INTERNATIONAL DATA SPACES ASSOCIATION

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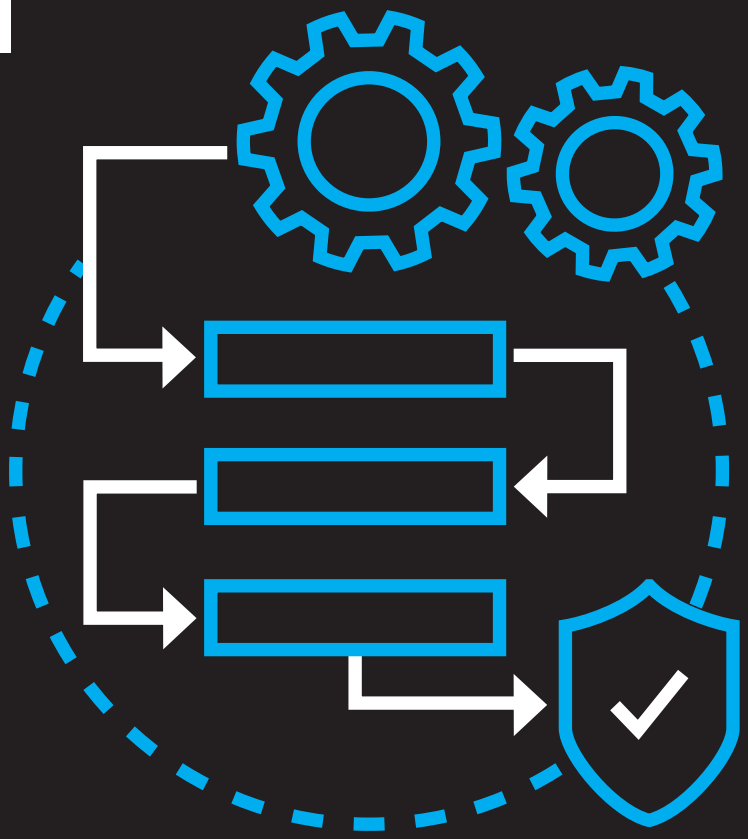
Data Spaces Standardization Landscape – Europe and International



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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 draws 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.

Due to time constraints, this paper focuses on European regulations. In the future, we plan to expand it to include international regulations and laws that may introduce additional standardization requirements at the global level.

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 the ongoing efforts of 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 contributing to data spaces standardization.

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[1]]. The European Commission also emphasizes that avoiding unjustified trade restrictions is essential for maintaining a strong, transparent, and rules-based multilateral trading system[2].

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. The report also aims to identify gaps in existing standards that should be addressed by IDSA and standardization committees, thereby fostering improved standardization efforts.

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. Stakeholders, including businesses and European Commission (EC) projects, can use it to align strategies with standards. Standardization committees focused on areas such as artificial intelligence, interoperability, and cybersecurity will benefit from the insights to integrate data spaces standards into broader regulatory frameworks.

[1] *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*
[2] *European Commission. Technical Barriers to Trade. Available at: https://policy.trade.ec.europa.eu/help-exporters-and-importers/accessing-markets/technical-barriers-trade_en*

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: https://forms.office.com/pages/responsepage.aspx?id=NNZGs_usx0K9RPFVfuibG1VRzYeJ3HhFjOauNwHCzFZUMU1HOEhBV0w0T1FMWDlCRU44S1Y0NUtRWiQlQCN0PWcu&route=shorturl.

2.2 Scope of data spaces standardization

2.2.1 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[3], which distinguishes data spaces from traditional data-sharing approaches.

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.

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

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.

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.

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 for data spaces

This chapter presents an initial first 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 and chapter 4.5 for more details).

2.3.1 Guiding principles for standardizations in data spaces.

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 plan** 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 European 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[4] 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.
- **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 such as DCP or OID4VC.
- **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.

[4] *https://internationaldataspaces.org/data-space-user-group/*

2.3.3 About the European Commission's standardization request.

The current Standardization Request (SReq) from the European Commission addresses Article 33(1) of the EU Data Act, Regulation (EU) 2023/2854. This article outlines essential requirements for data interoperability, data sharing mechanisms and services, and the creation of common European data spaces.

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 are meant 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:

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

	Reference information	Adoption timeline by ESOs
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 4.3: *European Trusted Data Framework.*

3 Selected international standardization on data spaces

3.1 Aligning IDSA with standardization efforts

Given the IDSA's foundational work in data spaces architecture and specifications, aligning its assets with relevant International and European bodies is essential to foster broad market adoption and support the maturation of the technology.

