

Interoperability, Harmonization and Generic Facilities across Data Sharing Initiatives

More Value from Data through an Overarching Approach

A Directional Guide

“Value creation with data is the goal.

Interoperability, harmonization and reuse make this value scalable.”

Data gains value when it is available across the boundaries of individual data-sharing initiatives. The CoE-DSC posits that, to achieve this, data-sharing initiatives must be able to justify their choices regarding interoperability, harmonization, and the reuse of generic facilities based on shared principles: interoperability, harmonization, and reuse where these enable value at scale; domain autonomy where it demonstrably adds value; and experimentation only under specific conditions.

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Author(s): E. Bouwman, F. Haijenga NimbleNova
H. Bastiaansen, B. Farias Loscio TNO
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Management summary

Greater value from data will accelerate when organizations can find, understand, trust, and use data across the boundaries of individual data sharing initiatives, without having to join, contract with, and technically connect to each initiative separately.

The leading principles are:

- Focus on concrete value, do this step by step, and connect, harmonize or federate what needs to work together across boundaries.
- Put participants at the center by avoiding multiple onboarding requirements, legal agreements, and technical integrations. Participants are or will be involved in multiple initiatives.
- Preserve domain-specific choices and agreements only where they demonstrably add value. Reuse or align with capabilities that are generic or are becoming generic as part of the EU Data Strategy and the Common European Data Spaces.
- Experiment only where uncertainty remains. Make clear in advance what must be learned and which follow-up decision an experiment supports.

The challenge

The Netherlands already has a broad landscape of data sharing initiatives, data spaces, and service providers. The CoE-DSC Landscape Scan from early 2026 identified 124 initiatives and 99 service providers. Many of these have their own approach to interoperability, harmonization, and reuse of capabilities.

However, individual participants are increasingly facing multiple data sharing initiatives, each with different forms of participation, contracts, and technical connections. This increases connection costs and lead times and thereby limits the reuse of data across boundaries of initiatives and sectors ¹, along with the associated limitation to value creation.

The next challenge is therefore to have motivated and grounded policies on connecting, reusing, harmonizing and, where necessary, migrating agreements and capabilities across data sharing initiatives. This requires proactive governance and choices about what should become common, what should remain domain-specific, and where temporary room for experimentation is needed.

In this approach, the participants should be at the center, while data sharing initiatives should play a facilitating role.

From challenge to action

Various roles and stakeholders are involved in data sharing initiatives: participants (data-providers or data consumers), policymakers (public commissioners, funders, ...), data sharing initiatives (existing and new), and service providers. Each stakeholder has its own role in addressing this challenge. This guidance therefore describes, for each stakeholder, what this means in practice. The table summarizes this briefly.

¹ CoE-DSC. "Towards Scalable Data Space Interoperability and Federation - A Combined Community-Driven and Participation-Driven Approach based on a Common Carrier Layer - CoE-DSC Discussion Paper". <https://coe-dsc.nl/towards-a-common-carrier-layer-for-large-scale-data-space-interoperability-and-federation>.

Stakeholder	Core message
Participant	Start from demonstrable value and the potential for broader application. Accept that data sharing is still developing, but make clear agreements about roles, responsibilities, use, and conditions, and embed participation within the organization. Participate only when the value, conditions, effort, control, and exit options are clear. Request for strategy on interoperability, harmonization, reuse and transferability to further extend options for data sharing .
Policymaker	Do not fund a new variant of a generic capability without requiring reuse or deviation to be substantiated. Steer on policy for interoperability and harmonization that is grounded in evidence.
Existing data sharing initiative	Protect the domain value that has been built up while also creating an explicit migration path toward interoperability, harmonization, and reuse of capabilities. Preserve what works, but do not automatically treat historical choices as domain-specific necessities. Interconnect and migrate without a complete rebuild.
New data sharing initiative	Start with value, participants, and existing capabilities based on concrete use cases; only then choose the architecture and service providers. Keep this period contained and focused on the essentials to create and maintain momentum. Design from day one for interoperability, harmonization, reuse, and transferability.
Service provider	Align with the standards, protocols and guidelines for data sharing that are being developed and adopted as part of the European Data Strategy. Aim for harmonization, interoperability and cost minimization. Compete on the price and quality of interoperable services, rather than through closed ecosystems and switching barriers.

Principles and core messages

This directional guide provides a shared way of thinking and working that enables each stakeholder, according to its own role and responsibility, to determine how it can deliberately pursue interoperability, harmonization, and reuse of capabilities, and where necessary migrate agreements and capabilities. The directional guide does not call for a single central decision or a heavy joint governance approach. Where parties can act together within or across data sharing initiatives — also among policymakers and service providers — this can accelerate implementation and reduce shared costs.

The primary consideration is that data sharing initiatives demonstrably meet the needs of the participants: the initiative exists for the participants, not the other way around. The table provides the main principles for developing data sharing initiatives.

Principle	Core message
Value first	Make visible what public, societal, economic, or operational value data sharing is intended to deliver.
Interoperable by default	Have a strategy on interoperability, harmonization, reuse and transferability to enable for new data sharing use cases. When necessary, interconnect with other data sharing initiatives through recognized agreements, interfaces, conversions, and trust mechanisms. Take into account the participant

Principle	Core message
	perspective on data sharing across data sharing initiatives: optimization of value with minimization of complexity and costs of onboarding.
Domain-specific where demonstrably necessary	Preserve sector-specific focus, processes, applications, and semantics when they determine value or legal validity.
Experiment with discipline	Link a trial to learning objectives, evaluation criteria, a follow-up decision, and a path toward reuse or phase-out.
Reuse or explain	Examine existing capabilities, agreements, standards, services, and initiatives before developing or funding a new variant.
Open and transferable	Make dependencies explicit and safeguard composability, transferability, and a realistic migration path.

Status, application, and positioning

This directional guide provides a shared way of reasoning, with practical considerations for policy, program development, architecture design, procurement, service delivery, and participation.

It is not a formally adopted policy, standard, or agreement framework. Formal obligations arise only when parties and stakeholders establish them in policies, assignments, agreements, or contracts.

This directional guide aligns with existing CoE-DSC instruments and positions:

- The **MAMI** (Minimal Agreements for Maximal Interoperability) framework provides minimal, no-regret recommendations for interoperability ².
- The concepts of a **community- and participant-driven approach** based on the **CCL** (Common Carrier Layer) that enables large scale interoperability ³.
- The **DSSM** (Data Sharing Strategy Model) helps data sharing initiatives to determine for various aspects what can be reused generically, what must be connected federatively, what remains domain-specific, and where room is still needed to learn and develop ⁴.
- The **Market Service Model** provides a structure for defining, describing and positioning required services, market roles, and service categories in context ⁵.
- The **Data SVP!** (Data Sharing Valorisation & Velocity Programme) program helps make the value of data sharing explicit: for users and participants, for partners and investors, and for society ⁶.

² CoE-DSC. "MAMI Framework - Minimal Agreements for Maximal Interoperability". January 2026. <https://coe-dsc.nl/wp-content/uploads/2026/03/2026-January-MAMI-Framework-2026-report-v1.0.0.pdf>.

³ CoE-DSC. "Towards Scalable Data Space Interoperability and Federation - A Combined Community-Driven and Participation-Driven Approach based on a Common Carrier Layer - CoE-DSC Discussion Paper". <https://coe-dsc.nl/towards-a-common-carrier-layer-for-large-scale-data-space-interoperability-and-federation>.

⁴ CoE-DSC. "From Fragmentation to Alignment: Leveraging DSSM for Dataspace Interoperability". <https://coe-dsc.nl/files/fragmentation-to-alignment>.

⁵ Van Houwelingen, G., Punter, M., Berkers, F., Stolwijk, C., Stoter, A.: "The Influence of the Emerging Service Provider Market on the Data Space Business Model. To be published as chapter in the upcoming DSSC book (Q4 2026). Concept version on the CoE-DSC website: <https://coe-dsc.nl/files/influence-of-emerging-service-provider-market>.

⁶ CoE-DSC. "Data SVP! - Data Sharing Valorisation & Velocity Programme". <https://coe-dsc.nl/knowledge-base/original-content/datasvp>.

- The annual **CoE-DSC Landscape Scan** systematically maps the Dutch data sharing landscape and thereby provides a factual basis for insight to support developments, reuse opportunities, and further harmonization ⁷.

These sources provide depth and background, not a target architecture imposed in advance.

Reading guide

This report is structured with specific reading paths for different stakeholders.

Chapters 1 and 2 are generic for all stakeholders: participants (data-providers or data consumers), policymakers (public commissioners, funders, ...), data sharing initiatives (existing and new), and service providers. They describe, respectively, the motivation for why it is now relevant to explicitly address data sharing across the boundaries of individual data sharing initiatives (Chapter 1), and the approach, principles, and decision logic for substantiating cohesion in data sharing — interoperability, harmonization, and reuse of capabilities — for the various stakeholders (Chapter 2).

The following chapters further detail this in terms of relevance considerations, action perspectives, key questions, red flags, and working questions on interoperability, harmonization, and reuse. Each of these chapters addresses a specific stakeholder: participants, data providers, or data users (Chapter 3); policymakers, public commissioning parties, or funders (Chapter 4); existing data sharing initiatives (Chapter 5); new data sharing initiatives (Chapter 6); and service providers (Chapter 7).

The concluding Chapter 8 considers the shared responsibilities that the various stakeholders must take on.

The appendices provide, in sequence, an elaboration of the architecture vision—the dot on the horizon—for interoperability, harmonization and reuse of data sharing initiatives (Appendix A), the models for substantive elaboration (Appendix B), and the glossary (Appendix C).

