspective of releasing the value of data factors. It is an organic unity covering hardware, software, open-source protocols, standards and specifications, mechanism design, etc. Among them, network facilities represented by 5G, optical fiber, satellite Internet, etc., provide high-speed and ubiquitous connection capabilities for data, computing facilities represented by general, intelligent, and super computing power provide efficient and agile processing capabilities for data, data circulation facilities represented by data space, blockchain, and high-speed data network breakthrough data sharing and circulation bottlenecks, and data security facilities represented by privacy computing and federated learning ensure data security.[137]

In a move from September 2023, Cyberspace Administration of China, the country's cyberspace regulator, issued a document containing draft protocols for the regulation and boosting cross-border data exchange: "Cross-border flow of data generated from activities such as international trade, academic cooperation, multinational manufacturing and marketing are exempted from relevant security appraisals, individual information-flow contracts and information protection certificates, so long as the data does not include personal or important information, according to the draft protocols."[138] According to another article "China's cybersecurity regulator has released a draft document that proposes to ease rules on the export of personal information and "important" data overseas. The draft document rolls back requirements for companies to undergo certain approval procedures to export data, allowing free cross-border data transfer in certain situations. If passed, these regulations will significantly ease aspects of the current China cross-border data transfer rules to the benefit of foreign companies and multinationals in particular."[139] On the 22nd

[137] *Public Data Alliance, "Collection: 16,000 words, Liu Bureau of National Statistics on Data Factors" [machine translation]*
[138] *Global Times, "China's optimized regulation on cross-border data flow to enhance confidence of foreign business: EU chamber representative"*
[139] *China Briefing, "China's Cybersecurity Regulator Moves to Ease Cross-Border Data Transfer Rules"*

March 2024, Cyberspace Administration of China issued rules to facilitate and regulate cross-border data flow, clarifying reporting standards for security assessments of important data exports. According to Reuters "The rules published on Friday said Chinese authorities would also establish a "negative list system" for free trade pilot zones, allowing those areas to independently formulate lists of data that need to be included in the scope of security assessment."[140]

In May 2024, the 7th Digital China Summit conference was held in Fuzhou, the establishment of National Data Standardization Technical Committee was formally announced by the Standardization Administration of the P.R.C. and the National Data Administration. The general session was keynoted by Mr. Liu Liehong, who has stressed the role of standardization in the area of data, as an important foundation for economic development and innovation. He has "pointed out that data standardization is an important foundation for innovative development. Comprehensively promoting data standardization is important for improving data quality, enhancing data technology applications, promoting data circulation, activating data potential, releasing data value, and building a new development pattern in the data field. The NDA will give full play to the role of the National Data Standardization Technical Committee, continuously improve the construction of the data standard system, strengthen international exchanges and cooperation on standards, form a good situation for jointly promoting data standardization, prosper the data standardization ecosystem, and help the high-quality development of the digital economy."[141] During the conference, the 2024 version of "Data Factor Circulation Standardization White Paper" was also formally issued by the secretary of National Data Standardization Technical Committee.

In October 2024, National Technical Committee 609 on Data of Standardization Administration of China (SAC/TC609) was founded. Approved by the National Standardization Administration, it is a professional technical organization which engages in national standardization work in the data field. SAC/TC609 is endorsed and guided by the National Data Administration. Its secretariat is undertaken by the China Electronics Standardization Institute (CESI).

The work scope of SAC/TC609 covers basic general standards such as data resources, data technology, data circulation, smart cities and digital transformation, data infrastructure standards that support the data circulation and utilization, and the development and revision of security standards that ensure data circulation and utilization. It mirrors the international standard organizations such as ISO/IEC JTC1/SC32, ISO/IEC JTC1/WG11, ISO/IEC JTC1/SC42/WG2 and IEC/SyC Smart Cities.

The members of SAC/TC609 are from a wide range of organizations. There are 98 individual members and over 1500 organizational members. Individual members are professional representatives from a wide range of organizations (including state-owned enterprises, private enterprises and multinational enterprises), research institutions, universities, and

[140] *Reuters, "China relaxes security review rules for some data exports"*
[141] *Public Data Alliance, "Highlights of Liu Liehong's speech at the Digital China Summit" [machine translation]*

government departments. Organizational members are organizations or companies which are involved in standards, work, or want to participate in standardization development.