At IDSA, standardization is a strategic priority. Our members, working groups and the Standardization Coordination Group (SCG), and the IDSA Head Office actively engage with key organizations such as ISO, CEN/CENELEC, IEEE and W3C to help shape global standards for data spaces.

These efforts are driven by the dedication of IDSA members and technical experts, who play a leading role in standardization committees and help define the technical foundations of data spaces. At the core of these works are the IDS Reference Architecture Model, the Rulebook, and the Dataspace Protocol - core assets that define technical specifications and ensure interoperability.

3.2 ISO/IEC DIS 20151 dataspaces concept and characteristics

3.2.1 Introduction

ISO/IEC DIS 20151 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. (*source* ISO/IEC 20151)

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[5].

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[6], the IDSA Rulebook[7], and Dataspace Protocol[8], these serve as guidance rather than formal standards. ISO/IEC 20151 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: DIS [40.00][9]
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 Committee Draft (CD) 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.

The final publication of ISO/IEC 20151 is expected in summer 2026. Once released, it will provide industries and government stakeholders with standardized guidance for

[5] *ISO/IEC JTC 1/SC 38 Cloud computing and distributed platforms. Available at: https://www.iso.org/committee/601355.html*
[6] *IDS Reference Architecture Model 4.0. Available at: https://docs.internationaldataspaces.org/ids-knowledgebase/ids-ram-4*
[7] *IDSA Rulebook. Available at: https://internationaldataspaces.org/idsa-rulebook/*
[8] *Dataspace Protocol DSP Version (RC-4). https://eclipse-dataspace-protocol-base.github.io/DataspaceProtocol/2025-1-RC4/*
[9] *ISO stage codes. https://www.iso.org/stage-codes.html*

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 20151 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.

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.

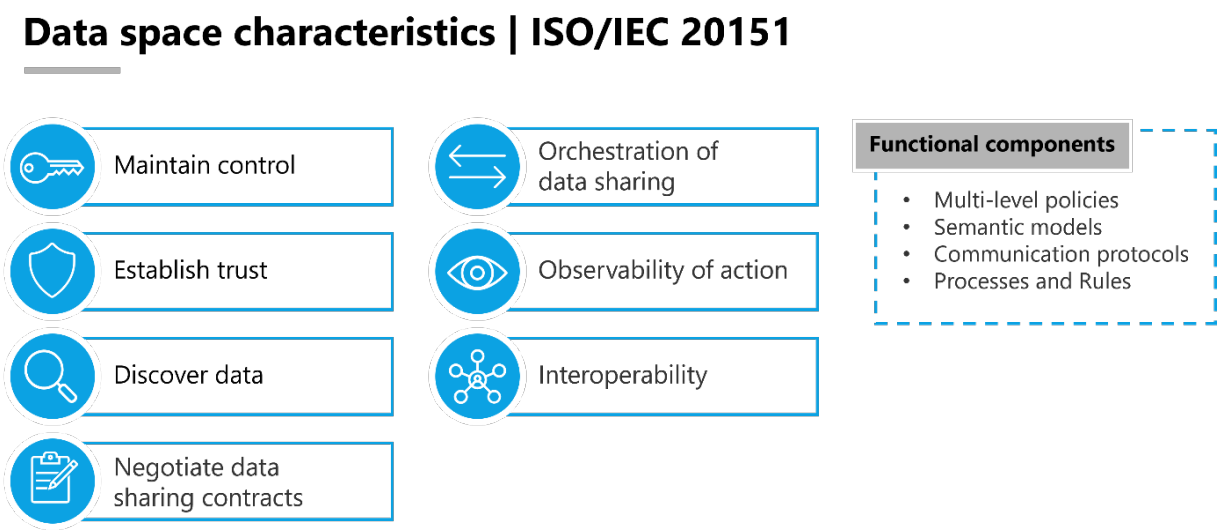

Figure 1. Dataspace characteristics on ISO/IEC 20151

3.2.4 Why is this important

ISO/IEC CD 20151 Dataspace concepts and characteristics covers the fundamental aspects of data spaces, as described in the IDSA Rulebook[10]. 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 20151 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.