Finally, from the reader only minimal technical background knowledge is needed on federated data sharing, data sharing initiatives, data spaces, and interoperability. Extensive background information on these topics is available through the websites of the Data Spaces Support Center (DSSC) ⁸ and the Centre-of-Excellence for Data Sharing and Cloud (CoE-DSC) ⁹.

⁷ March 2026. CoE-DSC. "Dutch Data Sharing Landscape Scan 2026 - Insights on Data Sharing Initiatives & Service providers in the Netherlands". March 2026. <https://coe-dsc.nl/wp-content/uploads/2026/03/2026-CoE-DSC-Landscape-Scan-Report.pdf>.

⁸ Data Spaces Support Centre (DSSC). "DSSC Blueprint v3". 2025. <https://blueprint.dssc.eu>.

⁹ Centre of Excellence for Data Sharing & Cloud (CoE-DSC). <https://coe-dsc.nl>.

Table of Contents

Management summary	3
1 Why now: data sharing must work across boundaries.....	8
2 Coherence in data sharing: approach, principles, and decision logic.....	11
3 Participants: data providers and data consumers	16
4 Policymakers, public commissioners, and funders	19
5 Existing data sharing initiatives	22
6 New data sharing initiatives	25
7 Service providers.....	28
8 Finally: taking shared responsibility	31
Appendix A. The Common Carrier Layer	33
Appendix B. Models and further information	37
Annex C. Vocabulary	41
Colophon	42

1 Why now: data sharing must work across boundaries

KEY CONCLUSION:

The next step in the development of data sharing initiatives is to develop an aligned strategy for their interoperability, to expand their joint interests and opportunities to support new applications and business models. Interoperability, harmonization and reuse need to become a fundamental design and development consideration, including both business, legal and technical aspect. In doing so, the goals are to increase both *effectivity* (in being able to support cross-cutting data sharing use cases) and *efficiency* (in preventing new data sharing initiatives from starting from scratch each time and participants from having to onboard and technically connect multiple times).

1.1 Value creation often crosses the boundary of a single initiative

Public tasks, chain processes, supervision, innovation, and new services increasingly require data from multiple organizations. The required data may be distributed across organizations from different sectors, regions, platforms, data spaces, and agreement frameworks. An organization may therefore simultaneously be a participant in multiple data sharing initiatives and still need additional data sharing relationships.

The form of data sharing initiatives varies. Some initiatives are platform-oriented, while others operate as a federation or as access to a collection of data sources. Many initiatives combine characteristics. The label is less important than the question of whether autonomous participants can find, provide, consume, understand, trust, and get access to data under explicit conditions, with minimal barriers stemming from the organizational structures of individual data sharing initiatives.

1.2 The landscape is rich, but the burden of connection remains high

A recent data sharing landscape scan by CoE-DSC shows that interoperability is already widely on the agenda. At the same time, European instruments and data space protocols are not yet widely applied in practice. Many initiatives also develop components themselves that are needed elsewhere as well. This may be understandable at an early stage, but it makes future connection more expensive when choices are not explicitly motivated, open, and migratable.

124	99	84%	45%
data sharing initiatives	service providers	explores interoperability	relies on one-time subsidies

Source: CoE-DSC Dutch Data Sharing Landscape Scan, status early 2026 ¹⁰. The inventory is not exhaustive.

¹⁰ March 2026. CoE-DSC. "Dutch Data Sharing Landscape Scan 2026 - Insights on Data Sharing Initiatives & Service providers in the Netherlands". March 2026. <https://coe-dsc.nl/wp-content/uploads/2026/03/2026-CoE-DSC-Landscape-Scan-Report.pdf>.

1.3 Recurring friction when participating in multiple data sharing initiatives

The following aspects often differ by data sharing initiative and therefore become a recurring source of friction when individual participants want to participate in multiple data sharing initiatives. This creates additional complexity, cost, and lead time:

- **Onboarding en identiteit** – De organisatie moet herhaaldelijk onboarden bij datadeel initiatieven om data te leveren of af te gebruiken van meerdere initiatieven; dit omvat onder meer het verstrekken van bedrijfsinformatie, autorisaties, certificaten en contactrollen, en het ontvangen van diverse lidmaatschaps-certificaten.
- **Contracts and terms of use** - Comparable rights, obligations, purposes, and audit arrangements are drafted and assessed again for various initiatives.
- **Technical connection** - Participants must implement different technical connections for participation and manage different connectors, interfaces, profiles, and security configurations.
- **Dependence on service providers** - Service-provider-specific combinations resulting from data-initiative-specific solutions make switching, combining, and scaling costly.
- **Discoverability and metadata** - Data and services can be found only within a single catalog or through divergent descriptions.
- **Meaning of data** - Concepts, codes, models, and application profiles differ, and translations are not reusable.¹¹
- **Value and adoption** - The focus of initiatives is still too often on technical and architectural aspects rather than on realizing usage and added value.

1.4 New applications and developments strengthen the need for interoperability and harmonization

Digital product passports, digital twins, federated learning, and chain-wide optimization or reporting are examples of application areas that may require data from more organizations being participant in different data sharing initiatives. Privacy-enhancing technologies, semantic technology, and AI are supporting technologies in this context. They can be applied both within a single sector or community and across sectors and communities. The latter implies in practice that they may need to work across multiple data sharing initiatives. The need for interoperability and harmonization across data sharing initiatives may therefore vary by application area, legislation, and risk profile.

In addition, common Dutch and European data sharing initiatives are being developed at the same time, for which interoperability and harmonization may also need to be provided, or which may serve as alternatives for (or support) existing data sharing initiatives, including:

- **Common European Data Spaces (CEDs) from the European Union**, as currently being developed by the European Commission (EC) as implementation of the European Data Strategy. Fourteen CEDs are being developed, including the European Mobility Data Space (EMDS) for the mobility and logistics sector, the Common European Agriculture Data Space (CEADS) for the agricultural sector, and the Common European Energy Data Space (CEEDS) for the energy sector. For these CEDs, an interoperable and harmonized approach is being pursued based on regulations, architectures, standards/protocols, and open-source building blocks developed under the umbrella of the European Data Strategy. An example is the SIMPL programme, which is developing an open-

¹¹ It should be noted that machine-processable descriptions of data sources can reduce these points of friction and lessen the need for full harmonization through uniform data formats. AI agents can interpret conversions, metadata, terms of use, and provenance information. For this to work, however, these metadata descriptions must be explicit, reliable, discoverable, and managed. These dynamic conversions do not replace governance choices around interoperability and harmonization; they do make different forms of interoperability and harmonization easier.

source middleware platform designed to enable data access and interoperability between European data spaces.

- **Data sharing initiatives for the Dutch government**, as shaped by the Intergovernmental Data Strategy (IBDS) / Federated Data System (FDS) initiative.
- **Shared digital facilities**, as developed by the EU or the Netherlands to increase interoperability, reduce usage costs, improve ease of use, and minimize administrative burden. Examples include:
 - The European **eIDAS** (Electronic Identification, Authentication and Trust Services) regulation for electronic identification and trust services for electronic transactions, and its services that are now becoming available.
 - The European **OOTS** (Once-Only Technical System) initiative for streamlining data requests for cross-border procedures, facilitating trust, efficiency, and data exchange between European public authorities and citizens.

When (further) developing data sharing initiatives, their choices need to explicitly consider these developments on the aspects of interoperability, harmonization and reuse of facilities (components). Shared principles should be applied for this purpose: common agreements on interoperability and reuse of generic facilities where this enables value at scale, domain freedom where it demonstrably adds value, and experimentation only under conditions.

2 Coherence in data sharing: approach, principles, and decision logic

KEY CONCLUSION:

The goal is a well-motivated and widely supported vision, strategy, and approach for the joint realization of a coherent and interoperable data-sharing facility. This does not require a single (new) overarching data sharing initiative or a uniform architecture, but rather explicit and well-substantiated choices regarding interoperability, harmonization, and the reuse of generic facilities.

2.1 Basic questions: interoperability, harmonization, and reuse

For a coherent federated data sharing capability based on explicit and well-substantiated choices, the following questions about data sharing interoperability, harmonization and reuse must be answered transparently and motivated.

Topic	Question about interoperability, harmonization, and reuse
1. Value	Which applications, tasks, or information chains improve through interoperability and harmonization, and how is this measured?
2. Interoperability	How can participants and initiatives collaborate across boundaries, including governance, legal, semantic, and technical aspects?
3. Reuse	Which agreements, standards, generic facilities, and services can be used and reused?
4. Adoption	How do onboarding burden, lead time, and management complexity for participants decrease through interoperability, harmonization, and reuse and increase adoption?
5. Dependencies	Which service providers, authorities, standards, or facilities become critical, and how are their transferability, terminability, and/or migration arranged?
6. Follow-up	What decision follows a pilot, assessment, or investment?

2.2 Seven guiding principles

Seven guiding principles can help each party make choices about interoperability, harmonization, and reuse in a way that fits its own role.

Principle	Meaning for decisions
1. Value first	Link every choice to a concrete value effect for applications, tasks, processes, chains, innovation, or participants.
2. Reuse or explain	Use existing agreement frameworks, standards, services, and initiatives where they are appropriate. Justify deviations.
3. Federated over unnecessarily centralized	Interconnect data sharing initiatives through mutual agreements, interfaces, recognition, and conversion. Centralize only where necessity and proportionality can be demonstrated.
4. Domain freedom with evidence	Preserve sector-specific choices when specific use cases or application areas, legislation, risk, or semantics genuinely determines and justifies that choice.
5. Participant burden as a test	Measure the impact of repeated onboarding, integration, contracting, and management on individual participants. Harmonization must demonstrably reduce this burden.
6. Open, modular, and transferable	Safeguard the use of open interfaces, standards, transferability, composability, manageability, terminability, and a migration path.
7. Experiment with follow-up	Link experiments to learning objectives, evaluation criteria, decision-making, and a path toward reuse, scaling, or termination.

