Deliverable 3.3
The Data Spaces Radar and Onboarding Toolkit

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Abstract

This deliverable provides a comprehensive overview of the foundational concepts, tools, and practical guidance required for organizations to onboard into data spaces in alignment with the International Data Spaces (IDS) Reference Architecture and other assets. It presents a five-step onboarding journey—ranging from conceptual understanding to go-live preparation and scaling up—which helps stakeholders navigate the complexity of designing and deploying trustworthy data sharing ecosystems. Key enablers such as usage control mechanisms, certification processes, and legal frameworks are introduced to ensure secure, sovereign, and interoperable data exchange.

In addition, the deliverable touches upon the relevance of the data space concept for the DISCO project while diving into the Urban Freight Data Space and introduces the Data Spaces Radar, a publicly accessible platform designed to showcase and monitor global data space initiatives and use cases. It outlines the Radar's functionalities, development stages, user experience, and procedures for contribution, emphasizing its growing role in fostering transparency, knowledge sharing, and cross-sector collaboration. Together, the onboarding toolkit and the Radar aim to empower organizations of all sizes and maturity levels to participate in a robust, federated global data ecosystem.

Summary sheet

Deliverable No.	3.3
Project Acronym	DISCO
Full Title	DATA-DRIVEN, INTEGRATED, SYNCHROMODAL, COLLABORATIVE AND OPTIMISED URBAN FREIGHT META MODEL FOR A NEW GENERATION OF URBAN LOGISTICS AND PLANNING WITH DATA SHARING AT EUROPEAN LIVING LABS
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Project partners

Organisation	Country	Abbreviation
FIT CONSULTING SRL IT Coordinator	IT	FIT
RUPPRECHT CONSULT-FORSCHUNG & BERATUNG GMBH	DE	RC
INLECOM INNOVATION ASTIKI MI KERDOSKOPIKI ETAIREIA	EL	INLE
PNO INNOVATION SL	ES	PNO
INTERNATIONAL DATA SPACES EV	DE	IDSA
FM LOGISTIC IBERICA SL	ES	FM
AKKA INDUSTRY CONSULTING GMBH	DE	AKKA
FONDAZIONE ISTITUTO SUI TRASPORTI E LA LOGISTICA	IT	ITL
ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTY XIS	EL	CERTH
LINDHOLMEN SCIENCE PARK AB	SE	LSP
KUHNE LOGISTICS UNIVERSITY GGMBH	DE	KLU
INSTITUT DE RECHERCHE TECHNOLOGIQUE SYSTEM X	FR	IRTX
STICHTING BREDA UNIVERSITY OF APPLIED SCIENCES	NL	BUAS
POLIS - PROMOTION OF OPERATIONAL LINKS WITH INTEGRATED SERVICES, ASSOCIATION INTERNATIONALE	BE	POLIS
EUROPEAN PARKING ASSOCIATION EPA EV	DE	EPA
ALLIANCE FOR LOGISTICS INNOVATION THROUGH COLLABORATION IN EUROPE	BE	ALICE
ERASMUS CENTRE FOR URBAN,PORT AND TRANSPORT ECONOMICS BV	NL	ERASMUS
INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM	BE	IMEC
VLAAMS INSTITUUT VOOR DE LOGISTIEK VZW	BE	VIL

FUNDACION ZARAGOZA LOGISTICS CENTER	ES	ZLC
BE-MOBILE	BE	BE-MOBILE
STAD GENT	BE	GENT
OPLEIDINGSCENTRUM VOOR HOUT EN BOUW VZW	BE	OHB
CITYLOGIN IBERICA SL	ES	CITYLOGIN
UNIVERSITAT POLITECNICA DE CATALUNYA	ES	UPC
AJUNTAMENT DE BARCELONA	ES	BCN
VENICE INTERNATIONAL UNIVERSITY	IT	VIU
FUNDACION DE LA COMUNIDAD VALENCIANA PARA LA INVESTIGACION, PROMOCION Y ESTUDIOS COMERCIALES DE VALENCIAPORT	ES	VPF
FUNDACION DE LA COMUNITAT VALENCIANA PARA LA PROMOCION ESTRATEGICA EL DESARROLLO Y LA INNOVACION URBANA	ES	LAS NAVES
T-BOX DELIVERY & SOLUTIONS SL	ES	T-BOX
AYUNTAMIENTO DE ZARAGOZA	ES	ZARAGOZA
FUNDACION ZARAGOZA CIUDAD DE CONOCIMIENTO	ES	FZCC
FORUM VIRIUM HELSINKI OY	FI	FVH
KOBENHAVNS KOMMUNE	DK	COPENHAGEN
REGION HOVEDSTADEN DK Partner	DK	REGIONH
COMUNE DI PIACENZA	IT	PIACENZA
MESTSKA CAST PRAHA 6 / District Prague	CZ	PRAHA
REGIONAL MANAGEMENT NORDHESSEN GMBH	DE	RMNH
AARHUS KOMMUNE	DK	AAKS
DIMOS THESSALONIKIS	EL	THESSALONIKI

DIETHNIS EKTHESI THESSALONIKI AE	EL	TIF HELEXPO
ACS TACHIDROMIKES IPIRESIES MONOPROSOPI ANONYM	EL	ACS
ROLAN OY	FI	ROLAN
ASOCIACIÓN LOGÍSTICA INNOVADORA DE ARAGÓN	ES	ALIA
A to B Finland Oy	FI	A2B
GETPLUS srl IT Partner	IT	NEXT
COMUNE DI PADOVA IT	IT	ComPADUA

Document history

Version	Date	Organization	Main area of changes
0.1	17/07/2025	IDSA	Table of Contents, abstract
0.2	18/07/2025	IDSA	Sections 1 & 2 (draft)
0.3	29/07/2025	IDSA	Sections 3, 4 & 5 (draft)
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0.5	27/08/2025	INLE	Section 4.1
0.6	28/08/2025	IDSA	Final check before internal review
0.7	15/09/2025	INLE, KLU	Peer Review
0.8	19/09/2025	IDSA	Changes after peer review
0.9	22/09/2025	FIT	Quality Assurance Committee Review
1	14/10/2025	FIT	Ready for submission

List of acronyms

DSSC	Data Spaces Support Center
IDS	International Data Spaces
IDS RAM	International Data Spaces Reference Architecture Model
IDSA	International Data Spaces Association
MVDS	Minimum Viable Data Space
TRL	Technology Readiness Level
UFDS	Urban Freight Data Space

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1.   Introduction

1.1. Purpose of the Data Space Onboarding Toolkit

The purpose of this deliverable is to provide an accessible and structured onboarding toolkit for both members of the DISCO consortium and the broader public interested in data spaces. While the concept of data spaces has been under development since 2016, it remains relatively unfamiliar to many stakeholders across sectors.

This toolkit is designed to introduce newcomers to the data space paradigm, starting with a high-level overview of the concept and gradually exploring its technical underpinnings. It presents key enablers such as the International Data Spaces Association (IDSA) and its foundational assets and culminates in a detailed exploration of the Data Spaces Radar — a visual mapping and assessment tool supporting the development and maturity evaluation of data space initiatives.