3.3 ISO/IEC 10866 organizational autonomy & digital sovereignty

3.3.1 Introduction

ISO/IEC TS 10866:2024, titled "*Information technology — Cloud computing and distributed platforms — Framework and concepts for organizational autonomy and digital sovereignty*"[11] 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.

3.3.2 Status and expected timeline

Status: Published
Publication date: 2024-11
Stage: International Standard published [60.60[12]]
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).

[10] *IDS Rulebook. Available at: https://docs.internationaldataspaces.org/ids-knowledgebase/idsa-rulebook/idsa-rulebook/3_functional_requirements*
[11] *ISO/IEC TS 10866:2024. Available at: https://www.iso.org/standard/83757.html*
[12] *ISO stage codes. https://www.iso.org/stage-codes.html*

3.3.3 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[13].

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.

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).

[13] *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*

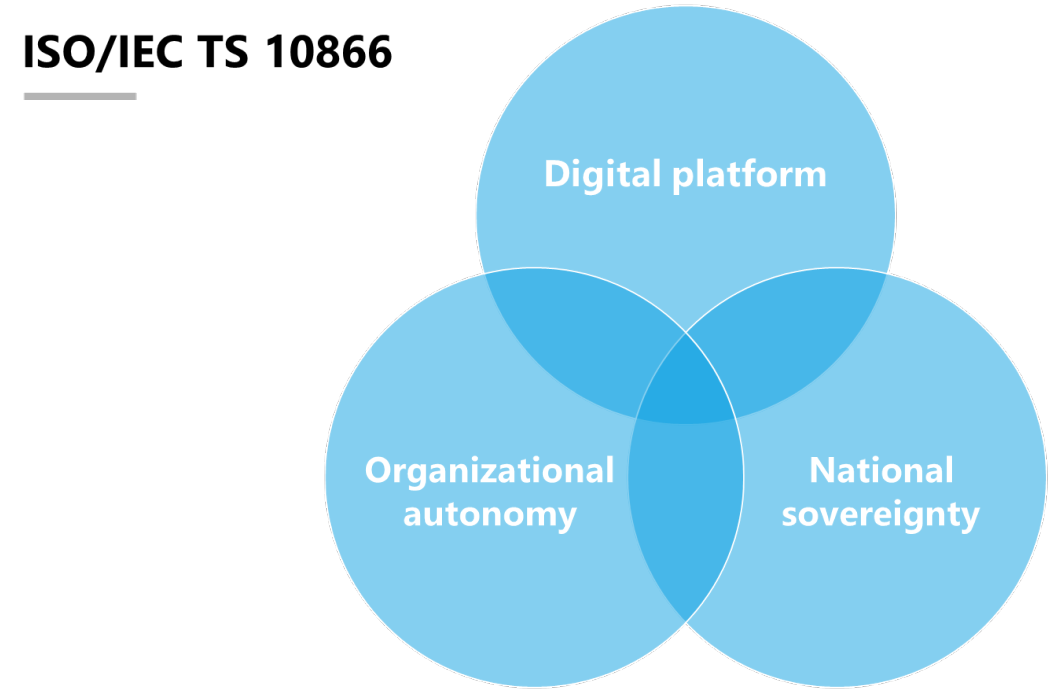

Figure 2: Digital sovereignty matters addressed by organizations[14]

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[15]. Also, you can view the IDSA Tech Talk Understanding digital sovereignty and organizational autonomy (September 19, 2024)[16].

3.3.4 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

[14] *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*
[15] *ISO/IEC TS 10866:2024, available at https://www.iso.org/es/contents/data/standard/08/37/83757.html*
[16] *IDSA Tech Talk, 2024 available at https://internationaldataspaces.org/archive/*

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[17] 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.

3.4 ISO/IEC 19941 Interoperability & portability

3.4.1 Introduction

ISO/IEC 19941:2017[18] 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 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

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

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.

3.4.2 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[19].

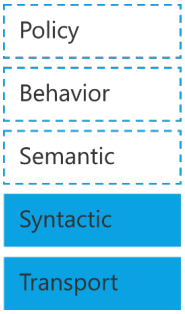

Figure 3: ISO 19941 - Cloud Computing Interoperability and Portability

3.4.3 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 [20], ISO/IEC 17789[21], ISO/IEC 19086-1[22], and ISO/IEC 19944[23], 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.