2.3 The decision logic

The decision to make something common, align it with others, leave it domain-specific, or organize it temporarily as an experiment is not a technical choice alone. Above all, it is a governance choice about value, dependencies, reuse, ownership, and development direction. The CoE-DSC therefore uses the Data Sharing Strategy Model (DSSM) as a model for making choices about interoperability, harmonization, and reuse explicit and explainable.

The DSSM distinguishes two questions:

- **Differentiation** - Is the topic generically applicable across multiple initiatives or sectors, or is it specific to a domain, community, or application?
- **Dynamics** - Is the topic sufficiently stable to standardize and harmonize, or is it still developing because of regulation, technology, market development, or practical experience?

The combination of these two questions leads to four quadrants within the DSSM, as shown visually in Figure 1, each with its own color code.

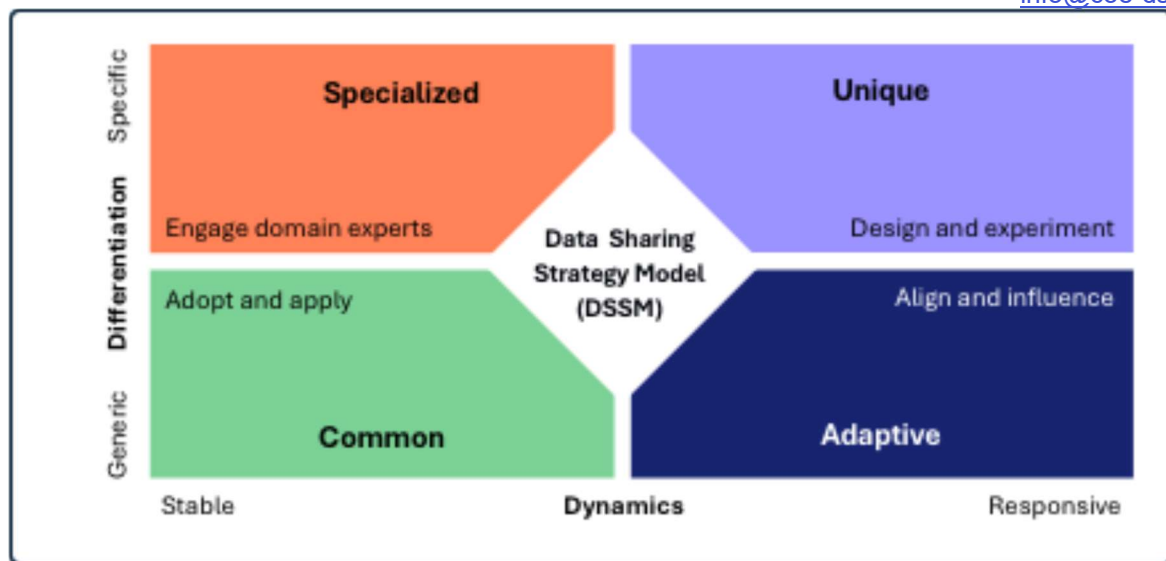


Figure 1: Four decision directions for interoperability, harmonization, and reuse. These are context-dependent.

The table below describes each of the four quadrants as decision directions from the DSSM, indicating when each is applicable and which examples and points of attention belong to it.

Category	Direction	When to apply	Examples and points of attention
Common	<i>Adopt and apply</i> Choose existing solutions and avoid unnecessary customization	When requirements are broadly applicable, mature and stable. Solutions are proven and widely adopted; market services are generally available.	Core concepts, metadata baselines, identity and attestation requirements, minimum contractual mechanisms, open standards and core interfaces.
Adaptive	<i>Align and influence</i> Keep requirements generic, align initiatives and actively influence the desired direction of the market and standards.	When requirements are generic but still evolving due to regulation, technology, European alignment or market developments. Solutions and market services are not yet fully stable.	Trust frameworks, catalogues, semantic hubs, credentials, participant onboarding and EU convergence.
Specialized	<i>Engage domain experts</i> Engage domain experts to properly translate and safeguard specific value, requirements and agreements.	When requirements are specific to a sector, community or initiative, but are stable and predictable. Solutions are tailored and market services are typically niche-oriented.	Domain models, sector-specific applications, operational processes and sector-specific governance.
Unique	<i>Design and experiment</i> Develop together with stakeholders, experiment purposefully and validate in practice what works.	When requirements are specific and still evolving, and mature solutions, agreements or market services are not yet available. Remain unique only as long as necessary; converge as soon as possible.	PETs, AI/LLMs, digital twins, event-driven data sharing and new service models.

This DSSM categorization into four quadrants of decision directions gives parties a way to substantiate and explain their choices. It does not provide an automatic classification, but rather a supporting tool. This categorization prevents interoperability, harmonization, and reuse from becoming a generic plea. For each harmonization topic (see annex B.1), the required form of coherence can be determined, and why. This shifts the discussion from “whether or not to harmonize” to “which choice can be motivated here from a governance, substantive, and practical perspective”, or: “*selective harmonization*”.

The categories also help maintain balance. Where reuse is logical, the wheel should not be reinvented. Where domain-specific value is decisive, that room should not be unnecessarily standardized away. Where developments are still uncertain, experimentation is possible, but only with clear evaluation criteria, documentation, and visibility into a possible migration path.

2.4 Interoperability and harmonization: the community-driven and participant-driven perspective

Interoperability and harmonization can be considered from two perspectives: between data sharing initiatives and between participants. These are referred to as the community-driven perspective and the participant-driven perspective, respectively. In the community-driven perspective, the steering is done by the governance authorities of the data sharing initiatives; in the participant-driven perspective the individual participants themselves take the lead.

Between data sharing initiatives (community-driven)	Between participants (participant-driven)
Interoperability and harmonization agreements (e.g. on, catalogs, legal aspects, semantic models, trust mechanisms, and technical profiles) are made under the steering of the governance authorities of the data sharing initiatives.	Individual participants (organizations) establish trusted data sharing relationships with one another, even when they are not member of the same data sharing initiative.

Together, these complementary perspectives help realize interoperability and harmonization both administratively and practically. Allowing participants to connect freely through a participant-driven approach alone may ignore domain-specific legislation, semantics, and governance. The value proposition is preserved when there is a shared foundation from a community-driven approach: discoverability, identity and attestations, contract and policy exchange, logging and audit, semantic conversions, and interoperability profiles.

The practical approach therefore lies in combining both: strong communities for domain value, plus reusable capabilities that enable participants to act across community boundaries.

2.5 Reuse of facilities: the Common Carrier Layer

As described in the previous section, scalable interoperability and harmonization require a combination of a community-driven and a participant-driven approach. The Common Carrier Layer (CCL) provides a reference concept for this purpose. The CCL comprises two related aspects:

- First, the CCL provides a reference framework for **reusable data sharing facilities** that can be used by multiple initiatives. These include capabilities for discoverability and access, data sovereignty and trust, data interoperability, and technical interoperability. Reusing such facilities can simplify connectivity between initiatives, lower the cost per initiative, and minimize development time for new applications. A framework for identifying and defining reusable data sharing facilities is provided by the Data Sharing Strategy Model and is addressed in annex B.4.
- Second, the CCL provides the basis for a **participant-driven approach** in which participants themselves make mutual, bilateral, legally binding agreements about data sharing, for example by using existing European identity, trust, and credential mechanisms such as eIDAS. This can prevent

participants from having to join multiple data sharing initiative, thereby minimizing interconnection burdens (in terms of contractual, legal, technical and management complexity).

The CCL is explicitly not a new central platform layer with its own governance and mandatory facilities. Instead, the concept enables a separation of responsibilities. Moreover, community-driven initiatives can build on reusable generic functions, while participants can enter into transactions across the boundaries of individual data sharing initiatives and use domain-specific claims, credentials, and agreements. In this way, the CCL is not a prescribed architecture, but a conceptual framework for harmonization, reuse, and collaboration across the boundaries of data sharing initiatives. The CCL can develop into a shared foundation for cross-domain and cross-community applications and new business models. The architecture vision for the CCL is elaborated further in Appendix A.

3 Participants: data providers and data consumers

Participants ultimately determine which facilities are successful. Data sharing initiatives exist to support participants, not the other way around. The participant is the starting point, not the final piece of an architecture.

KEY CONCLUSION:

Participate only when the value, conditions, effort, control, and exit options are clear. Ask prospective data sharing initiatives for insight into their strategy for interoperability and harmonization, and their approach for participating in multiple data sharing initiatives simultaneously with minimal organizational, legal, and technical effort and cost.

3.1 Why this is relevant to you

A participant does not need to master a full data space architecture. However, the organization must be able to determine what value participation delivers, which data and responsibilities are involved, who is authorized to act on behalf of the organization, how use is controlled, and what costs and risks arise.

A participant-driven approach becomes meaningful in practice when identity, authorities, attestations, contractual terms, and technical connection are reusable as much as possible. This enables an organization to establish relationships without having to start completely over for every collaboration.

3.2 Conclusions for your role

- **Start with a concrete value proposition** - Make visible which process, decision, product, or public task improves.
- **Understand rights and obligations** - Record who may use data, for what purpose, under which conditions, and with what evidence.
- **Include all burdens** - Calculate admission, integration, contracting, internal management, assurance, and recurring costs.
- **Ask for reusability** - Check whether identity, credentials, connection, metadata, and semantic conversions can be used elsewhere.
- **Preserve freedom of choice** - Safeguard data portability, termination, deletion, transfer, and dispute resolution.