2.   Understanding Data Spaces

This section introduces the foundational concepts and terminology related to data spaces, providing readers with the necessary context to navigate the subsequent sections of the toolkit. By establishing a common understanding of the data space paradigm and its relevance, this section aims to ensure that both technical and non-technical audiences can effectively engage with the content presented throughout this deliverable.

2.1. What are Data Spaces?

The **International Data Spaces Association** was founded in 2016 with the mission to position data spaces as a world standard for secure and sovereign data sharing, marking the beginning of the development of the IDS standard and the associated architectural components. Since then, the concept has evolved significantly, supported by the creation of various technical assets and frameworks.

As of 2023, the Data Spaces Support Centre (DSSC) defines a data space as:

"A distributed system defined by a governance framework that enables secure and trustworthy data transactions between participants while supporting trust and data sovereignty. A data space is implemented by one or more infrastructures and enables one or more use cases."

This definition, published in the second version of the DSSC Glossary[1], serves as a cornerstone for understanding the scope and intent of data spaces.

In practical terms, a data space can be understood as the network of interconnected data endpoints capable of securely exchanging information. A distinguishing characteristic of data spaces is their foundation in **federated architectures**, as outlined in the IDS Reference Architecture Model [2](IDS-RAM). Rather than focusing on where data is stored, data spaces are primarily concerned with **how data is shared**, enabling data to flow between participants without compromising control or ownership.

Crucially, data spaces rely on **interoperability**—not only among their internal components but also across different data spaces. Central to their design is the principle of **data sovereignty**, which ensures that data owners retain full control over their data at all times. This includes the ability to define who may access, store, copy, or share the data, along with specifying a wide range of permissions or restrictions.

Moreover, data spaces operate within a **trust framework**, which facilitates reliable and transparent data transactions between participants. Trust, combined with sovereignty and interoperability, forms the foundation upon which data spaces are built.

Another essential feature is their **domain and technology agnosticism**. Data spaces serve as adaptable templates that can be applied across a wide range of sectors—including health, energy, industry, and mobility, as explored in the DISCO project. Their underlying architecture allows them to interoperate with various technologies, including artificial intelligence systems, digital twins, and other advanced digital infrastructures.

2.2. Why do Data Spaces matter?

Data sharing is not a new practice. For decades, organizations have exchanged information through bilateral arrangements — often as simple as one party sending a file to another via email or a shared platform. While such informal exchanges are functional and require minimal technical effort, they lack consistent **governance, security measures**, and **legal or policy safeguards**. As a result, these methods offer limited protection to the data itself and to the parties involved. Furthermore, they frequently prevent data owners from unlocking the full value of their data assets.

In today's digital economy, vast amounts of data remain unused, stored in isolated silos or cloud environments. Organizations are often reluctant to share data, particularly sensitive information,

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[1] https://dssc.eu/space/Glossary/176553985/DSSC+Glossary+%7C+Version+2.0+%7C+September+2023
[2] https://internationaldataspaces.org/offers/reference-architecture/

due to concerns about **loss of control, legal implications**, and **cybersecurity risks**. In many cases, they lack both the **technical means** and the **institutional trust** required to share data in a controlled, sovereign, and secure manner.

This is where **data spaces** play a crucial role.

Data spaces address two fundamental challenges in modern data ecosystems:

1. **Where is the technological framework for secure and sovereign data sharing?**
2. **Where is the trust infrastructure that enables safe collaboration between data owners and data users?**

The answer to the first question lies in the **IDS Reference Architecture Model (IDS-RAM)**, the foundational blueprint developed by the International Data Spaces Association (IDSA) for implementing data spaces. The most recent version, **IDS-RAM 4.0**[3], provides comprehensive technical specifications for building the infrastructure and components necessary for establishing interoperable and trustworthy data sharing environments.

The second question, that of trust, is addressed through the **IDS Certification Scheme**. This certification framework ensures that both **technical components** and **organizational participants** within a data space meet defined standards for security, interoperability, and compliance. Certification, managed through accredited evaluation facilities, provides assurance that participants can be trusted to handle data responsibly and in accordance with the principles of data sovereignty.

In essence, data spaces provide the **infrastructure, governance**, and **trust mechanisms** needed to overcome the limitations of traditional data sharing models, unlocking new opportunities for innovation, collaboration, and data-driven value creation across sectors.

2.3. IDSA and the Data Space Ecosystem?

To understand how data spaces function, and to eventually join or establish one, it is essential to be aware of the ecosystem of organizations and actors shaping and advancing this paradigm.

At the heart of this ecosystem is the **International Data Spaces Association (IDSA)**, a non-profit organization headquartered in Dortmund, Germany. IDSA coined the term *"data space"* in 2016 and has since taken a leading role in the development and promotion of secure and sovereign data sharing through its **IDS standard**. IDSA is a member-driven, consensus-based association comprising

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[3] https://internationaldataspaces.org/offers/reference-architecture/

more than **180 members** across approximately **30 countries**, with nearly **900 active contributors** involved in its working groups and initiatives.

IDSA has developed a number of key assets that provide the foundation for implementing data spaces, including:

- The **IDS Reference Architecture Model (IDS-RAM)** – outlining the technical framework;
- The **IDSA Rulebook** – defining governance and usage policies;
- The **Dataspace Protocol** – enabling interoperability between data space participants;
- The **IDS Certification Scheme** – establishing trust through component and organization certification.

These assets are created collaboratively with IDSA members and stakeholders from across Europe and beyond, ensuring broad applicability and adoption potential.

Within the ecosystem, IDSA distinguishes between **data space "makers"** and **"users"**. Makers are typically solution providers who develop and offer data space technologies and services. Users are organizations that consume or interact with these solutions. Both groups are mutually dependent—makers requiring feedback to refine their offerings, while users rely on makers for accessible, compliant solutions. This interplay has already led to several successful implementations, such as:

- **Mobility Data Space**[4]
- **Catena-X**[5]
- **Smart Connected Supplier Network**[6]
- **EONA-X**[7], among others.

Prominent solution providers (i.e., data space "makers") include **Sovity**, **T-Systems**, **Huawei**, and others who build upon the IDSA framework to enable practical deployments.

The overarching ambition of IDSA is to establish data spaces as a **global standard** for secure and sovereign data sharing, comparable to how **Bluetooth** became a universal communication standard. In pursuit of this goal, IDSA actively contributes to international **standardization bodies**, with the intention of advancing the IDS framework towards ISO recognition.

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[4] https://mobility-dataspace.eu/
[5] https://catena-x.net/
[6] https://smart-connected.nl/en/about-scsn/how-it-works
[7] https://eona-x.eu/

The broader data space ecosystem also comprises a wide range of organizations and initiatives. Notable contributors include:

- **Gaia-X**, promoting federated data infrastructure in Europe;
- **iShare Foundation**, working on digital trust frameworks;
- **Eclipse Foundation**, supporting open-source components;
- Research institutes and companies such as **TNO**, **VTT**, and **Microsoft**;
- And the **Data Spaces Support Centre (DSSC)**, an EC-funded initiative in which IDSA plays an active role, supporting the onboarding of newcomers into the data space ecosystem.

In summary, the data space ecosystem is diverse and dynamic, with numerous stakeholders, makers, users, standardization bodies, and authorities, jointly contributing to the co-development and dissemination of the data space model. While IDSA plays a central role, this toolkit also aims to illuminate the broader landscape, offering guidance on how to build data spaces and how to explore existing initiatives.