[19] *ISO/IEC JTC 1/SC 38 available at https://www.iso.org/committee/601355.html*
[20] *ISO/IEC 17788 available at https://www.iso.org/obp/ui/en/#iso:std:iso-iec:17788:en*
[21] *ISO/IEC 17789 available at https://www.iso.org/obp/ui/en/#iso:std:iso-iec:17789:ed-1:v1:en*
[22] *ISO/IEC 19086-1 available at https://www.iso.org/obp/ui/en/#iso:std:iso-iec:19086:-1:ed-1:v1:en*
[23] *ISO/IEC 19944 available at https://www.iso.org/obp/ui/en/#iso:std:iso-iec:19944:ed-1:v1:en*

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.

3.4.4 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 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.

3.5 About ISO/IEC JTC 1 SC38 and relevant resources

3.5.1 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.

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

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[24] work program that are most relevant to data spaces:

- CD 20151
- IS 19941
- TS 10866

Collaboration and Liaisons

The success of standardization efforts in this domain relies heavily on collaboration with external partners and other technical committees. 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.

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, SC 38 also maintains a liaison with ISO/IEC JTC 1/SC 41 – Internet of Things and Digital Twin[25].

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

[24] *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*
[25] *ISO/IEC JTC 1/SC 41 Internet of things and digital twin available at https://www.iso.org/committee/6483279.html*

3.6 IEEE Data Trading Systems Working Group

The IEEE P3800-2024 [26] 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 standard for a data trading system, which establishes a unified architecture for trading data through domain-independent and principled marketplaces. This standard defines common terminology, a reference model, and outlines the roles and responsibilities of key stakeholders, including data providers, data users, and data marketplaces. It offers a high-level overview of data trading systems through its reference model, which is based on the International Data Spaces Reference Architecture Model (IDS-RAM 4).

The IEEE P3800 family of standards includes:

- **IEEE P3800.1** – *Specification of the Connector*: Defines the technical interface for connecting participants within the data trading system. This project was recently initiated.
- **IEEE P3800.2** – *Specification of Data Usage Rights*: Establishes a standard format and approach for expressing and managing data usage rights across marketplaces.

It is important to note that IEEE P3800 operates under an individual participation model, meaning that only individuals—not organizations—may contribute to its development. While we are actively monitoring the progress of this standard, our primary focus remains aligned with standardization activities within ISO/IEC JTC1 SC 38.

The IEEE P3800 standard, titled *Standard for a Data-Trading System: Overview, Terminology and Reference Model*, was officially published in 2024[27].

4 European 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, and

[26] *IEEE Data-Trading System: Overview, Terminology, and Reference Model available at https://standards.ieee.org/ieee/3800/10298/*
[27] *IEEE Standard for a Data-Trading System: Overview, Terminology, and Reference Model, available at https://standards.ieee.org/standard/3800-2024.html*

- 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

4.2.1 Introduction to the standardization request.

The European Commission's 2024 Annual Union Work Programme (AUWP)[28] for European standardization introduces the "EU Trusted Data Framework" as a new priority action (Action 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[29]. This request seeks the creation of a unified European Trusted Data Framework,

[28] *https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ%3AC_202401364&utm_source=chatgpt.com*
[29] *C(2025)4135 - Standardisation request M/614 available at https://ec.europa.eu/growth/tools-databases/enorm/mandate/614_en*

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[30], 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.

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)[31], Its data governance provisions 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:

[30] *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*

[31] *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)*

Regulation (EU) 2024/1183 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[32], 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.

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 consistence 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" 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*)[33] 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:

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[32] *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)*

[33] *'Harmonised standard' means a harmonised standard as defined in Article 2, point (1)(c), of Regulation (EU) No 1025/2012*

The final report[34] 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.

The European Trusted Data Framework defines five standardization fields, as shown in the diagram below. 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.