3.3 Action perspective

1. **Determine the application and minimum data** - Avoid requesting broader access than is necessary for the purpose.
2. **Assign internal mandate and responsibility** - Determine who contracts, assesses data rights, accepts risk, and provides oversight.
3. **Assess conditions and control** - Review purposes of use, access, logging, audit, changes, complaints, and liability.
4. **Calculate the total cost of participation** - Include technology, people, legal review, management, assurance, transferability, termination, and migration.

5. Validate within a limited scope - Test value and feasibility before entering into structural obligations.

6. Make an explicit follow-up or stop decision - Record the conditions for continuing, scaling, adapting, or terminating.

3.4 Deliverable outcome

Product decision	or	Minimum content
Participation decision		Value, scope, data, roles, rights, risks, costs, conditions, transferability, termination, and migration.
Internal mandate map		Decision-makers, signing authority, data ownership, security, privacy, compliance, and operations.
Control and assurance view		Identity, authorization, policies, logging, auditing, incidents, complaints, and evidence.
Validation report		Realized value, participant burden, shortcomings, risks, and follow-up recommendation.

3.5 Five key questions

No.	Question for decision-making
1	What concrete value does participation deliver, and what measurable outcome do we expect?
2	Who retains control over access to and use of our data, and how is compliance demonstrated?
3	Which legal, organizational, and technical obligations do we accept?
4	Which components of our connection and supporting evidence can we reuse in other initiatives?
5	Can we stop, switch, or combine without loss of control or disproportionate costs?

3.6 Red flags

- The value proposition is generic, while the data and usage rights are broadly formulated.
- Responsibilities for data quality, use, incidents, or liability are unclear.
- Participants must repeatedly provide the same organizational information and evidence.
- There is no visibility into logging, audits, complaints, disputes, or changes to terms and conditions.
- Termination or switching leads to loss of data, configuration, evidence, or operational continuity.

3.7 Working questions

The purpose of the questions below is to make a well-founded participation decision based on value, control, risk, effort, and freedom of choice.

Value and Scope

No.	Working question
1	What concrete value or obligation justifies participation?
2	What minimum data, services, and partners are needed for that value?
3	What success criteria determine whether participation is continued or scaled up?

Rights, Conditions, and Control

No.	Working question
4	Who may use which data, for what purpose, for what period, and under what conditions?
5	How are identity, authority, use, logging, audit, and violations made demonstrable?
6	Who is liable for data quality, unlawful use, incidents, and consequential damages?

Organization and Costs

No.	Working question
7	Who has the internal mandate for contracts, data rights, privacy, security, compliance, and operations?
8	What are the one-time and recurring costs for admission, integration, legal review, and management?
9	Which internal processes and systems need to be adapted?

Reuse, Portability, and Termination

No.	Working question
10	Can organizational data, credentials, connections, and transformations be reused in other initiatives?
11	Can data, metadata, configurations, and evidence be transferred or exported?
12	How are termination, deletion, disputes, switching, and operational continuity arranged?

4 Policymakers, public commissioners, and funders

This target audience, as initiator and/or funder, has significant influence over whether reuse, federated connection, interoperability, and harmonization actually become possible.

KEY CONCLUSION:

Make reuse and interoperability a condition for policy, funding, and commissioning. Do not pay again for a generic facility without a substantiated reason.

4.1 Why this is relevant to you

Public funding can accelerate valuable innovation. It can also unintentionally create new fragmentation when each program separately develops governance, admission, catalogs, trust, semantics, and technical connection.

Policymakers do not have to prescribe a technology or service provider. They should, however, require that public objectives, reuse, interoperability, ownership, openness, and options for portability, termination, and/or migration are made explicit in advance. This shifts steering from individual solutions to steering toward a coherent portfolio of public and private functions and services.

4.2 Conclusions for your role

- **Fund the value challenge, not automatically a new ecosystem** - A new initiative or platform is a means and requires an explicit necessity.
- **Apply “reuse or explain”** - A different choice is possible when proportionality, domain value, and a migration path are substantiated.
- **Make interoperability testable** - Include requirements for governance, legal aspects, semantics, technology, and the participant experience.
- **Arrange ownership and management** - Publicly funded agreement frameworks and building blocks need an owner, funding model, and change process.
- **Steer toward cross-portfolio effects** - Measure duplicate work, connection burden, reuse, and collaboration across program and sector boundaries.

4.3 Action perspective

1. **Define the public value and intended users** - Record which task, chain, or application improves and who experiences the effect.
2. **Conduct a portfolio and reuse scan** - Identify comparable initiatives, standards, services, and public building blocks, and determine which ones may be eligible for reuse.
3. **Classify the main components** - Determine what becomes common, what must be aligned, what remains domain-specific, and what is experimental.
4. **Translate this into funding and commissioning conditions** - Include open interfaces, reuse, evidence of interoperability, portability, termination and/or migration, and management.
5. **Assign ownership and decision-making** - Determine who manages definitions, standards, trust anchors, facilities, and exceptions.

- 6. Measure and reconsider** - Link funding to connection burden, lead time, reuse, production use, and realized value.

4.4 Deliverable outcome

Product or decision	Minimum content
Funding decision	Value, target audience, reuse scan, grounds for deviation, risks, management, and measurable effects.
Commissioning or grant framework	Minimum interoperability requirements, openness, documentation, portability, migration, data protection, and reporting.
Portfolio view	Existing initiatives and facilities, overlap, dependencies, and coherence.
Governance decision	Ownership, mandate, decision-making, change management, funding, and dispute resolution.

4.5 Five key questions

No.	Question for decision-making
1	Which public or societal value requires collaboration across initiative or sector boundaries?
2	Which generic agreement framework and/or generic facilities already exist, and why are they sufficient or not sufficient?
3	Which deviation is truly domain-specific, and how is that substantiated?
4	How will it be demonstrated that participants can connect and collaborate faster and with lower burden?
5	Who will manage and fund the result after the program or grant period ends?

4.6 Red flags

- A technology, service provider, or platform has been selected before value, participants, and reuse have been examined.
- The grant again funds identity, admission, catalog, or trust without comparison with existing functions and services.
- There is no owner or funding model for management after the project period.
- Interoperability is described only as a technical interface.
- A pilot has no predefined decision to scale, migrate, or stop.

4.7 Working questions

The purpose of the questions below is to prevent policy and funding from creating new fragmentation while preserving room for demonstrable domain value.

Value and public mandate

No.	Working question
1	What public, societal, or economic value should result from data sharing?
2	Which organizations, sectors, and end users should experience the effect?
3	Which measurable outcomes and time horizon correspond to the investment?

Portfolio and reuse

No.	Working question
4	Which existing initiatives, standards, services, and public building blocks have been examined?
5	Where do other programs fund comparable functions or agreements?
6	Which components are reused, federated, kept domain-specific, or made experimental?

Funding, commissioning, and market

No.	Working question
7	Are open interfaces, interoperability, documentation, portability, termination, and/or migration included as conditions?
8	Can the market offer services modularly, and can multiple service providers collaborate?
9	Are substantiated deviations time-bound and provided with a migration path?

Ownership and impact measurement

No.	Working question
10	Who manages definitions, agreements, profiles, trust anchors, and publicly funded facilities?
11	Who funds management and further development after the project or grant period?
12	How are connection burden, reuse, cross-boundary applications, and realized value measured and managed?

5 Existing data sharing initiatives

This target audience has already demonstrated value, operational services, and a base of participants and users. Further development should therefore focus on expanding services, increasing user numbers, and/or reducing costs based on a gradual migration path that safeguards current service delivery.

KEY CONCLUSION:

Protect existing domain value and create an explicit path toward connection. Preserve what works, but do not automatically treat historical choices as domain-specific necessities. Connect and migrate without a full rebuild.

5.1 Why this is relevant to you

Existing initiatives represent real value: participants, agreements, applications, investments, and domain expertise. The task is to preserve that value while reducing friction for participants who want to use data outside their own community.

A phased migration path is often more realistic than a full rebuild. Conversions between data models, adapters, mutual recognition, reference profiles, and reusable services can deliver results quickly. The participant experience is a more important measure than formal architectural compliance.

5.2 Conclusions for your role

- **Start with an honest assessment** - Make visible which choices add value and which have mainly grown historically.
- **First reduce concrete participant friction** - Focus on duplicate admission, contracting, metadata, semantics, and technical connection.
- **Use minimum interoperability mechanisms** - Full uniformity is often not required to realize a concrete cross-boundary application.
- **Treat migration as a program** - Work with phases, owners, compatibility, phase-out, and fallback options.
- **Test outside your own community** - A concrete application with another community reveals where assumptions do not hold.

5.3 Action perspective

1. **Inventory the current setup** - Record the governance of participation, agreements, standards, services, and funding separately.
2. **Create a participant friction map** - Measure repeated actions, lead time, costs, and operational bottlenecks.
3. **Classify components using the four choice directions** - Substantiate what is common, federated, domain-specific, or experimental.
4. **Map dependencies, portability, termination, and/or migration** - Analyze service providers, central authorities, data formats, contracts, and critical knowledge.
5. **Choose a minimum cross-boundary application** - Test with another community or participant what is truly needed.

- 6. Establish a migration and phase-out path** - Prioritize conversions, adapters, mutual recognition, reusable services, and legacy phase-out.

5.4 Deliverable outcome

Product or decision	Minimum content
Harmonization assessment	Classification by component, rationale, deviations, owners, and priorities.
Participant friction map	Admission, contracting, data discoverability, semantics, technology, management burden, and costs.
Dependencies and phase-out overview	Service providers, standards, central facilities, and data and configuration portability.
Migration path	Short-term measures, target profiles, compatibility, pilots, phase-out, and measurement points.