3. 5 Steps to Build Data Spaces

The data space landscape is complex and rapidly evolving. It is characterized by a wide range of technical topics, a growing body of documentation, and a diversity of actors with varying levels of familiarity and expertise. Some organizations are already leading innovation in the field, while for others, the concept of data spaces remains entirely new.

Similarly, the level of technical understanding among individuals varies considerably. Professionals with a strong background in engineering or IT may find it relatively straightforward to engage with data space technologies. Others, particularly those coming from business, policy, or humanities-oriented disciplines, may encounter a steeper learning curve when exploring the more technical aspects of implementation.

*To support this broad and diverse audience, the following **five-step guide** provides a high-level yet practical framework for building a data space. It is intended to help organizations and individuals orient themselves within the ecosystem, regardless of their starting point.*

- *For newcomers, the recommended approach is to begin with **Step 1**, which focuses on acquiring foundational knowledge.*
- *For those with prior experience or technical familiarity, it may be appropriate to begin at a later step, depending on their needs and the maturity of their initiatives.*

Each step outlines a key phase in the journey from concept to operational data space. Additional, in-depth guidance and supporting materials are available via the IDS Knowledge Base[8].

3.1. Step 1: Gather knowledge

The first step in building a data space is to develop a solid understanding of the core ideas and foundational concepts that underpin the International Data Spaces (IDS) approach. As outlined in earlier sections, the International Data Spaces Association (IDSA) has been shaping and refining these concepts, assets, and technologies since 2016. For newcomers, this may require an initial period of orientation and familiarization.

A good starting point is the IDSA website[9], which offers introductory resources on key concepts such as **data spaces**, **trusted data sharing**, and **data sovereignty**. Visitors will also find a range of **position**

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[8] https://docs.internationaldataspaces.org/ids-knowledgebase
[9] https://internationaldataspaces.org/

papers, **webinars**, and **use cases** that showcase practical applications of data spaces across various sectors.

After becoming familiar with the foundational principles, the next step is to explore the core assets developed by IDSA, starting with the **technical framework**:

- The **IDS Reference Architecture Model (IDS-RAM)** provides a comprehensive blueprint for designing and implementing data spaces. It outlines the technical layers, perspectives, and components necessary for establishing interoperable, secure, and sovereign data-sharing environments.

From a **governance perspective**, the:

- **IDSA Rulebook** offers guidance on the regulatory, functional, technical, operational, and legal aspects of data space governance. It clarifies which rules are mandatory and which are offered as best-practice recommendations, helping stakeholders establish a compliant and trustworthy environment.

In addition to these core documents, stakeholders are encouraged to explore other relevant assets and initiatives, such as:

- The **Dataspace Protocol**, which enables interoperability between participants;
- The **IDS Testbed**, which allows for practical testing of components;
- Ongoing **standardization activities**;
- And alliances and initiatives led by other organizations that contribute to the broader data space ecosystem.

Together, these resources provide a well-rounded knowledge base to support informed decision-making and successful engagement in the development or adoption of data spaces.

3.2. Step 2: Define your use case

Once you have acquired a basic understanding of data space concepts, the next step is to define your data sharing use case. IDS use cases illustrate how research translates into real-world applications. They serve as success stories that demonstrate the potential of putting theory into practice. Most importantly, a clearly defined use case helps articulate your goals, outlines how IDS-compliant components will be used, and serves as a model for others seeking to adopt similar approaches.

Defining a data sharing use case is essential not only for planning how data will be shared but also for clarifying the roles and responsibilities of participants, identifying expected outcomes, and establishing risk mitigation and management measures.

For newcomers, the process may seem overwhelming. Fortunately, there is a growing number of existing data spaces and documented use cases that can serve as inspiration. These are available through the Data Spaces Radar[10] (see section 5), which showcases active implementations across sectors.

In addition to these examples, several tools and resources are available to support the design of your own use case. The Dutch Center of Excellence for Data Sharing and Cloud (CoE-DSC), a close collaborator of IDSA, offers a suite of tools that guide organizations through every stage—from exploring the benefits of data sharing to designing, implementing, and scaling a use case. These resources are accessible via their knowledge base[11].

3.3. Step 3: Build Components

Once you have familiarized yourself with the core concepts of data spaces and defined your data sharing use case, the next step is to bring your data space to life through technical implementation. This step focuses on building the actual software components required to enable secure and sovereign data exchange.

IDS-based components are technical enablers that support the full functionality of a data space. These components make it possible to share data securely, manage participant identities, register and monitor transactions, browse and offer data services, apply semantic interoperability through ontologies, and integrate applications to process shared data.

All components should ideally align with the IDS Standard and the IDS Reference Architecture Model (RAM), which provide the blueprint for building interoperable and trustworthy data space infrastructures. When starting the technical implementation, there are three main approaches you can follow:

1. **Custom Implementation Using Open Source Components**
   You can develop your own data space infrastructure using open-source components available in the IDSA GitHub repository[12]. This option offers flexibility and can be adapted to specific needs.
2. **Use the IDS Reference Testbed (Minimum Viable Data Space - MVDS)**
   The IDS Reference Testbed[13] provides a ready-to-use, minimal configuration to quickly set up a functioning data space. It includes just enough features to enable secure and

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[10] https://www.dataspaces-radar.org/radar/
[11] https://coe-dsc.nl/knowledge-base/original-content/data-space-development/
[12] https://github.com/International-Data-Spaces-Association/idsa/blob/main/overview_repositories.md
[13] https://github.com/International-Data-Spaces-Association/IDS-testbed/blob/master/minimum-viable-data-space/MVDS.md

sovereign data exchange and is particularly useful for experimentation and early-stage development.

3. **Adopt the IDS Base Camp for Industry-Ready Deployment**
   The IDS Base Camp is a more robust, industry-grade solution designed to help organizations rapidly launch production-ready data spaces. It offers a more complete environment for organizations looking to scale and deploy data space solutions in real-world scenarios.

Regardless of the approach you choose, resources like the **IDS Graduation Scheme** and the **Data Connector Report** can support you throughout the implementation process by providing guidance on maturity levels, interoperability, and certification-readiness.

3.4. Step 4: Prepare for "Go-Live"

With your data space components developed and integrated, the next step is preparing for deployment—commonly referred to as the "go-live" phase. This involves integrating IDS components into your operational ecosystem and ensuring interoperability, security, and trust through testing and certification.

Two key elements support this phase: the **IDS Testbed** and **IDS Certification**.

- **IDS Testbed:** The IDS Testbed is a comprehensive setup of open-source IDS components used to test interoperability within a controlled environment. It helps verify that your components are correctly implementing the IDS specifications and can seamlessly interact with other IDS-compliant systems.
- Key features and documentation include:
  - **Installation instructions** for setting up the test environment
  - **Guides for interconnecting components**, ensuring secure and sovereign data exchange
  - **User manuals** for tasks such as connector integration, certification preparation, and DAPS (Dynamic Attribute Provisioning Service) registration
- You can access and install the IDS Testbed from the official repository[14].
- **IDS Certification:** IDS Certification plays a central role in building trust among participants in the data space ecosystem. It provides a standardized and transparent evaluation process that validates both technical and organizational compliance with IDS requirements. Certification ensures:
  - Secure and sovereign data exchange
  - Interoperability between components and participants

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[14] https://github.com/International-Data-Spaces-Association/IDS-testbed

o Compliance with established industry standards such as **ISO 27001** and **IEC 62443**
- A significant advantage of IDS Certification is its alignment with common security and data management standards. This allows organizations to **reuse existing compliance documentation**, reducing the effort required to achieve certification.