As for the organization structure, there are 6 working groups in TC609.

1. WG1: General Working Group

Scope: WG1 is responsible for researching the current status and development trends of data standards, improving the data standardization system, providing suggestions for data standardization work, as well as coordinating and promoting the development and revision of international and national standards in the data field.

2. WG2: Data Governance Standards Working Group

Scope: WG2 focuses on researching the current status and development trends of standards related to data governance, data ownership, data compliance trading, and data circulation security. It develops and revises these standards and promotes their dissemination, application and implementation.

3. WG3: Data Circulation and Utilization Standards Working Group

Scope: WG3 is responsible for researching the current status and development trends of standards related to data circulation as well as data development and utilization. It also formulates and revises these standards to promote their dissemination, application and implementation.

4. WG4: Full-Range Digital Transformation Standards Working Group

Scope: WG4 is set to research the current status and development trends of standards related to smart cities and digital transformation. It facilitates the formulation and revision of these standards and promotes their dissemination, application and implementation.

5. WG5: Data Technology Standards Working Group

Scope: WG5 researches the current status and development trends of data technology standards, formulates and revises these standards, and drives their dissemination, application and implementation.

6. WG6: Data Infrastructure Standards Working Group

Scope: WG6 is responsible for researching the current status and development trends of data infrastructure standards. It formulates and revises data infrastructure standards that support data circulation and utilization to promote their dissemination, application and implementation.

Now TC609 has published the “National Data Standardization Technical Committee Digital Working Platform” (www.tc609.org.cn). The platform can release committee news and information, manage members, manage standard production and revision processes, promote results, and so on.

TC609 holds several meetings and activities each year, including one plenary meeting, two standard week events and two standards thematic activities named “Digital China Summit” and “Guiyang Big Data Expo”. Except for the plenary meeting, the other four events all

welcome international experts to attend. It is an opportunity for international experts to communicate and present their standard work.

5.4 Standardization in the United States

In the United States, data governance and data-sharing initiatives follow a decentralized and market-driven approach. Rather than adopting a comprehensive national data-space framework, the U.S. ecosystem relies on a combination of sector-specific regulation, federal strategies, state-level legislation, and private-sector innovation. This model reflects the broader U.S. policy tradition of encouraging technological development while addressing privacy, security, and governance challenges through targeted regulatory interventions.[142]

Unlike jurisdictions that pursue centralized data governance frameworks, U.S. data policy is characterized by a patchwork of sectoral and state-level regulations. For example, the protection of personal data is governed through specific laws depending on the domain, such as the Health Insurance Portability and Accountability Act (HIPAA)[143] for healthcare data and the Gramm–Leach–Bliley Act (GLBA)[144] for financial information. At the state level, legislation such as the California Consumer Privacy Act (CCPA)[145] provides individuals with greater control over their personal data, including rights to access, delete, and opt out of certain data uses. In addition, the Federal Trade Commission (FTC) plays a central role in enforcing consumer protection by addressing unfair or deceptive data practices, including cases related to data breaches or misuse of personal information.

The private sector plays a central role in shaping the U.S. data ecosystem. Technology companies drive much of the data economy by developing digital services and platforms that rely on large-scale data processing. Public policy therefore tends to emphasize innovation-driven growth, with regulations designed to address specific market failures—such as privacy or cybersecurity risks—without constraining technological innovation. Federal investments in research and development, particularly in areas such as artificial intelligence, privacy-enhancing technologies, and data analytics, further support this innovation-oriented strategy[146].

Several federal initiatives aim to improve responsible data sharing while protecting privacy and national interests. One notable example is the National Strategy to Advance Privacy-Preserving Data Sharing and Analytics, which promotes the use of technologies that enable data analysis while safeguarding personal information. The strategy highlights the importance of privacy-enhancing technologies, secure data collaboration, and trusted data environments that can support innovation while maintaining public trust.