5.5 Five key questions

No.	Question for decision-making
1	Which current choices are essential to our domain value, legislation, or risks?
2	Where do participants repeat the same admission, verification, contracting, or integration steps?
3	Which functions can be reused as an existing service or be mutually recognized?
4	Which initiatives or participants must we demonstrably be able to collaborate with within two years?
5	Which dependency hinders future connection, combination, or switching, and how will we reduce it?

5.6 Red flags

- “Domain-specific” is used as a general defense without evidence for each choice.
- There is no data on participant burden, lead time, or connection costs.
- The development path contains only technical connections and no legal, semantic, or governance choices.
- There is no plan for portability, termination, or migration for critical service providers or custom components.
- Interoperability is tested only within the existing community.

5.7 Working questions

The purpose of the questions below is to preserve existing value while deliberately reducing participant friction, duplicate work, and future dependencies.

Value and participants

No.	Working question
1	Which current applications and participants constitute the initiative's demonstrable core value?
2	Which participants need data or services outside the current community?
3	Where do participants experience the greatest time, cost, or uncertainty when connecting and using the initiative?

Current choices and classification

No.	Working question
4	Which choices are truly domain-specific from a legal, semantic, or operational perspective?
5	Which generic functions are currently being built or managed in-house, and why?
6	Which components should become common, federate, remain domain-specific, or be temporarily experimental?

Interoperability and dependencies

No.	Working question
7	Which initiatives, profiles, catalogs, trust frameworks, and providers need to be able to work together?
8	Which service providers, central facilities, contracts, or knowledge constitute a critical dependency?
9	Which export and transfer options are available?

Migration and evidence

No.	Working question
10	Which minimum cross-boundary application can be tested within six months?
11	Which short-term measures will directly reduce the participant burden?
12	Which phases, owners, measurement points, and phase-out decisions does the migration path include?

6 New data sharing initiatives

This target audience has the opportunity to make substantiated decisions about interoperability, harmonization, and reuse of generic facilities from the outset, based on the many existing data sharing initiatives and the portfolio of building blocks offered by service providers.

KEY CONCLUSION:

Design from day one for connection, reuse, and exit readiness. Start with value and participants, not with a platform or service provider.

6.1 Why this is relevant to you

A new initiative can prevent new fragmentation. To achieve this, the decision-making sequence must be right: first the value challenge, participants, data sharing relationships, and conditions; then existing initiatives, functions, and services; and only after that architecture and service providers.

Not every application requires a new initiative. Sometimes connection to an existing initiative, temporary collaboration, a reusable service, or a bilateral data sharing relationship is sufficient. A start decision must explicitly weigh these alternatives.

6.2 Conclusions for your role

- **The value and validation question comes before infrastructure.** A pilot proves an effect or a critical assumption, not just that the technology works.
- **Reuse is the default.** A new variant requires an explicit reason and a future migration path.
- **Design for multiple communities and service providers.** Open interfaces, modular services, and portable configurations reduce later lock-in.
- **Make choices human- and machine-readable.** Publish roles, conditions, metadata, semantics, profiles, and supported standards.
- **Define the follow-up decision in advance.** Scale, adapt, migrate, or stop based on agreed criteria.

6.3 Action perspective

1. **Formulate the value and the critical assumptions.** Determine which outcome can only be achieved through data sharing with multiple parties.
2. **Describe participants, data, and relationships.** Record roles, rights, obligations, purposes, risks, and transactions.
3. **Conduct a reuse scan.** Examine existing initiatives, MAMI recommendations, standards, services, and European developments.
4. **Classify design choices.** Determine the appropriate choice direction for each component and record deviations.
5. **Select modularly and based on evidence.** Request open interfaces, interoperability tests, portability, termination options, migration, and clear service boundaries.
6. **Validate in a focused way.** Test value, trust, semantics, participant burden, and operational feasibility in a limited environment.

6.4 Deliverable outcome

Product or decision	Minimum content
Start decision	Value, need for a new initiative, alternatives, participants, risks, and success criteria.
Reuse scan	Existing initiatives, agreements, standards, services, building blocks, and substantiated deviations.
Decision and architecture log	Choice direction for each topic, rationale, owner, dependency, and reconsideration point.
Validation and scaling plan	Assumptions to be proven, measurement criteria, test environment, decision point, transferability, termination, and migration.

6.5 Five key questions

No.	Question for decision-making
1	Why is a new initiative needed, and which existing alternative is demonstrably insufficient?
2	Which value, participants, and data sharing relationships determine the minimum scope?
3	Which agreements, standards, and services will be reused from the start?
4	How can participants also establish trusted relationships outside this initiative or switch to another arrangement?
5	What concrete decision follows the pilot, and which evidence criteria determine that decision?

6.6 Red flags

- Procurement or technology selection starts before the value and participants have been established.
- The initiative develops its own admission or identity solution without a reuse scan.
- The pilot shows only a technical data transfer and has no business or governance decision.
- The solution requires one specific service provider or stack without export and migration options.
- There is no scenario for collaboration outside the first community.

6.7 Working questions

The purpose of the questions below is to prevent a new initiative from unnecessarily introducing new agreements, infrastructure, or dependency on service providers.

Necessity and value

No.	Working question
1	Which concrete application or public task requires collaboration among multiple autonomous parties?
2	Why is an existing initiative, existing service, or bilateral collaboration not sufficient?
3	Which assumptions about value, participation, and feasibility must first be proven?

Participants, data, and conditions

No.	Working question
4	Who are the data providers, data users, rights holders, administrators, and decision-makers?
5	Which data, purposes, terms of use, sensitivities, and legal restrictions are involved?
6	Which identity, authorities, attestations, logging, and audit are minimally required?

Reuse and design choices

No.	Working question
7	Which Dutch and European agreements, standards, profiles, and services will be reused?
8	Which components will be organized as common, federated, domain-specific, or experimental?
9	How are choices published in human-readable form and, where relevant, machine-readable form?

Service providers, validation, and follow-up

No.	Working question
10	Are components modular, combinable, transferable, and accessible through documented interfaces?
11	Which assumptions about value, trust, semantics, and interoperability will be tested in the pilot?
12	Which criteria determine whether to scale, adapt, migrate, or stop?

7 Service providers

This target audience can jointly offer a portfolio of data sharing services and building blocks that safeguard interoperability, can work together, and minimize costs through large-scale reuse by many data sharing initiatives.

KEY CONCLUSION:

Align with the standards, protocols and guidelines for data sharing that are being developed and adopted as part of the European Data Strategy. Aim for harmonization, interoperability and cost minimization. Compete on the price and quality of interoperable services, rather than through closed ecosystems and switching barriers. This direction also makes it easier to onboard a broader range of participants.

7.1 Why this is relevant to you

The market is not starting from scratch. Dutch service providers already offer infrastructure, identity, trust, connectivity, semantics, catalogs, security, advisory services, and operational support. The next step is to make the offering easier to find, compare, combine, and test.

Market dynamics and harmonization reinforce one another when providers compete on quality, assurance, ease of use, and domain expertise within open and interoperable boundaries. Customer loyalty through added value is legitimate; customer lock-in through closed interfaces and disproportionate switching costs is not. Enabling interoperability means thinking in terms of combinability, replaceability, and transferability. These fit with being open, modular, and exit-ready.

7.2 Conclusions for your role

- **Position one clear service function** - Make visible which problem the service solves and which responsibilities lie with the customer, provider, and third parties.
- **Use a shared service language** - Describe functionality, standards, interfaces, assurance, pricing model, and dependencies in a comparable way.
- **Prove interoperability** - Publish test results, supported profiles, references, and limitations.
- **Design for combination and replacement** - Support export, transfer, documented interfaces, and collaboration with other providers.
- **Offer practical validation options** - Demo, test, and sandbox environments make claims verifiable before a customer commits.

7.3 Action perspective

1. **Describe the service as a defined function** - Purpose, target audience, functions, boundaries, responsibilities, inputs, outputs, and dependencies.
2. **Publish interoperability information** - Standards, versions, profiles, interfaces, trust anchors, semantic support, and known limitations.
3. **Make assurance transparent** - Certifications, accreditations, audits, security, continuity, and incident handling.
4. **Safeguard transferability and termination** - Export formats, transfer process, configuration portability, notice periods, and costs.

5. **Test with other providers and initiatives** - Conduct reproducible interoperability tests and joint demonstrations.
6. **Make commercial terms transparent** - Pricing components, scaling factors, service levels, additional work, and boundaries of responsibility.

7.4 Deliverable outcome

Product or decision	Minimum content
Standard service description	Service function, target audience, interfaces, standards, dependencies, assurance, pricing model, transferability, termination, and migration.
Evidence of interoperability	Test scope, counterpart, profiles used, results, limitations, and validity period.
Plan for transferability, termination, and migration	Data, metadata, configurations, credentials, logging, transfer, termination, migration, and support.
Test offering	Demo, sandbox, or testbed with scenarios, boundary conditions, costs, and next steps.

7.5 Five key questions

No.	Question for decision-making
1	Which specific service function do we provide, and which part of the chain is demonstrably outside our responsibility?
2	With which initiatives, profiles, and services from other providers does our service demonstrably interoperate?
3	Which open standards and versions do we support, and which provider-specific dependencies do we introduce?
4	Can a customer transfer data, configuration, credentials, and operational knowledge without disproportionate costs?
5	What evidence supports our claims about compliance, trust, continuity, and interoperability?

7.6 Red flags

- The proposition claims to be “open” or “interoperable” without specified profiles and test evidence.
- Core configurations, metadata, or credentials cannot be exported.
- The customer/user must purchase multiple service functions as an inseparable bundle.
- Pricing and responsibility boundaries only become clear after selection.
- Collaboration with other providers has not been considered or is excluded contractually or technically.

7.7 Working questions

The purpose of the questions below is to make service functions comparable and combinable and to demonstrably substantiate claims about interoperability, trust, transferability, termination, and migration.