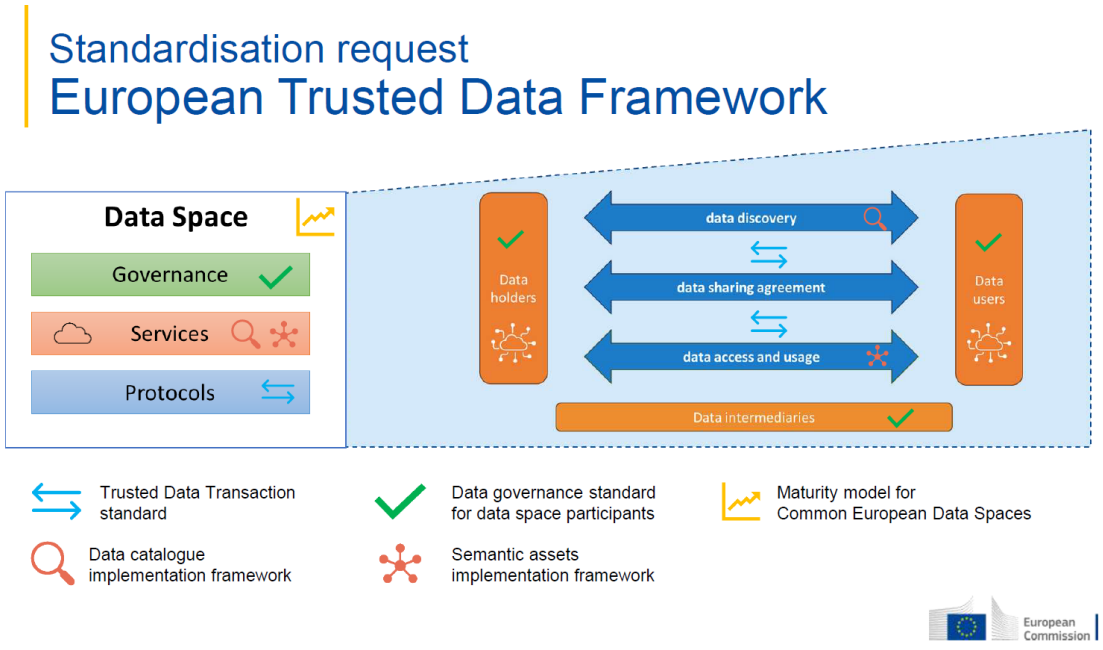

Figure 4: Standardization request: European Trusted Data Framework[35]

[34] *HLF Workstream 14 on Data Interoperability available at https://ec.europa.eu/docsroom/documents/58914*
[35] *European Commission draft standardisation request under Article 33 of the Data Act (EU 2023/2854).*

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.

Data spaces vs. Trusted Data Transaction (TDT)

This image visualizes different trusted data sharing frameworks organized across three layers: Technical, Operational, and Legal/Regulatory. It also distinguishes between four main configurations: Dataspace, Dataspace with TDT, TDT, and proprietary trusted data sharing. Let's relate this layered view with the conceptual understanding from the Data Act Article 33:

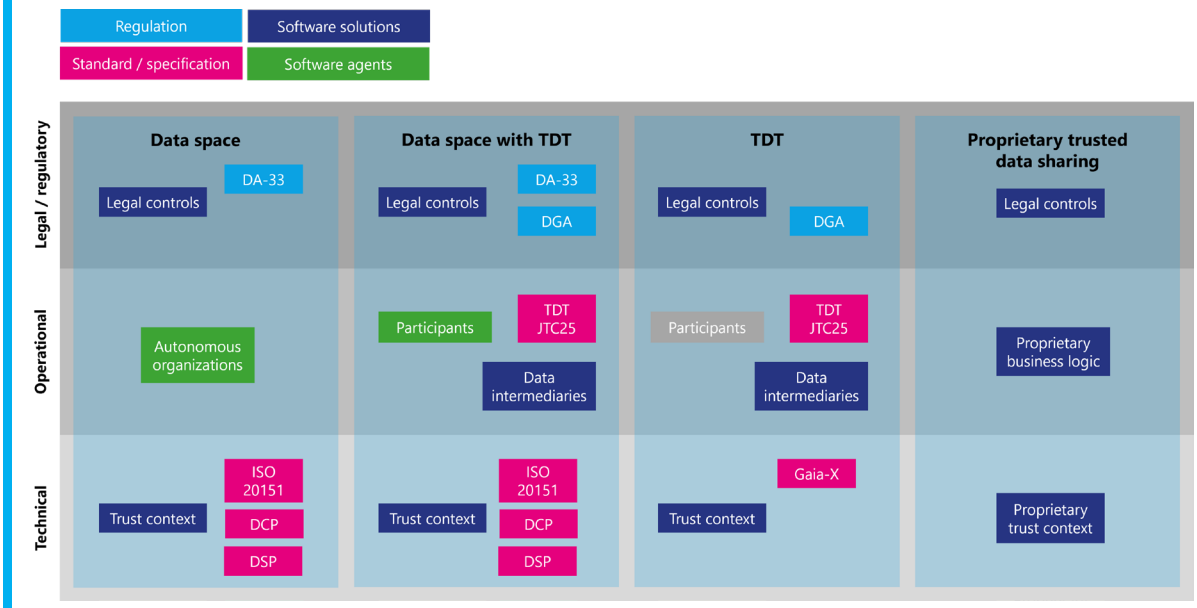

Figure 5. Trusted data sharing frameworks[36]