3.5. Step 5: Share and Scale-up

The final step in your IDS deployment journey is to operationalize secure data sharing and scale your implementation—while contributing back to the broader data space community. This phase focuses on enforcing proper usage control, establishing legal clarity through contracts, and sharing best practices to support collective growth.

3.5.1. Usage Control

Usage control[15] is essential for maintaining data sovereignty in operational environments. It ensures that data is only accessed, processed, and shared by authorized parties—and strictly under predefined conditions. This is critical for meeting legal, regulatory, and contractual obligations, and for maintaining trust within the ecosystem.

One notable implementation of usage control is MYDATA Control Technologies[16], which are based on the **IND2UCE framework**. These technologies enable real-time enforcement of policies by monitoring or intercepting sensitive data flows to ensure they are used as intended.

3.5.2. Data Sharing Contracts

Clear legal agreements are a foundation for trustworthy data spaces. These contracts define the terms of data sharing, including usage purposes, rights, and obligations for all parties involved.

To support this, the SITRA Rulebook templates[17], adapted by the IDSA Legal Task Force[18], offer standardized, legally compliant contract frameworks. These templates evolve alongside IDS specifications and provide a reliable starting point for setting up your own data-sharing agreements.

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[15] https://internationaldataspaces.org/wp-content/uploads/dlm_uploads/IDSA-Position-Paper-Usage-Control-in-the-IDS-V3..pdf
[16] https://www.mydata-control.de/
[17] https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/
[18] https://internationaldataspaces.org/make/working-groups-and-task-forces/

3.5.3.   Sharing Best Practices

To foster a collaborative and scalable data space ecosystem, organizations are encouraged to share their experiences and outcomes. This creates a feedback loop that helps new adopters and advances the maturity of the entire community.

Key resources include:

- IDS Deployment Scenarios[19]: A repository of real-world implementation cases that offer practical insights and inspiration.
- IDS Graduation Scheme[20]: A tool for assessing the maturity of IDS-based solutions. It helps organizations evaluate progress, identify next steps, and gain recognition for their efforts.

4.   Data Spaces and the DISCO Project

Data Spaces are a key element of the DISCO Project, aiming to develop and demonstrate a federated Urban Freight Data Space (UFDS) as a one-stop shop for data sharing on digital urban logistics solutions and smart decision-making tools. This section first outlines the UFDS, its key elements, and current status; then, it presents the dissemination activities carried out in relation to it.

4.1. The Urban Freight Data Space

The Urban Freight Data Space (UFDS) has been developed as part of the DISCO project to provide a practical and accessible environment for sharing and using urban freight data. From the very beginning, the UFDS was designed around three guiding principles: (i) leveraging existing and open-source technology, (ii) enabling user interaction through a straightforward interface, and (iii) relying on mature, widely adopted technologies to ensure reliability and sustainability.

The core components of the UFDS have already been developed and are available for use. These include the data space connector and its accompanying user interface, an identity management system to ensure secure participation, a federated catalog that facilitates dataset discovery, a vocabulary hub to support alignment across different datasets, and a logging house that provides transparency and traceability in data exchanges. All of these components are open-source and

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[19] https://github.com/International-Data-Spaces-Association/IDS-Deployment-Scenarios
[20] https://github.com/International-Data-Spaces-Association/idsa/tree/main/graduation_scheme

accessible through the DISCO Open Software Repository[21] where deployment and configuration guides are also provided to simplify adoption.

Currently, all 8 Living Labs of the DISCO project, together with INLECOM (INLE) have deployed Data Space connectors and are participating in the UFDS, with INLE taking the role of the "Data Space Authority", that is in charge of handling the Vocabulary Hub, Identity Management, Logging House, and Data Space Catalog.

Building on this foundation, a proof-of-concept component has been developed to extend the UFDS with data space federation capabilities, allowing multiple data spaces to interconnect; this is also available in DISCO's Open Software Repository, with its methodology and functionality having been documented in the journal paper "Towards interconnected dataspaces: implementing decentralized identity management via DAPS".[22]

With the technical infrastructure in place, the UFDS joined the Data Space Radar (see Section 5) and work has shifted towards the development of applications that can make practical use of the datasets available within the UFDS. Special attention is being given to GeoJSON data, which is commonly used in urban freight contexts, including parking information, delivery data, and other location-based datasets. These applications demonstrate how shared data can be turned into actionable insights and useful tools for cities, businesses, and other stakeholders.

Figure 1 below illustrates the status of the UFDS core components and data space applications, with components and applications under development shown using a dotted line. A more detailed and technical description can be found in Deliverable D3.2: UF Data Space Connector Store, while the final status update for the UFDS components and applications, along with full documentation and implementation guidance, will be presented in Deliverable D3.4: DISCO Data Space Open Software Repository Version 2 and Implementation Guide (M36).

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[21] https://gitlab.com/disco-horizon-europe/open-software-repository
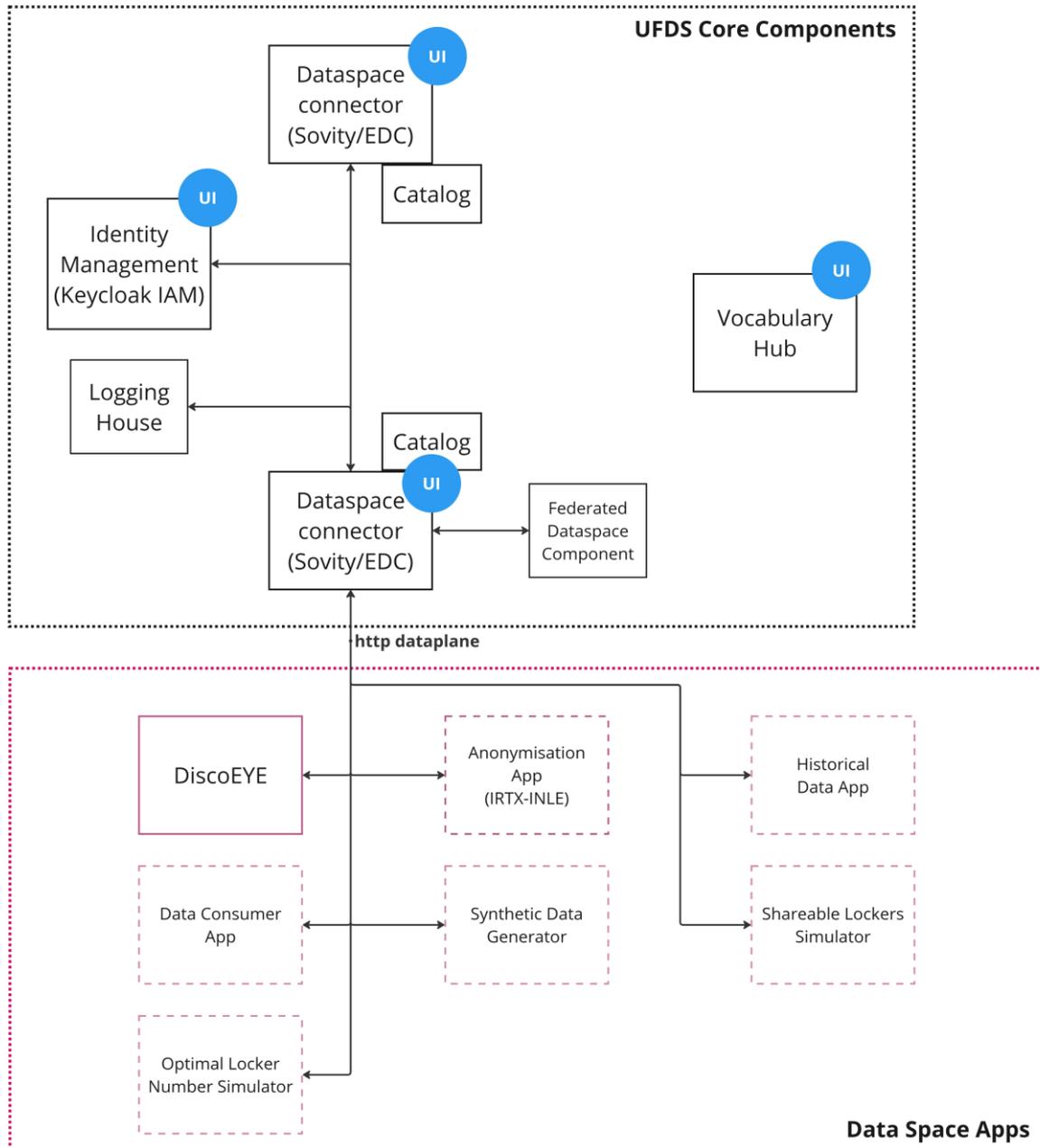[22] https://ceur-ws.org/Vol-4007/08short.pdf