Efforts are also underway to improve data sharing within government and across public-sector organizations. Programs such as the State Data Sharing Initiative provide tools and

[142] *Fraunhofer ISI. International Data Governance Landscape: Global Approaches to Data Governance and Data Strategies. Fraunhofer Institute for Systems and Innovation Research.*
[143] *U.S. Department of Health & Human Services. (1996). Health Insurance Portability and Accountability Act (HIPAA).*
[144] *U.S. Congress. (1999). Gramm–Leach–Bliley Act (GLBA)*
[145] *State of California. (2018). California Consumer Privacy Act (CCPA).*
[146] *National Science and Technology Council. (2023). National Artificial Intelligence R&D Strategic Plan.*

guidance to help policymakers develop legal frameworks and agreements that facilitate secure data exchange between agencies while protecting sensitive information. These initiatives aim to enhance public service delivery, support policy analysis, and improve evidence-based decision-making.

Key developments shaping the U.S. landscape include:

National Strategy to Advance Privacy-Preserving Data Sharing and Analytics: This strategy outlines the U.S. government's efforts to promote data sharing that preserves privacy. It emphasizes the importance of safeguarding personal information while facilitating data exchanges necessary for innovation and societal benefits. The strategy places particular emphasis on the development and adoption of privacy-enhancing technologies that allow organizations to derive insights from data without exposing sensitive information[147].

Barriers to Data Sharing: A report from the Center for Data Innovation highlights the various hurdles to data sharing in the U.S., including restrictive data privacy laws, mistrust of data practices, and the lack of universal data standards. These barriers are stifling innovation in fields like healthcare and education, where improved data access and sharing could significantly enhance outcomes and service delivery[148].

Government Initiatives to Enhance Data Sharing: Various initiatives aim to strengthen data sharing across governmental agencies to improve public services and operational efficiency. For example, the State Data Sharing Initiative provides tools, guidance, and best practices to help state policymakers design data confidentiality laws and establish secure data-sharing agreements. These efforts support policy analysis and program evaluation while ensuring that privacy and data protection requirements are maintained[149].

Role of standards and interoperability

Standardization plays an important role in enabling data exchange across sectors. Organizations such as the National Institute of Standards and Technology (NIST) develop frameworks, guidelines, and technical standards that support interoperability, data security, and privacy protection[150]. NIST initiatives include work on privacy frameworks, cybersecurity standards, and data governance guidance that contribute to the broader ecosystem supporting trustworthy data sharing.

Data Sharing in Government and Public Services: Standardization plays an important role in enabling secure and interoperable data exchange across sectors in the United States. Organizations such as the National Institute of Standards and Technology (NIST) develop frameworks, guidelines, and technical standards that support data governance, cybersecurity, and privacy protection. NIST initiatives include widely adopted resources such

[147] *The White House. (2023). National Strategy to Advance Privacy-Preserving Data Sharing and Analytics.*
[148] *Center for Data Innovation. (2021). Barriers to data sharing in the United States.*
[149] *State Data Sharing Initiative. (2021). Frameworks for cross-agency data sharing.*
[150] *National Institute of Standards and Technology (NIST). (2020). NIST Privacy Framework.*

as the Privacy Framework and the Cybersecurity Framework, which provide organizations with practical guidance for managing data risks and ensuring trustworthy digital systems[151].

Industry and research organizations also emphasize the importance of interoperable data systems for improving collaboration and operational efficiency. For example, analyses from consulting and research institutions highlight how cross-agency data sharing can enhance public services, support policy development, and enable better use of data for societal benefit[152].

Protection of sensitive personal data: The U.S. government has also introduced measures to prevent the misuse of sensitive data by foreign adversaries. In 2024, President Joseph R. Biden Jr. issued an Executive Order on Preventing Access to Americans' Bulk Sensitive Personal Data and United States Government-Related Data by Countries of Concern[153]. This order addresses risks associated with foreign entities gaining access to large volumes of personal or government-related data that could be used for espionage, surveillance, or influence operations. The order establishes restrictions on certain data transactions and introduces safeguards to protect national security while maintaining international data flows and economic cooperation.