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

[36] *Samson, E. (2024). The Need for Layered Trusted Data Sharing. Microsoft.*

Standards Institute (ETSI) are tasked with drafting new European standards and standardization deliverables. These activities, illustrated in Figure 4. 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.*[37]

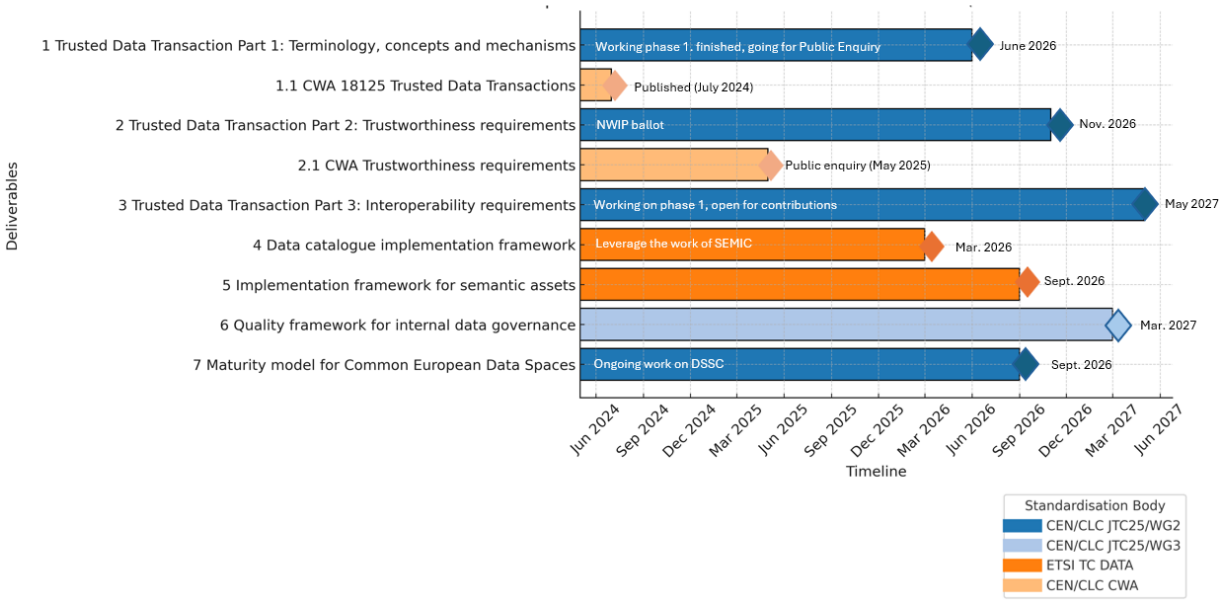

Figure 6: Timeline for adoption by ESOs[38]

4.2.4 Related work

CEN, CENELEC and ETSI shall prepare joint work programmes outlining all the standards and European standardization deliverables referred 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 4 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.

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. Furthermore, the work program shall include the following actions:

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

- CEN, Cenelec and ETSI shall submit the work programme to the Commission within four months ofthe notification of this decision and provide access to an overall project plan.
- CEN, Cenelec and ETSI shall inform the Commission of any amendments to the joint work program.

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[39] 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.

[39] *https://eur-lex.europa.eu/eli/reg/2023/2854/oj*

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.

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[40] 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)[41] 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

[40] *Regulation (EU) 2023/2854 available at https://eur-lex.europa.eu/eli/reg/2023/2854*
[41] *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*

the gap between the current needs for standardization and the practical steps needed to achieve it.

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*"[42].

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.

[42] *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*[43].

4.4 CEN/CENELEC JTC25

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 JTC25 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, 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[44]. The second plenary meeting was conducted in February 2025 in Milan, Italy. The JTC 25 Working Groups have established their respective work programmes.

Following the Standardization Request, JTC 25 will produce first documents during 2025.

[43] *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*

[44] 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/*

4.5 CEN Workshop Agreement Trusted Data Transaction

The CEN Workshop Agreement (CWA) on Trusted Data Transaction[45] 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[46]. 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.