Figure 1: UFDS Core Components and Data Space Applications (status at M30)

4.2. Awareness raising within the DISCO consortium

Throughout the project, IDSA has promoted the concept of data spaces and its implementation with several webinars and on-site sessions.

Task 3.4 has delivered a series of webinars and workshops to the DISCO consortium and close partners, focusing on different topics, going from the basic concept of data spaces and data sovereignty to more technical topics, like the implementation of data space technologies, dataspace components, and the Dataspaces Protocol. Throughout the duration of the project, IDSA, in collaboration with FIT, INLECOM and other partners, has delivered the following workshops and webinars:

1. **5 Steps to build Data Spaces, powered by DISCO**. June 27th, 2023: This was the first introductory webinar IDSA offered to the DISCO consortium, here[23] you can find the recording.
2. **Second webinar on Data Spaces**. February 9th, 2024: This was the second webinar offered to the DISCO Consortium, in cooperation with INLECOM. This webinar focused on the more technical aspects of data spaces and data sharing.
3. **Data Spaces Role Play**. April 22nd, 2024: This interactive activity took place in Thessaloniki, during the 3rd General Assembly of DISCO. The aim was to simulate how interactions take place within a data space in real life scenarios in the urban mobility domain. This activity was led by IDSA, and several project partners were invited to participate.
4. **CIVITAS Pre-summer Meeting**. June 21st, 2024: IDSA participated in the Pre-summer meeting of CIVITAS with a presentation focusing on the technical aspects of dataspaces and the outcomes from the roleplaying exercise during the GA in Thessaloniki.
5. **From Theory to Practice** - Demonstration and planned development of the DISCO Urban Freight Data Space. November 5th, 2024: IDSA participated in a webinar offered by Rupprecht Consult to the DISCO Consortium and other close partners with a presentation focusing on the technical aspects of data spaces and the IDSA offering.

Besides the above-mentioned webinars and activities, IDSA is in constant interaction with the DISCO consortium via different touchpoints and events. All IDSA assets, documents and offerings are available to the consortium via the IDSA Website[24], and IDSA staff members are always at their disposal.

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[23] https://www.youtube.com/watch?v=Dqy2VCwU2P8
[24] https://internationaldataspaces.org/

5. The Data Spaces Radar

This section introduces the Data Spaces Radar, a digital platform developed to map and showcase data space initiatives worldwide. Readers will gain a deeper understanding of the Radar's purpose, how to navigate its features, and how to interpret the information it presents. The section also covers the user experience, the process for submitting new data spaces and use cases, and the benefits of being featured on the Radar. Whether you're seeking inspiration, exploring collaboration opportunities, or looking to contribute your own initiative, the Data Spaces Radar is a valuable resource for stakeholders across all sectors of the data space ecosystem.

5.1. Purpose of the Data Spaces Radar

The **Data Spaces Radar** serves as the central hub for discovering data space initiatives around the world. It is a publicly accessible tool designed to provide a comprehensive overview of ongoing and emerging data space projects. The platform offers insights into each initiative's sector, geographical scope, development stage, and the specific use cases they enable.

The initial version of the Data Spaces Radar was developed by the International Data Spaces Association (IDSA) in 2021 as a feature of the IDSA website. At its inception, the tool contained approximately 90 entries. Its primary goal was to make data space implementations and use cases visible to anyone looking for inspiration to create their own initiative or to join an existing one.

By exploring the Radar, users can gain inspiration from real-world examples of how organizations across various sectors—such as healthcare, mobility, industry, and agriculture—leverage data to address industrial, economic, and societal challenges. In addition to showcasing goals and outcomes, the Radar highlights the technical implementations behind each case, offering valuable information on architectures, components, and deployment strategies.

The tool has grown significantly since its launch. By 2023, interest from other organizations and European projects led to a collaborative expansion effort. As a result, the Data Spaces Radar[25] was migrated to its own dedicated website and now hosts over 230 entries, with more being added regularly.

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[25] https://www.dataspaces-radar.org/

The Radar continues to evolve as a living repository, enabling transparency, fostering collaboration, and accelerating the adoption of secure and sovereign data sharing through data spaces.

5.2. Development Stages

Data spaces are emerging and evolving across the globe. As the number of initiatives grows, the **Data Spaces Radar** not only serves as a tool to visualize these efforts but also enables users to classify them according to their level of maturity. This classification is based on **development stages**, which reflect how far along a data space is in its lifecycle. These stages account for several factors, such as **technology readiness level (TRL)**, **onboarding and offboarding mechanisms**, **participant accessibility**, **volume of available datasets**, and the **amount of public information available online**.

The development stages range from the earliest conceptualization—what we often refer to as a "napkin sketch"—to fully operational and scalable data space solutions. The five development stages, which also define the concentric rings of the Radar, are as follows:

1. **Exploratory**
   This is the initial stage of a data space initiative. At this point, a group of organizations explores the potential value, feasibility, and direction of a data space. Activities may include identifying stakeholders, gathering requirements, discussing potential use cases, or evaluating existing standards and conventions.

2. **Preparatory**
   This stage begins once a critical mass of committed partners agrees to move forward. The initiative takes shape as partners collaboratively define use cases and begin planning the implementation of both governance structures and technical architecture.

3. **Implementation**
   At this point, the initiative has a detailed project plan, including defined milestones and committed resources (such as funding, personnel, and infrastructure). The implementation stage often includes a pilot project, where parties involved and the expected value of the data space are clearly identified.