Proposition and responsibilities

No.	Working question
1	Which service function does the service provide, and for which target audience and use case?
2	Which responsibilities lie with the provider, the customer, a trust anchor, or another service?
3	What inputs, outputs, service boundaries, and dependencies does the service have?

Standards and interoperability

No.	Working question
4	Which open standards, versions, profiles, and interfaces are supported?
5	With which initiatives, connectors, and services from other providers has testing been demonstrably performed?
6	Which limitations, exceptions, and provider-specific components are present?

Assurance and operations

No.	Working question
7	Which certifications, accreditations, audits, and security measures support the claims?
8	How are continuity, incident handling, logging, support, and changes arranged?
9	How are pricing components, scaling factors, service levels, and additional work made transparent?

Portability and market development

No.	Working question
10	Which data, metadata, configurations, credentials, and log files can the customer export?
11	What support and costs apply to transfer, migration, or termination?
12	Which demo, sandbox, or testbed options make the proposition testable in advance?

8 Finally: taking shared responsibility

KEY CONCLUSION:

The goal for participants (organizations) is to share data more easily and with fewer dependencies. This requires different responsibilities from different stakeholders, but within a shared direction.

Each stakeholder has its own responsibility. Jointly, they must steer toward less duplicated effort, lower participant burden, more reuse, demonstrable trust, and more valuable data sharing use cases and application areas.

In this, interoperability, harmonization, and generic facilities are the means, for which all stakeholders have a responsibility from within their specific role.

8.1 Mutual responsibilities for different roles

The table below shows the mutual responsibilities for each of the roles.

Stakeholder	Primary decision	Provides to others	Receives from others
Participant	Participation and data-sharing relationship	- Data source - Data demand / data use - Practical experience: value and friction	- Clear conditions - Reusable connection - Control
Policymaker	Goals and conditions for policy and funding	- Mandate - Preconditions - Funding and procurement requirements	- Portfolio insight - Effects and implementation evidence
Data-sharing initiative (new or existing)	Start, design, connection, and development / migration path	- Explicit design choices - Functioning community - Interoperability and harmonization resources (profiles, conversions, etc.)	- Participant needs and reusable generic facilities - Recognition and funding room
Service provider	Service development and assurances	- Interoperable services - Evidence and test environments - Roadmap	- Clear demand - Market access - Feedback

8.2 Five shared measurement points

The following five measurement points can be used for the different stakeholders / rollen on their shared path toward interoperability, harmonization and reuse:

- 1. Connection burden** - Time, cost, and number of repeated actions required to enable a participant to take part operationally.
- 2. Reuse** - Share of agreements, profiles, services, credentials, metadata, and data model conversions that are reused.
- 3. Working cross-boundary relationships** - Number of applications and transactions between participants from different data-sharing initiatives or domains.

4. **Switching and migration capability** - Time, cost, and data loss involved in replacement, combination, phase-out, or modification.
5. **Realized value** - Public, societal, operational, or economic effects that would not have been achievable without data sharing.

8.3 Role of CoE-DSC

As a neutral knowledge and connecting organization, the CoE-DSC will support the application of this directional guide. Its role consists of disseminating and explaining methods, knowledge and concepts, facilitating assessments and organizing working sessions. These to support data sharing initiatives in their interoperability and harmonization efforts. It can build upon its expertise and knowledge on the MAMI, DSSC, and European developments, in combination with market capabilities and practical lessons.

CoE-DSC can	CoE-DSC is not
Facilitate, connect, coach, validate, share knowledge, and safeguard market neutrality and interoperability.	An owner, preferred service provider, central procurement organization, or mandatory technical authority.

8.4 Practical first steps

As an entry point for the shared path toward interoperability, harmonization and reuse, the following practical first steps can be taken:

- **Select three different practical cases** - An existing initiative, a new initiative, and a participant or service-provider question.
- **Use the checklists for the stakeholders / target groups** - Record answers, evidence, deviations, and open points.
- **Choose one concrete decision** - For example, funding, migration, service selection, or participation.
- **Measure participant burden and reuse** - Make visible which friction actually decreases.
- **Update this directional guide iteratively** - Use practical experience to refine questions, examples, and tools.

Appendix A. The Common Carrier Layer

The Common Carrier Layer (CCL) is a reference concept for interoperability, harmonization, and reusable data sharing facilities to enable data sharing across different data sharing initiatives. It provides an architecture vision that aligns with and builds on previous initiatives, including the participant-driven approach described in the CoE-DSC position paper ¹², the data space blueprint and building blocks as shaped by the Data Spaces Support Centre (DSSC) ¹³, and the CoE-DSC Data Sharing Strategy Model (DSSM) ¹⁴.

A.1 Principles

The Common Carrier Layer is based on the following design principles.

- **Data remains at the source** - The CCL does not transport data through a central platform and does not provide central storage. Data remains under the control of the data owner and is shared or made available only under agreed conditions.
- **Federation over centralization** - The CCL is based on a federated model in which multiple organizations jointly realize interoperability. Registries, trust facilities, and catalogs can be organized in a distributed way as long as they are interoperable.
- **Open standards over closed solutions** - Interoperability is created by applying open, broadly supported standards. The CCL does not prescribe service providers, products, or implementations, but defines the agreements and standards with which solutions must comply.
- **Separation between control and transport** - The architecture is based on standardized data sharing protocols that separate:
 - Controlling the data sharing process through a **Control Plane**. The Data Space Protocol (DSP) is the primary standard for the Control Plane. The DSP includes standards for publishing metadata, exchanging policies, negotiating contracts, and initiating data transfer. The DSP does not itself transport data.
 - The actual transport or transfer of data through a **Data Plane**. This takes place via well-known transport protocols such as HTTPS, MQTT, or Kafka.

This separation makes it possible to use different transport mechanisms side by side without losing interoperability.

- **Reuse over redevelopment** - Generic facilities are developed once and reused by multiple data sharing initiatives when possible. Domain-specific functionality remains part of specific data sharing initiatives.

¹² CoE-DSC. "Towards Scalable Data Space Interoperability and Federation - A Combined Community-Driven and Participation-Driven Approach based on a Common Carrier Layer - CoE-DSC Discussion Paper". <https://coe-dsc.nl/towards-a-common-carrier-layer-for-large-scale-data-space-interoperability-and-federation>.

¹³ Data Spaces Support Centre (DSSC). "DSSC Blueprint v3". 2025. <https://blueprint.dssc.eu>.

¹⁴ CoE-DSC. "From Fragmentation to Alignment: Leveraging DSSM for Dataspace Interoperability". <https://coe-dsc.nl/files/fragmentation-to-alignment>.

A.2 Basic functions

The Common Carrier Layer consists of a number of logically connected basic capabilities:

- **Discoverability and access:** federation of metadata catalogs makes data broadly available.
Data sharing at scale requires datasets, data services, participants, algorithms, conditions, and facilities to be discoverable and understandable by authorized parties, preferably across the boundaries of individual data sharing initiatives. Federated metadata catalogs make this possible. Relevant standards include DCAT, JSON-LD, OpenAPI, and RDF. Important aspects include provenance, quality, usage conditions, terms of use, and references to semantic models.
- **Data sovereignty and trust:** aligned trust frameworks are a prerequisite.
Data sovereignty means that entitled rights holders or responsible parties can determine who receives data, for what purpose, under what conditions, and with what safeguards. Trust means that data sovereignty can be guaranteed by a data sharing initiative.
Data sovereignty and trust are organized through a trust framework. This is especially relevant when sharing sensitive data, such as commercially, operationally, or privacy-sensitive data.
The CCL provides the building blocks for a trust framework. For data sovereignty, it supports defining and enforcing (for example) usage rights, usage restrictions, purpose limitation, obligations, onward-sharing conditions, and retention periods. These are based on the standardized and machine-readable ODRL language. For trust, it includes mechanisms for reliable organizational identities, verifiable credentials, federated trust anchors, digital signing, and legally binding data sharing contracts for transactions.
Within a bounded data sharing initiative, a specific community-driven trust framework may be appropriate. For data sharing across data sharing initiatives, trust frameworks must be aligned so that they are mutually trusted. This can be done in different ways. Community-driven trust frameworks can be made interoperable with one another through federation or connected through an overarching trust authority. As an alternative, a participant-driven approach is also envisioned, in which participants themselves take the lead in establishing trusted data sharing relationships with one another, made legally binding with digital signatures, for example as made available under the EU eIDAS Regulation.
- **Data interoperability:** semantic technology makes data machine-readable.
Large-scale reuse of data requires participants—increasingly represented through also computers—to understand what shared data means. Semantics and semantic technology enable this data interoperability. This does not require all data sharing initiatives and participants to use one and the same data model. It does mean that the concepts, relationships, translations, application profiles, and technical schemas are semantically described, discoverable, manageable, and reusable, so that different data models can be converted to one another at runtime. This lowers connection costs, reduces interpretation differences, and accelerates new applications. Semantic technology for data interoperability therefore becomes a prerequisite for large-scale adoption. Developments in AI are rapidly maturing to facilitate semantic translations and making it broadly applicable.
- **Technical interoperability:** protocols and standards remove harmonization barriers.
Technical interoperability ensures that systems can be connected easily and quickly. This requires the adoption of open standards and protocols for interoperability and harmonization in data exchange between data sharing initiatives and their participants. These standards include (a.o.) the Data Space Protocol (DSP), the Trusted Data Transaction standard and self-sovereign digital identities based on Verifiable Credentials (SSI / VCs).
The realization of technical interoperability is supported by open-source reference implementations of building blocks based on these standards, for example as developed by the EU SIMPL and Eclipse Dataspace Components (EDC) initiatives. These include both connectors for connecting to a data sharing initiative and building blocks for reusable facilities.