Taken together, these developments highlight a distinctive U.S. approach that prioritizes flexibility, innovation, and sectoral adaptability over centralized governance. While this model may limit the emergence of a unified data-space architecture, it enables rapid technological advancement and experimentation across industries. At the same time, increasing efforts in privacy-preserving technologies, interoperability standards, and cross-agency data governance suggest a gradual convergence toward more structured and trustworthy data-sharing mechanisms.

5.5 Data governance and data sharing initiatives in other jurisdictions

5.5.1 Australia

Australia's constitutional structure distributes data governance authority across the Commonwealth and eight state and territory governments, making protocol-based coordination rather than mandated standardisation the practical basis for national data sharing. Relevant trust infrastructure includes the Digital ID Act 2024[154], the Data Availability and Transparency Act 2022 (DATA Scheme)[155], and the Consumer Data Right[156], which operationalises trusted data sharing standards in banking. The Data and Digital Ministers'

[151] *National Institute of Standards and Technology (NIST). (2018). Cybersecurity Framework.*
[152] *McKinsey Global Institute. (2020). The value of data sharing in the public sector.*
[153] *The White House. (2024). Executive Order on Preventing Access to Americans' Bulk Sensitive Personal Data. Available at https://www.whitehouse.gov/briefing-room/presidential-actions/2024/02/28/executive-order-on-preventing-access-to-americans-bulk-sensitive-personal-data-and-united-states-government-related-data-by-countries-of-concern/*
[154] *Digital ID Act is available at https://www.digitalidsystem.gov.au/what-is-digital-id/digital-id-act-2024*
[155] *The DATA Scheme is available at https://www.datacommissioner.gov.au/data-scheme*
[156] *Consumer Data Right is available at https://www.cdr.gov.au/*

Meeting [157] coordinates national data sharing priorities under the National Cabinet's Intergovernmental Agreement on Data Sharing[158]; recent outputs include a Trusted Entities framework defining common organisational trustworthiness attributes, and a dataspaces workstream reflecting growing policy recognition of the approach. Key standardisation gaps remain in metadata governance, organisational identity verification, and usage control mechanisms compatible with Australia's distributed legislative landscape.

5.5.2 South Korea

South Korea has been actively promoting data-driven innovation through its national Digital New Deal strategy and broader digital transformation policies[159]. The country has introduced legislative frameworks such as the Data 3 Act, which modernizes data governance rules by enabling the use of pseudonymized data while strengthening privacy protections[160]. South Korea also promotes data sharing through initiatives such as the MyData project, which enables individuals to control and share their personal data with service providers[161]. In terms of standardization, Korea participates actively in international standardization bodies such as ISO/IEC and contributes to discussions on interoperability, data governance, and digital identity[162].

5.5.3 Singapore

Singapore has established itself as a leading hub for digital governance and trusted data sharing in the Asia-Pacific region. The country's Smart Nation initiative promotes digital infrastructure, cross-sector data sharing, and innovation across government and industry[163]. Singapore's Personal Data Protection Act (PDPA)[164] provides a comprehensive framework for personal data governance, while initiatives such as Trusted Data Sharing Frameworks[165] and the Digital Economy Agreements with international partners support cross-border data flows[166]. Singapore also participates actively in global standards development and promotes interoperability and trust mechanisms that enable secure data exchanges between organizations.

5.5.4 Canada

Canada is developing a policy framework for data governance that aims to balance economic innovation with privacy protection and public trust. The country's Digital Charter[167] outlines principles for responsible data use, transparency, and accountability. Canada is also exploring regulatory reforms through initiatives such as the Consumer Privacy Protection Act