4. **Operational**
   In this stage, the data space has functioning infrastructure and governance mechanisms, and at least one use case is live—meaning data is flowing securely between participants and value is being generated. Continuous improvements are common, both in the technical implementation and governance framework.

5. **Scaling**
   A data space in this stage has demonstrated the ability to attract new participants and expand to new use cases consistently and organically. It is typically financially and operationally sustainable and can respond to market demands while continuing to grow.

The development stage of each data space is initially determined by its owner and subsequently reviewed—based on the registration form—by the team responsible for maintaining the Radar.

As data spaces mature, the goal is for initiatives to move progressively from the **Exploratory** stage to the **Scaling** stage—ultimately becoming impactful, sustainable, and widely adopted solutions within the data economy.

5.3. How to navigate the Radar

The Data Spaces Radar has been developed as an intuitive and user-friendly tool, aimed at enabling a broad range of users—from newcomers to experts—to explore the landscape of data spaces across sectors and regions. However, due to the depth and breadth of information available, first-time visitors may find the platform overwhelming at a glance. This section provides guidance on how to effectively navigate the Radar and make the most of its features.

To facilitate usability, the Data Spaces Radar offers two main visualization modes: the **Radar View** and the **Chart View**. Each serves a distinct purpose and offers unique insights, depending on the user's interests and needs.

5.3.1 Radar View

The **Radar View** is the signature visualization of the Data Spaces Radar. It is accessible on the left side of the user interface and represents the core graphical representation of all data space initiatives and use cases currently listed on the platform. This view consists of five concentric rings that correspond to the five defined **development stages**: *Exploratory, Preparatory, Implementation, Operational,* and *Scaling*. Each entry is visualized as a **dot** placed within the appropriate ring, based on its self-assessed maturity level.

Below the radar graphic, users will find a **counter** showing the total number of entries. As of the date of writing (29 July 2025), the platform hosts **230 entries**. Beneath this counter, users can access a wide range of **filtering options** to customize their search. These filters include:

- **Type**: Whether the entry is a *data space* or a *use case*
- **Sector**: The industry or domain to which the entry belongs (e.g., health, agriculture, mobility)
- **Development stage**: To focus on initiatives at a specific maturity level
- **DSSC Community of Practice**: To highlight entries that are part of this community

Additional filters are also available for more targeted exploration, such as:

- **Geographical focus**
- **Country**
- **Implemented data connectors**
- **Technical components or architecture**
- **Source of funding**

- **Initiative start date**

A **"reset filters"** option is provided for convenience after completing a search.

At the **center of the screen**, users can browse a **scrollable list** of all radar entries. This list dynamically updates based on the filters applied. Users can also perform a **text-based search** using the query bar above the list, which allows them to locate specific entries by name, keyword, or other metadata.

On the **right side of the interface**, the **entry profile** section displays detailed information about the selected data space or use case. This includes:

- Name and short description
- The challenge it addresses and the solution it proposes
- Development stage
- Technical architecture and building blocks
- Access type (open, restricted, etc.)
- Business model
- Type and amount of funding
- Other relevant metadata (e.g., start date, country, participating organizations)

This combination of visual layout, rich metadata, and filtering functionality makes the Radar View a powerful tool for understanding the positioning and characteristics of data spaces worldwide, whether the user is searching for inspiration, seeking collaboration, or tracking sectoral trends.
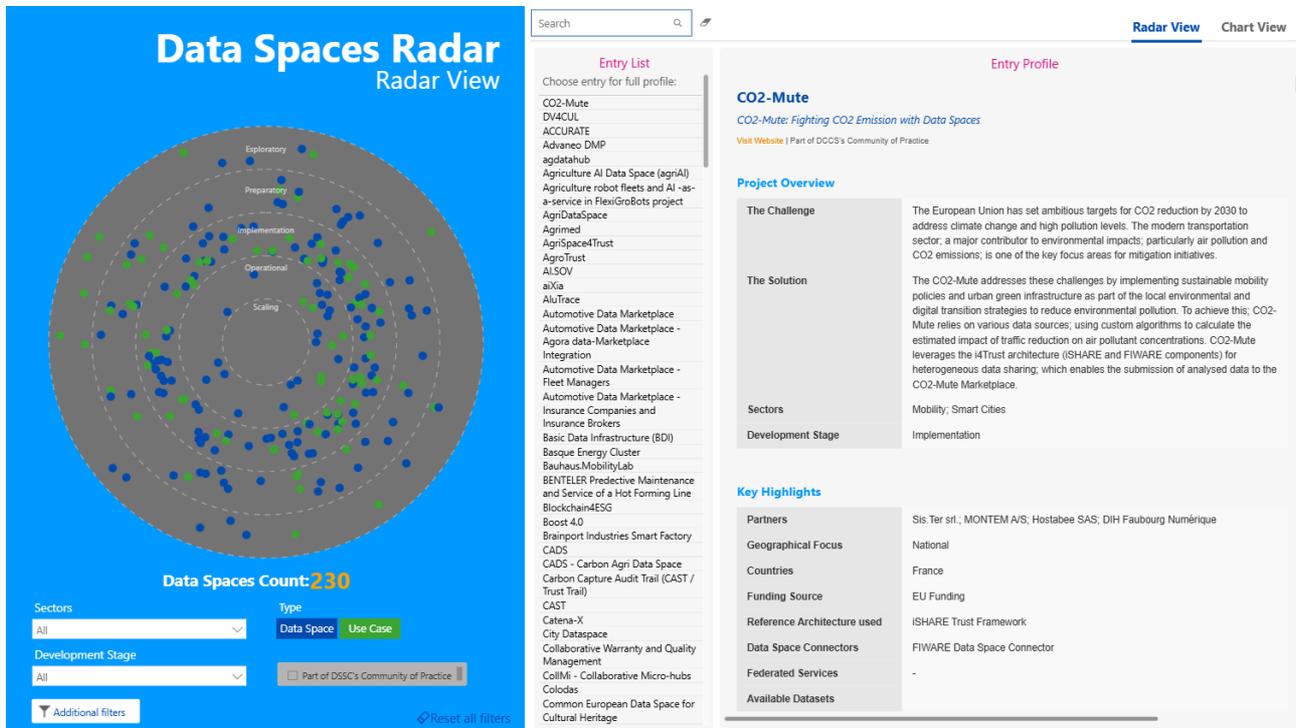
Figure 2 Data Spaces Radar "Radar View"

5.3.2 Chart View

The **Chart View** provides an alternative, data-rich perspective of the Data Spaces Radar. While the **left side** of the interface remains largely unchanged—with the classic radar visualization, entry counter, and filtering options—the **center and right sections** are replaced with a collection of dynamic **charts, graphs, lists, and a geographic map**. These visual elements enable users to explore trends, distributions, and metadata patterns across all listed data spaces and use cases.