[45] *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*
[46] *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 7: Scope of Data Transaction, which provides a high-level overview of the roles, components, and interactions across the data transaction lifecycle.

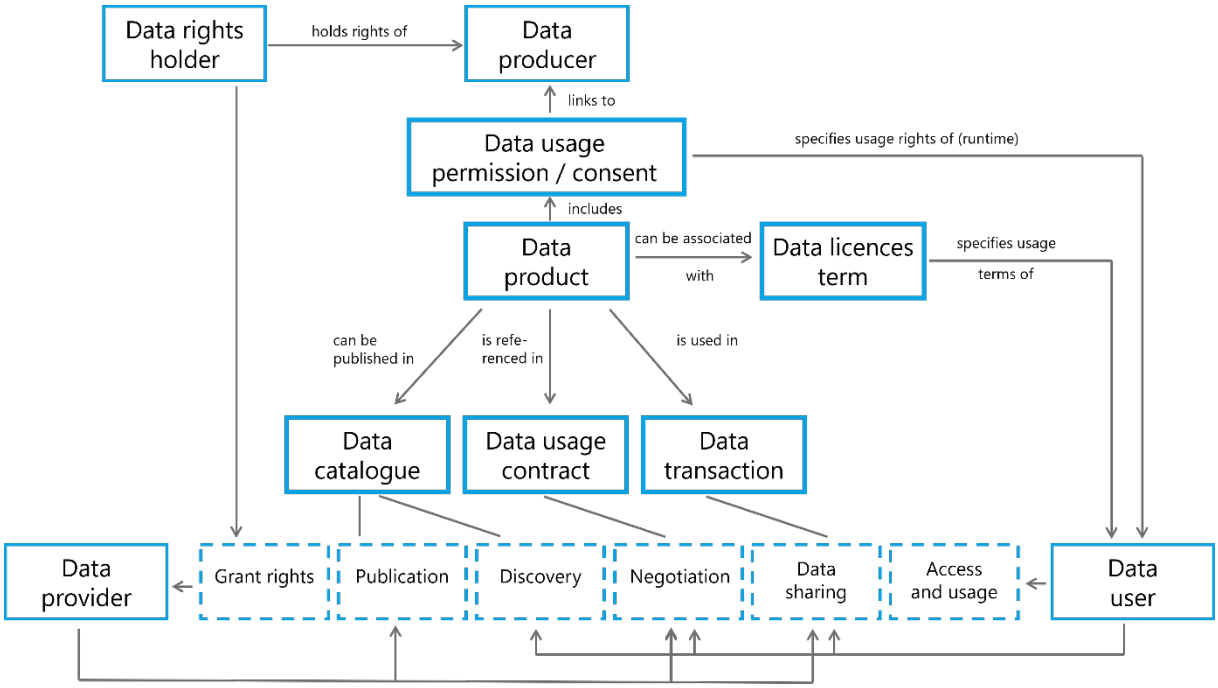

Figure 7: Scope of data transaction

4.5.3 Part 2: Trustworthiness requirements

The CEN Workshop Agreement *"Trusted Data Transaction – Part 2: Trustworthiness Requirements*[47]*"* 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

[47] *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)[48] 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.

[48] *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

The activities of TC DATA include:

- Acting as a centre of expertise in the area of data infrastructures, services and applications within ETSI, in coordination with the other ETSI groups. This includes data solutions targeting services for IoT, human beings, telecommunication systems and networks, and other industries.
- Developing technical standards to support data interoperability and semantic interoperability.
- Maintaining and evolving specifications related to data solutions and published by other ETSI Technical Groups (TGs), upon agreement with them.
- Supporting the development and maintenance of semantic and data models, such as SAREF (including the SAREF open portal) and NGSI-LD.
- Supporting the transposition in ETSI of the outputs of oneM2M.
- Supporting the maintenance and evolution of relevant industry data standards, such as the data model in the maritime domain.

5 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 Dataspace 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.

By documenting the current status and identifying open gaps, this paper aims to serve as both a reference and a starting point for continued collaboration. The insights shared here are informed by working groups, project experience, and regulatory dialogue, and are intended to guide the next phase of technical and policy development.

Looking ahead, the involvement of a broader stakeholder community – especially through mechanisms such as the Data Spaces User Group – will be key to refining and scaling the standards that underpin trusted data sharing in Europe and beyond.

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