[157] *Data and Digital Ministers Meeting is available at https://www.finance.gov.au/government/public-data/data-and-digital-ministers-meeting*
[158] *Intergovernmental Agreement on Data Sharing is available https://www.finance.gov.au/government/public-data/data-and-digital-ministers-meeting/intergovernmental-agreement-data-sharing*
[159] *Ministry of Economy and Finance [MOEF], 2020. The Korean New Deal: National Strategy for a Great Transformation. Government of the Republic of Korea, 2020.*
[160] *Personal Information Protection Commission [PIPC], 2021. Overview of the Personal Information Protection Act (PIPA).*
[161] *Financial Services Commission [FSC], MyData Industry Guidelines and Policy Direction, 2021.*
[162] *Korean Agency for Technology and Standards [KATS], 2022*
[163] *Smart Nation and Digital Government Office, Smart Nation Initiative., 2022*
[164] *Personal Data Protection Commission [PDPC], Personal Data Protection Act (PDPA), 2020*
[165] *Infocomm Media Development Authority (IMDA) & PDPC. Trusted Data Sharing Framework, 2019.*
[166] *Ministry of Trade and Industry [MTI], Digital Economy Agreements., 2021*
[167] *Innovation, Science and Economic Development Canada (ISED). Canada's Digital Charter, 2019*

(CPPA)[168] and broader digital governance strategies. In the area of data sharing, Canadian initiatives emphasize collaboration between government, industry, and research institutions, particularly in sectors such as health data, artificial intelligence, and smart infrastructure[169]. Canada participates actively in international standards development, including ISO and IEEE activities related to data governance and interoperability.

5.5.5 India

India has undertaken significant digital transformation initiatives aimed at enabling large-scale data-driven services. Programs such as Digital India[170] and the India Stack have created foundational digital infrastructure supporting identity, payments[171], and data sharing. India's approach emphasizes interoperable digital public infrastructure that enables both public and private sector innovation. Recent developments include the Digital Personal Data Protection Act[172] and the Data Empowerment and Protection Architecture (DEPA)[173], which provides a consent-based framework for secure data sharing between organizations. India is increasingly engaging in international discussions on digital governance, interoperability, and standards related to digital public infrastructure.

[168] *Government of Canada. Bill C-27: Digital Charter Implementation Act (CPPA), 2022.*
[169] *Statistics Canada. Data Strategy and Data Sharing Initiatives, 2021*
[170] *Ministry of Electronics and Information Technology (MeitY). Digital India Programme.*
[171] *National Payments Corporation of India (NPCI). Unified Payments Interface (UPI).*
[172] *Government of India. Digital Personal Data Protection Act, 2023.*
[173] *NITI Aayog. Data Empowerment and Protection Architecture (DEPA), 2020.*

6 Conclusions and future work

Standardization is a critical enabler of operational data spaces and a prerequisite for realizing the goals set out in European and international data strategies. Through its active role in shaping specifications and contributing to standardization committees, IDSA helps translate high-level regulatory and policy objectives into usable, testable, and certifiable tools for industry.

The alignment between the IDS architecture, the ISO/IEC DIS 26450 Dataspace Protocol and ISO/IEC DIS 26451 Decentralized Claims Protocol, and emerging standards such as ISO/IEC DIS 20151, ISO/IEC TS 10866, and ISO/IEC 19941 shows that foundational elements are beginning to converge. At the same time, the European Standardization Request (Article 33 of the Data Act) and the establishment of CEN-CENELEC JTC 25 highlight the urgency of delivering concrete, interoperable solutions across sectors.

Looking ahead, future work—highlighted by Sebastian Stainbuss (IDSA CTO) during the Data Spaces Symposium 2026—will focus on advancing both the technical and economic dimensions of data spaces across international and European contexts:

International dimension:

- Developing use cases for data spaces to better understand and demonstrate their economic value and impact.
- Advancing dataspace trust frameworks to strengthen and operationalize trustworthiness at a global level.

European priorities:

- Finalizing the Trusted Data Framework, including the development of a harmonized European Norm (hEN) to support Data Act compliance.
- Defining and consolidating Data Space Trust Frameworks from a European perspective
- Promoting the internationalization of European standards to achieve global recognition and adoption.
- Addressing data quality aspects in data spaces, with a formal standardization request expected.

Global outlook:

- Expanding and promoting dataspace standards across additional regions worldwide, fostering interoperability and global alignment.

Finally, the involvement of a broader stakeholder community—especially through mechanisms such as the Data Spaces Adoption Forum—will be key to refining and scaling the standards that underpin trusted data sharing in Europe and beyond.

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