This view is particularly valuable for users interested in gaining insights into the broader data space ecosystem at a glance. The visualizations are grouped into **four key categories**:

1. **Radar Overview**
   This section provides a general summary of the Radar's current landscape and its evolution:
   - A **list of the most recent entries** added to the Radar.
   - A **line chart** displaying the Radar's growth over time.
   - A **pie chart** representing the distribution of entries by **development stage**.
   - A **bar chart** showing the number of entries per **sector**.
2. **Building Blocks**
   This section focuses on the **technical components** implemented by data spaces and use cases:

- It features a **distribution chart** that illustrates the percentage of entries implementing building blocks in line with the **DSSC Building Blocks** categories:
  - *Data Sovereignty*
  - *Data Interoperability*
  - *Data Value Creation*

3. **Key Highlights**
   This section highlights relevant architectural and technical decisions, as well as economic models:
   - A chart showing the **reference architectures** adopted by initiatives (e.g., IDSA, Gaia-X, FIWARE).
   - A chart detailing the most used **data connectors** (e.g., Eclipse Dataspace Connector, True Connector, MDS Connector).
   - Visualizations showing the most common **funding sources** and **business model patterns** used across entries.

4. **Map View**
   This section provides a **global perspective**:
   - An interactive **world map** displaying the geographical distribution of data spaces and use cases.
   - A **ranked list of countries** with the highest number of data space implementations.

The **Chart View** was not part of the original version of the Data Spaces Radar, which initially featured only the radar visualization and textual profiles. The introduction of this enhanced view was a direct response to community feedback and a step toward improving **user experience** by enabling stakeholders to **interact with and interpret Radar data more intuitively and visually**.
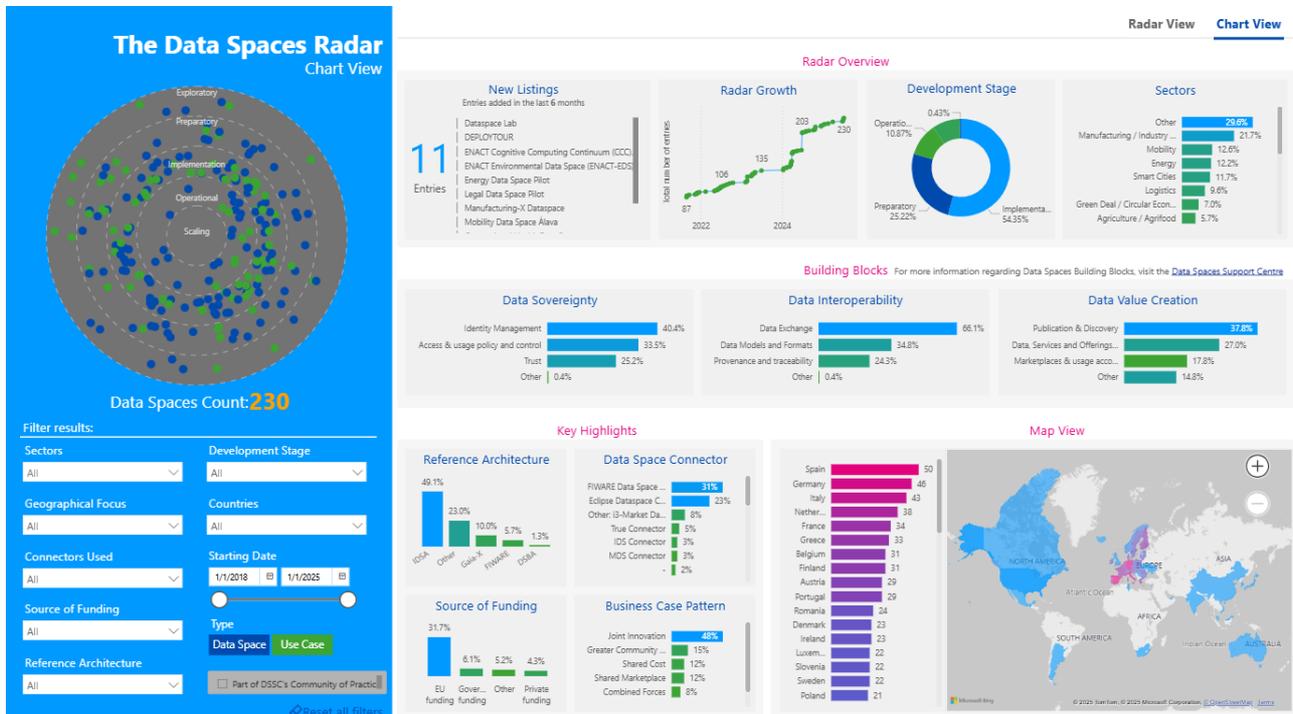
Figure 3 Data Spaces Radar "Chart View"

5.4. How to join the Radar

The **Data Spaces Radar** is a publicly accessible platform designed to showcase as many data space initiatives as possible. Its primary purpose is to raise awareness about **secure and sovereign data sharing**, promote transparency, and **inspire others** to either develop their own data spaces or join existing ones. In line with this goal, the International Data Spaces Association (IDSA) has ensured that the Radar is a **low-barrier-entry tool**, allowing organizations to join with minimal effort.

Joining the Radar is as simple as completing a short online form[26], available on the Radar's website. This is a **quick and cost-free** way for anyone who owns, coordinates, or is aware of a data space initiative or data-sharing use case to share it with the broader community. The form takes approximately **10 minutes** to complete and collects a range of relevant information, including:

- The **name** and **headline (slogan)** of the data space or use case.
- The **challenge** being addressed and the **solution** proposed.
- **Technical specifications**, including reference architecture, data connectors, and building blocks used.

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[26] https://form.jotform.com/232263600987055

- The **number of available datasets** and other operational details.

Once submitted, the entry is reviewed by the IDSA team. Provided the submission is **complete and accurate**, the profile is typically published **within one business day**. If there are inconsistencies or missing details, the team will reach out for clarification.

Should any **updates, corrections, or additional information** become available after publication, the entry owner can contact the IDSA team at any time using the **"Contact Us"** button located in the top menu of the Radar's website.

By joining the Radar, organizations not only gain **visibility** but also contribute to a growing ecosystem of **trusted, interoperable, and scalable data spaces**.

5.5. Why join the Radar?

Four years after its initial launch, the **Data Spaces Radar** has grown significantly—not only in terms of the number of entries but also in **visibility and relevance**. Increasingly, data space initiatives across Europe and beyond are choosing the Radar as their **primary platform for exposure**. Numerous **European research projects** have adopted it as their official dissemination space, and it has even been featured in **publications and communications by the European Commission**.

The Radar has established itself as a **leading reference tool** in the data space ecosystem. For data space and use case owners, it offers a **unique opportunity to showcase their efforts** to a global audience. By consolidating information on use cases, technical components, business models, and development stages, the Radar is progressively becoming a **centralized knowledge hub**—and in many ways, the **"search engine"** for those seeking insights into data sharing, interoperability, and sovereign data exchange.

The IDSA encourages all stakeholders, whether part of emerging initiatives or well-established implementations, to join the Radar and increase the **visibility, credibility, and reach** of their data space efforts within the broader community.