With these basic functions, the CCL provides the generic facilities needed to enable interoperability and harmonization. Data sharing initiatives can use and build on them. This creates a layered architecture in which generic interoperability and domain-specific value creation reinforce rather than overlap with each other, see also annex A.5. Individual data sharing initiatives remain responsible for their own governance, legal agreements, semantic models, quality agreements, certification, participation, and community building.

A.3 Reference framework for interoperability and harmonization

The CCL provides a reference framework for developing common facilities as a basis for interoperability, harmonization and reuse. The CCL consists of two parts:

- **Generic data sharing facilities across data sharing initiatives**

Large-scale interoperability among participants across the boundaries of data sharing initiatives is enabled by harmonization based on reusable common facilities. These include each of the fundamental functions that require harmonization, as described in the previous section: discoverability and access, data sovereignty and trust, data interoperability, and technical interoperability. The purpose is, on the one hand, to facilitate harmonization and interoperability among data sharing initiatives and participants and, on the other hand, to reduce the individual costs for each data sharing initiative through reuse of common facilities.

- **The building blocks for the bilateral participant-driven data sharing approach**

To enable bilateral federated data sharing transactions, the CCL specifically provides the capabilities to establish bilateral, legally binding, data sharing contracts based contract negotiation and electronic signing by means of existing EU eIDAS services, thereby safeguarding the fundamental precondition of data sovereignty and trust. In this way, the CCL prevents participants from having to onboard unnecessarily to different data sharing initiatives, reducing both connection burdens and contractual pressure.

With these two parts, the CCL enables an efficient design of data sharing facilities, interoperability and harmonization, and facilitates new cross-domain applications and business models. It is explicitly stated that the CCL is an aligned design choice for new and existing data sharing initiatives, and not a new or central platform with its own facilities.

A.4 Reference standards

The standards in the table below fit within the framework of the Common Carrier Layer.

Architecture component	Guiding standard
Metadata	DCAT
Policies	ODRL
Contract negotiation	Data Space Protocol (DSP)
Data Transaction	Trusted Data Transaction
Data space Connector	Eclipse Dataspace Components (EDC) or equivalent
API descriptions	OpenAPI
Semantics	RDF, JSON-LD, SKOS, OWL
Authentication	OpenID Connect
Authorization	OAuth 2.1
Verifiable Credentials	W3C VC
Digital identity	EUDI Wallet / eIDAS 2.0
Eventing	CloudEvents

Streaming	MQTT, Kafka
Logging & observability	OpenTelemetry

This list is intended as guidance and will evolve as additional international standards become available.

A.5 Separation of responsibilities

The CCL enables a separation of responsibilities between the community-driven and participant-driven approaches. Over time, and under adequate governance, the CCL can thereby provide a shared basis for multiple community-driven initiatives, use cases and application areas. It can form the foundation for a layered business and technical approach to the data sharing ecosystem.

This separation of responsibilities facilitates the development of innovative business models. The implementation of domain-specific use cases can benefit from the reusable generic data sharing facilities provided by the CCL, while participants in the CCL can in turn make use of the claims and credentials associated with participation in specific data sharing initiatives. Layered or hybrid business and technical architectures can emerge from this combination, each with opportunities for new usage scenarios. This layering in business and technical architectures is shown in Figure 2.

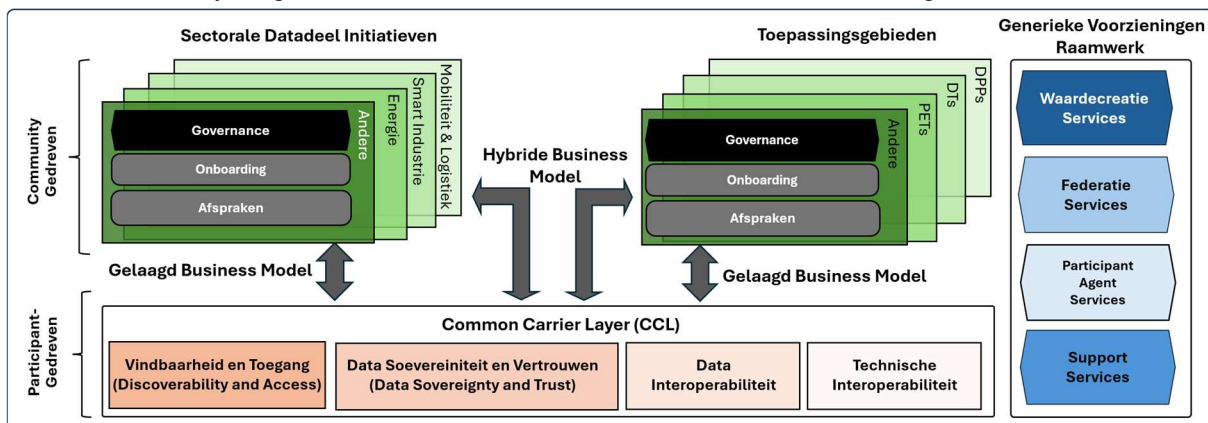


Figure 2: Layered business and technical architecture through the combination of the community-driven and participant-driven data sharing approaches, enabled by the CCL.

Appendix B. Models and further information

This appendix brings together the models and further information underlying this directional guide. It is intended to further support design choices regarding interoperability, harmonization, and the reuse of facilities.

B.1 Harmonization topics: selective harmonization

The table below shows the different topics in which harmonization can be considered and pursued. Data sharing initiatives should harmonize only those topics where this demonstrably creates value, for example by enabling new use cases or application areas, promoting adoption, or minimizing costs. This is referred to as “selective harmonization.” A categorization is made between business topics and technical topics.

Business	
Topic	Scope
Governance decision-making of and management	Mandate, ownership, change processes, funding, accreditation, supervision, migration, and dispute resolution.
Services and market development	Participant services, federation services, support services, and value-creating services offered in a modular and reusable way.
Migration and adoption	Assessments, adapters, conversions, reference profiles, mutual recognition, pilots, phase-out, and participant guidance.
Technical	
Topic	Scope
Metadata, discoverability, and access	Descriptions of data, services, participants, conditions, provenance, quality, and timeliness; discoverable centrally or federatively.
Trust and data sovereignty	Identity, authorization, attestations, rights, obligations, policies, contracting, transparency, logging, audit, and enforcement.
Semantics and machine processability	Concepts, vocabularies, ontologies, application profiles, schemas, and data-model conversions that both people and computers can interpret.
Technical interoperability	Open interfaces, connectors, control plane and data plane, protocols, profiles, security, and compatibility.

B.2 Minimal interoperability: MAMI

MAMI stands for “Minimal Agreements for Maximum Interoperability”. The MAMI framework provides no-regret recommendations to make design choices explicit on interoperability ¹⁵.

Its specific recommendations are grouped around trust and data sovereignty, semantics, discoverability, and connectivity. MAMI can be used for an individual assessment, comparison across initiatives, service development, and policy or procurement conditions.

- **For one initiative** - Plot which recommendations are followed now, later, or are deliberately not followed, and incorporate this into the development plan.
- **For multiple initiatives** - Compare plots, identify matches, conflicts, and blind spots, and determine the optimal harmonization or interoperability approach for each topic.
- **For policymakers** - Use recommendations in tenders, grants, and policy conditions to promote and monitor interoperability.
- **For service providers** - Match service capabilities with needs and design services for generic and sector-specific interoperability questions.

B.3 Interoperability perspectives: community-driven and participant-driven

In this directional guide, the distinction, importance, and complementarity of the community-driven and participant-driven perspectives on interoperability and harmonization are addressed in several places; see Chapter 2 and Appendix A.

A community-driven approach to data sharing organizes common value and rules for a defined group under the direction of a joint governance authority. The participant-driven approach to data sharing enables dynamic data sharing relationships to be bilaterally established and managed by individual participants (organizations).

The two approaches can coexist and reuse functions and services, enabling new business models and application areas. A possible layered design of the business and technical architecture, with separation of responsibilities based on the CCL, provides the foundation for this. In this design, generic facilities for discoverability and access, data sovereignty and trust, data interoperability, and technical interoperability become available more independently of any single data sharing initiative ¹⁶. See also appendix A.5.

For that reason, the CCL should be considered as a reference framework for interoperability and harmonization.

Application rule:

Use the CCL as a conceptual model for interoperability, harmonization, and the reuse of facilities across data-sharing initiatives. The CCL offers a coordinated design approach for (new and existing) data-sharing initiatives, rather than a new or central platform with its own governance and infrastructure. Therefore, do not consider it as a mandatory platform, a fixed architecture, or a replacement for domain-specific data-sharing initiatives.

¹⁵ CoE-DSC. “MAMI Framework - Minimal Agreements for Maximal Interoperability”. January 2026. <https://coe-dsc.nl/wp-content/uploads/2026/03/2026-January-MAMI-Framework-2026-report-v1.0.0.pdf>.

¹⁶ CoE-DSC. “Towards Scalable Data Space Interoperability and Federation - A Combined Community-Driven and Participation-Driven Approach based on a Common Carrier Layer - CoE-DSC Discussion Paper”. <https://coe-dsc.nl/towards-a-common-carrier-layer-for-large-scale-data-space-interoperability-and-federation>.

B.4 Generic facilities/services: four categories

As shown on the right-hand side of Figure 2, four categories of generic facilities are distinguished, in line with the Data Sharing Strategy Model (DSSM) ¹⁷ and the building blocks in the data space blueprint of the EU Data Spaces Support Centre (DSSC) initiative ¹⁸.

These facilities can be organized centrally or federatively, provided that they function interoperably.