5.6. The DISCO UFDS joins the Data Spaces Radar!

The DISCO UFDS is currently positioned in the **Implementation ring** of the Radar, which means it counts on a sufficiently detailed project plan, milestones and resources, as a well as a governance framework and a technical infrastructure for a data space pilot. According to its current development stage, the use cases and value for the participants of the data space have been already identified.
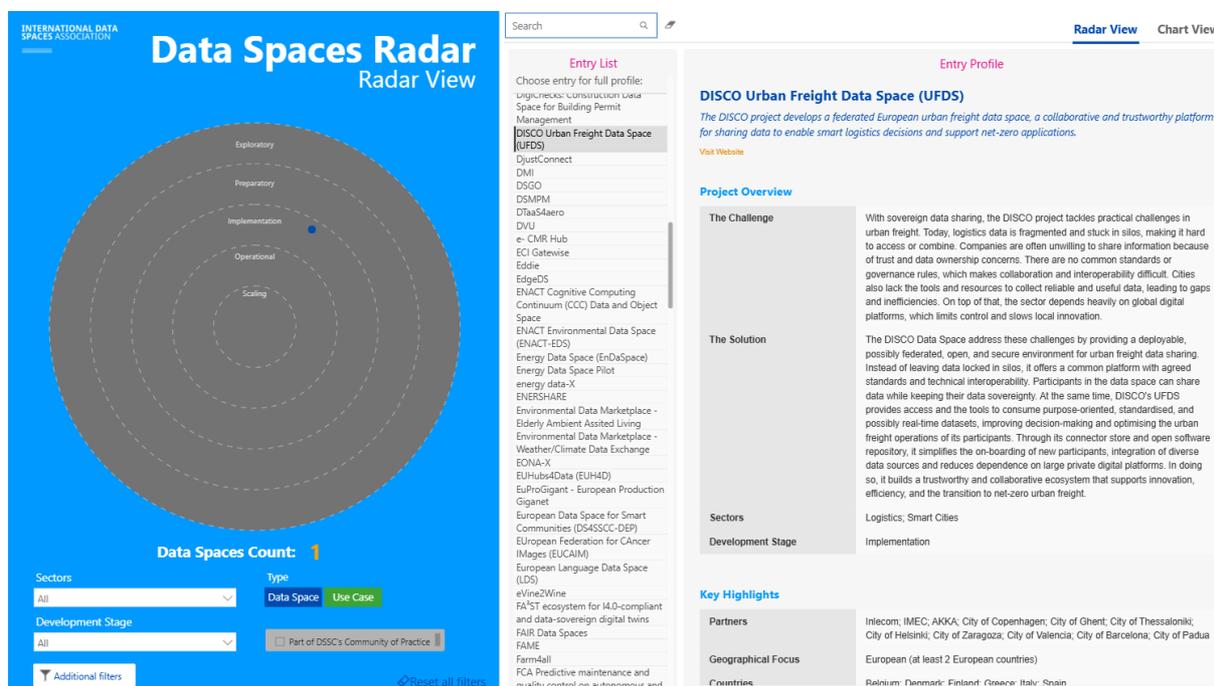
Figure 4 The UFDS in the Data Spaces Radar

Compared to other similar initiatives, the UFDS is currently at an advanced stage of development. It has moved beyond the **Exploratory** and **Preparatory** stages, where initiatives such as the GATE Urban Data Space [27] currently stand. However, there is still progress to be made before reaching the **Operational** stage, achieved by more mature initiatives like EONA-X and the Mobility Data Space.

6. Conclusion

As data becomes one of the most valuable assets of the digital age, the concept of **data spaces** offers a transformative framework for enabling **secure, interoperable, and sovereign data sharing** across sectors and borders. Rooted in principles of **trust, transparency, and fairness**, data spaces empower organizations to unlock new forms of value while maintaining control over their data. In this context, the **International Data Spaces Association (IDSA)** plays a pivotal role by defining the standards, architectures, and governance models that make such ecosystems possible.

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[27] https://idsa-bulgaria.gate-ai.eu/?page_id=125

This deliverable has outlined a **step-by-step pathway** to support organizations throughout their data space journey—from understanding the foundational principles and drafting use cases, to building technical components, preparing for deployment, and scaling securely.

A prominent example highlighted in this deliverable is the Urban Freight Data Space (UFDS), developed as part of the DISCO project. The UFDS showcases how data spaces can be applied in practice by enabling secure data sharing in urban logistics, supporting smart decision-making, and demonstrating the benefits of data sovereignty and interoperability in real-world scenarios. Its successful integration with the Data Spaces Radar further illustrates how technical infrastructure, governance, and collaboration can converge to deliver tangible value.

Complementing this onboarding process, the **Data Spaces Radar** serves as a dynamic, user-friendly platform that not only visualizes the global landscape of data space initiatives but also fosters knowledge exchange, transparency, and collaboration within the community. By joining the Radar, data space initiatives gain visibility, credibility, and the opportunity to connect with like-minded actors working toward a more interconnected and data-driven future.

Together, these tools and resources form a **comprehensive toolkit** for accelerating the adoption and sustainability of data spaces, paving the way for a trusted European data economy and inspiring innovation across industries*.*

6.1. Summary of key takeaways

- **Data spaces** enable secure, sovereign, and interoperable data sharing among trusted partners, supporting innovation while respecting data ownership and usage policies.
- The **International Data Spaces Association (IDSA)** plays a central role in shaping the data space ecosystem through standardization, reference architectures, and community building.
- Organizations can follow a **five-step onboarding journey** to build or join a data space:

  1. Gather knowledge
  2. Define your use case
  3. Build components
  4. Prepare for go-live
  5. Share and scale-up

- The **IDS Testbed** and **IDS Certification** support interoperability, security, and trust across components and participants.
- **Usage control** and **data sharing contracts** are critical for enforcing data governance, ensuring compliance, and maintaining trust among stakeholders.
- **The Urban Freight Data Space (UFDS)**, developed within the DISCO project, demonstrates a concrete, real-world implementation of a data space, highlighting its potential to optimize urban logistics and smart decision-making.

- The toolkit, the Radar, and implementations like the UFDS together contribute to building a vibrant, trustworthy, and scalable data economy in Europe and beyond.
- The **Data Spaces Radar** is a public, accessible tool for discovering and showcasing data space initiatives and use cases across sectors and countries.
- With over 230 entries, the Radar allows users to **filter, explore, and analyze** initiatives by development stage, geography, technical architecture, business model, and more.
- The Radar's **chart view** enhances data visualization and insight discovery, making it easier for newcomers and experts alike to navigate the data space ecosystem.
- **Joining the Radar is simple and free**, encouraging open participation and wider visibility for data space initiatives.
- The toolkit and the Radar together contribute to **building a vibrant, trustworthy, and scalable data economy** in Europe and beyond.

6.2. Future outlook and ongoing activities

At present, there are no major changes planned for the interface or structural layout of the Data Spaces Radar, as the most recent version was released at the end of 2024. The current focus is on maintaining the platform, ensuring the accuracy and relevance of its content, and encouraging data space and use case owners to regularly update their entries. Continuous promotion of the Radar remains a key activity to expand its visibility and increase participation. This is done through various channels, including events, webinars, live sessions, and European research projects like DISCO—which themselves often contribute new entries to the Radar.

Another important ongoing effort is the **Data Spaces Radar Report**, a publication that showcases selected data spaces and use cases within specific sectors featured on the Radar. These are highlighted as success stories that exemplify value creation and innovation through data sharing. Four editions of the report have been published to date, with the latest available here[28]. While this was previously a quarterly release, plans are underway to revive the report series with a new edition that reflects the evolving landscape of data spaces and celebrates fresh success cases.

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[28] https://internationaldataspaces.org/wp-content/uploads/dlm_uploads/The-Data-Spaces-Radar-Version-4.pdf