Category	Function
Value-creation services	Services that directly deliver societal, economic, policy, or operational value using shared data.
Federation services	Services for collaboration among participants, initiatives, communities, and providers, such as discoverability, trust, and semantic alignment.
Participant-agent services	Services close to the participant for onboarding, enforcement of policy and usage rules, contracting, and controlled data exchange.
Support services	Services for adoption, admission, compliance, training, management, continuity, and operational support.

A detailed elaboration of each category into a set of possible services is available as further background information of the DSSM on the CoE-DSC website ¹⁷.

B.5 Migration mechanisms

The following mechanisms can be considered when migrating data sharing initiatives toward an interoperable and harmonized target state:

- **Mutual acknowledgement** – Initiatives and participants acknowledge each other's identity, attestations, participant status, or assurance under defined conditions.
- **Reference profiles** - Multiple implementations follow a minimal common configuration of standards and interfaces.
- **Proxies and converters** - Semantic, contractual, or technical differences are explicitly converted without full uniformity.
- **Adapters** - Existing systems receive a limited integration layer to connect to a new profile or service.
- **Parallel support** - Old and new mechanisms temporarily coexist with a clear phase-out date.
- **Reuse of services** - Generic functions are consumed as services while domain-specific processes are retained.

B.6 Further background

This directional guide elaborates on a number of more detailed reports from CoE-DSC activities. These are available on the CoE-DSC website. Readers are referred to these sources for further detail.

- **CoE-DSC information sources on the community-driven and participant-driven approaches:**
The introduction of a participant-driven approach in addition to a community-driven approach, enabled by a CCL, is now widely discussed as a methodology for harmonization and large-scale

¹⁷ CoE-DSC. "From Fragmentation to Alignment: Leveraging DSSM for Dataspace Interoperability". <https://coe-dsc.nl/files/fragmentation-to-alignment>.

¹⁸ Data Spaces Support Centre (DSSC). "DSSC Blueprint v3". 2025. <https://blueprint.dssc.eu>.

interoperability in Dutch and EU data sharing developments in the mobility sector, and is certainly relevant for other sectors as well. Additional elaboration is available on the CoE-DSC webpage:

- CoE-DSC. "Towards Scalable Data Space Interoperability and Federation - A Combined Community-Driven and Participation-Driven Approach based on a Common Carrier Layer - CoE-DSC Discussion Paper". <https://coe-dsc.nl/towards-a-common-carrier-layer-for-large-scale-data-space-interoperability-and-federation>.
- S. Pretzsch, H. Bastiaansen, B. Farias Lóscio, K. Chawla, P. Mulder, S. Udayan, G. Kruithof. "Towards a Common Carrier Layer - A First Step for a Participant-Driven Data Sharing Approach for Data Spaces". *Accepted as a chapter for the DSSC book, scheduled for publication in Q4 2026. Concept version is available on the CoE-DSC website: <https://coe-dsc.nl/wp-content/uploads/2025/12/coe-dsc-a-participant-driven-data-sharing-model-for-data-spaces.pdf>.*

- **CoE-DSC information sources on trust frameworks:**

Data sovereignty is essential when developing data sharing initiatives, use cases, and infrastructures. Data sovereignty gives "entitled data holders" the means to define and enforce the conditions under which their sensitive data is shared. Trust and trust frameworks are fundamental to safeguarding data sovereignty; without them, the sharing of sensitive data can be hindered. Trust frameworks include, for example, identity and attestation management, the definition and enforcement of terms of use, legally valid data sharing contracts, and accreditation and auditing of trust-service providers.

Because of the major importance of trust and trust frameworks for interoperability across data sharing initiatives, CoE-DSC actively addresses these topics and has made additional information available:

- CoE-DSC. "Cross-Cutting Trust Frameworks to Support Cross-Community Data Sharing Use Cases – Overview and Elaboration Paper", December 2025. <https://coe-dsc.nl/wp-content/uploads/2025/12/CoE-DSC-Cross-Cutting-Trust-Frameworks-to-support-Data-sharing-across-Communities.pdf>.
- CoE-DSC. "The Need and Role for Neutral Orchestrators of Cross-Community Trust Frameworks – Call to Action", December 2025. <https://coe-dsc.nl/wp-content/uploads/2025/12/CoE-DSC-The-Need-and-Role-for-Neutral-Orchestrators-of-Cross-Community-Trust-Frameworks.pdf>.

- **CoE-DSC information sources on the Data Sharing Strategy Model (DSSM)**

The DSSM is a common framework for policymakers, program leaders, and architects to discuss direction, design choices, and market development. The model classifies the need for interoperability and harmonization using two dimensions: (1) differentiation—generic, reusable across sectors and initiatives, versus specific, linked to a particular sector, use case, or context; and (2) dynamics—stable, mature and predictable, versus responsive, still evolving under the influence of regulation, technology, or practice. Additional information is available under the CoE-DSC umbrella:

- CoE-DSC. "From Fragmentation to Alignment: Leveraging the DSSM for Dataspace Interoperability". 2026. <https://coe-dsc.nl/files/fragmentation-to-alignment>.
- G. van Houwelingen, M. Punter, F. Berkers, C. Stolwijk, A. Stoter. "The influence of the emerging service provider market on the data space business model". *Accepted as a chapter for the DSSC book, scheduled for publication in Q4 2026. Concept version is available on the CoE-DSC website: <https://coe-dsc.nl/files/influence-of-emerging-service-provider-market>.*

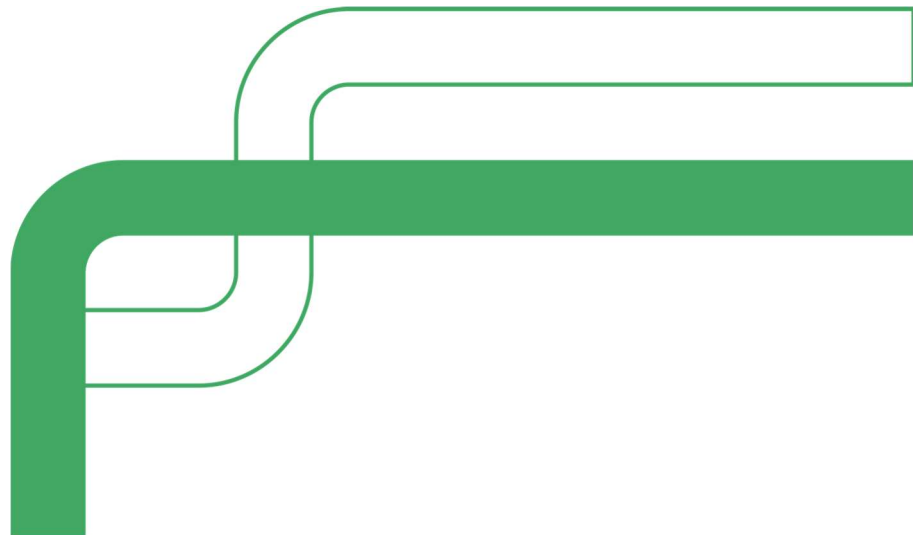
- **CoE-DSC information sources on interoperability between data sharing initiatives**

Within the CoE-DSC, the MAMI (Minimal Agreements for Maximum Interoperability) framework is being developed to support interoperability between data sharing initiatives. It is a concise list of jointly developed and broadly supported recommendations for interoperable data sharing between data sharing initiatives. Additional information is available on the CoE-DSC website:

- CoE-DSC. "MAMI Framework - Minimal Agreements for Maximal Interoperability". January 2026. <https://coe-dsc.nl/wp-content/uploads/2026/03/2026-January-MAMI-Framework-2026-report-v1.0.0.pdf>.

Annex C. Vocabulary

Term	Working definition in this directional guide
Data sharing initiative	An organized collaboration in which multiple parties develop agreements, capabilities, or processes to share or reuse data responsibly between organizations.
Data space	An interoperable system of agreements and capabilities that enables autonomous participants to enter into trusted data transactions.
Participant	An organization or actor that provides data, uses data, or fulfills another role in a data sharing initiative or data space.
Harmonization	Targeted alignment of definitions, agreements, standards, processes, capabilities, or governance to enable collaboration and reuse.
Selective harmonization	Aligning only those components where variation demonstrably impedes value, interoperability, trust, scalability, adoption, or reuse.
Federation	Connecting autonomous parties or initiatives through shared or mutually recognized agreements, interfaces, standards, transformations, or trust mechanisms.
Interoperability	The ability of organizations, agreements, processes, data, and systems to work together reliably and meaningfully.
Data sovereignty	The ability of entitled or responsible parties to exercise control over access to and use of data.
Trust framework	A coherent set of rules, roles, assurance, identity, authority, attestations, policies, and controls used to establish trusted data sharing relationships.
Metadata	Data that describes other data or services, such as origin, meaning, quality, timeliness, and terms of use.
Semantics	The meaning of data, concepts, relationships, and context.
Exit option	The ability to replace or leave a service, service provider, standard, or capability without disproportionate costs, data loss, or continuity risk.



Colophon

This directional guide was prepared by the Centre of Excellence for Data Sharing and Cloud (CoE-DSC, www.coe-dsc.nl). It was developed to provide policymakers, clients, programs, architects, service providers, and knowledge partners of new and existing data sharing initiatives with guidance for enabling cross-domain data sharing applications through harmonization and the design of shared capabilities. The framework helps make the related choices explicit and explainable.

Contributions

- E. Bouwman, F Haijenga NimbleNova
- H. Bastiaansen, B. Farias Loscio TNO

Reviewers

- P. Verhagen InnoPay
- G. Kruithof, G. van Houwelingen, C. van der Weerd, P. Verkoulen TNO

Contact

- Centre of Excellence for Data Sharing and Cloud (CoE-DSC)
- E-mail — info@coe-dsc.nl
- Website — www.coe-dsc.nl

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