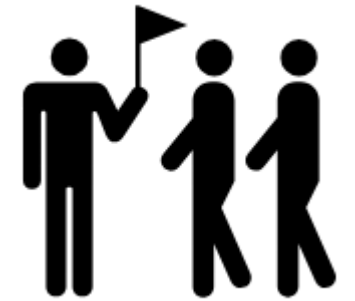


Data Interoperability and Semantics

< Part 5. The European Data Strategy >



A guided tour !

ICM – Toolbox Engineering and Interoperability of Software Systems – Course unit on Data Interoperability and Semantics

M1 Cyber Physical and Social Systems – Course unit on Data Interoperability and Semantics

Maxime Lefrançois <https://maxime-lefrancois.info>

Course unit URL: <https://ci.mines-stetienne.fr/cps2/course/data>

European data strategy

Making the EU a role model for a society empowered by data

The European data strategy aims to make the EU a leader in a data-driven society. Creating a single market for data will allow it to flow freely within the EU and across sectors for the benefit of businesses, researchers and public administrations.

Digital Package - Data teaser



CONSCIOUS ENERGY CONSUMPTION

Access to data and the ability to use it are essential for innovation and growth. Data-driven innovation can bring major and concrete benefits, such as

- personalised medicine
- improved mobility
- better policymaking
- upgrading public services

1)



https://ec.europa.eu/commission/presscorner/detail/en/fs_20_283

2)



<https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy>

Data Interoperability and Semantics

Outline

- < Part 5. The European Data Strategy >
 - Part 5.1. The European legislation on open data
 - Part 5.2. The General Data Protection Regulation (GDPR)
 - Part 5.3. The Data Governance Act (DGA)
 - Part 5.4. The Data Act
 - Part 5.5. Data Spaces

ICM – Computer Science Major – Course unit on Data Interoperability and Semantics

M1 Cyber Physical and Social Systems – Course unit on Data Interoperability and Semantics

Maxime Lefrançois <https://maxime-lefrancois.info>

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Data Interoperability and Semantics

Part 5. The value of data

Part 5.1. The European legislation on open data

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European legislation on open data

(adopted 05/2022 – applicable 09/2023)

The Directive on open data and the re-use of public sector information provides common rules for a European market for government-held data.

The **“Open Data Directive”** (EU) 2019/1024 entered into force on 16 July 2019

It replaced the **Public Sector Information (PSI) Directive** of 2003.

EU countries had to transpose Directive (EU) 2019/1024 by 16 July 2021.

The **Commission Implementing Regulation (EU) 2023/138** adopted a list of specific high-value datasets by way of an implementing act.

1)



<https://digital-strategy.ec.europa.eu/en/policies/legislation-open-data>

European legislation on open data

(adopted 05/2022 – applicable 09/2023)

20.1.2023

EN

Official Journal of the European Union

L 19/43

COMMISSION IMPLEMENTING REGULATION (EU) 2023/138

of 21 December 2022

laying down a list of specific high-value datasets and the arrangements for their publication and re-use

(Text with EEA relevance)

The **Commission Implementing Regulation (EU) 2023/138** adopted a list of specific high-value datasets by way of an implementing act.

2)



http://data.europa.eu/eli/reg_impl/2023/138/oj

Actual impact (FR)

The screenshot shows the Etalab website with the header "Etalab Politique publique de la donnée". Below the header, there is a navigation bar with links: Etalab, Programmes, Plateformes, Historique, and Actualités. The main content area is titled "Plateformes" and displays a grid of 12 data platforms, each with an icon, a name, and a brief description.

Platform	Description
data.gouv.fr	diffuse l'ensemble des données publiques de l'État français
transport.data.gouv.fr	rassemble les données de toute l'offre de mobilité française
entreprise.data.gouv.fr	diffuse les informations publiques des entreprises et associations de France
app.dvf.etalab.gouv.fr	permet de diffuser les données de demandes de valeurs foncières
cadastre.data.gouv.fr	permet de consulter, télécharger et intégrer facilement les données cadastrales
adresse.data.gouv.fr	référence l'intégralité des adresses du territoire et les rendre utilisables par tous
geo.data.gouv.fr	permet de trouver facilement les données géographiques dont vous avez besoin
code.gouv.fr	permet de consulter la liste des codes sources ouverts par des organismes publics
sill.code.gouv.fr	permet d'accéder au Socle interministériel de logiciels libres
api.gouv.fr	référence l'ensemble des API de l'État
entreprise.api.gouv.fr	permet d'échanger des données entreprises via une API pour simplifier leurs démarches
particulier.api.gouv.fr	simplifie les démarches des usagers en permettant l'échange d'informations

<https://www.etalab.gouv.fr/>

The screenshot shows the meteo.data.gouv.fr website. The header includes the French Republic logo and the Météo France logo. The main heading is "La météo et le climat en Open Data". Below this, a paragraph states: "meteo.data.gouv.fr vise à référencer, héberger et diffuser les données publiques météorologiques produites par Météo-France. Vous y trouverez des données téléchargeables et utilisables de manière libre et gratuite." At the bottom, there is a search bar with the text "Rechercher un jeu de données" and a button labeled "Recherche guidée".

<https://meteo.data.gouv.fr/>

The screenshot shows the recherche.data.gouv.fr website. The header includes the French Republic logo and the text "recherche.data.gouv.fr". Below the header, there is a search bar with the text "Rechercher sur le site" and a search icon. The main content area has a green background with the text "Un écosystème au service du partage et de l'ouverture des données de la recherche". At the bottom, there is a white box with the text "Fédérer, Accompagner, Partager, Ouvrir, Réutiliser".

<https://transport.data.gouv.fr/>

Data Interoperability and Semantics

Part 5. The value of data

Part 5.2. The General Data Protection Regulation (GDPR)

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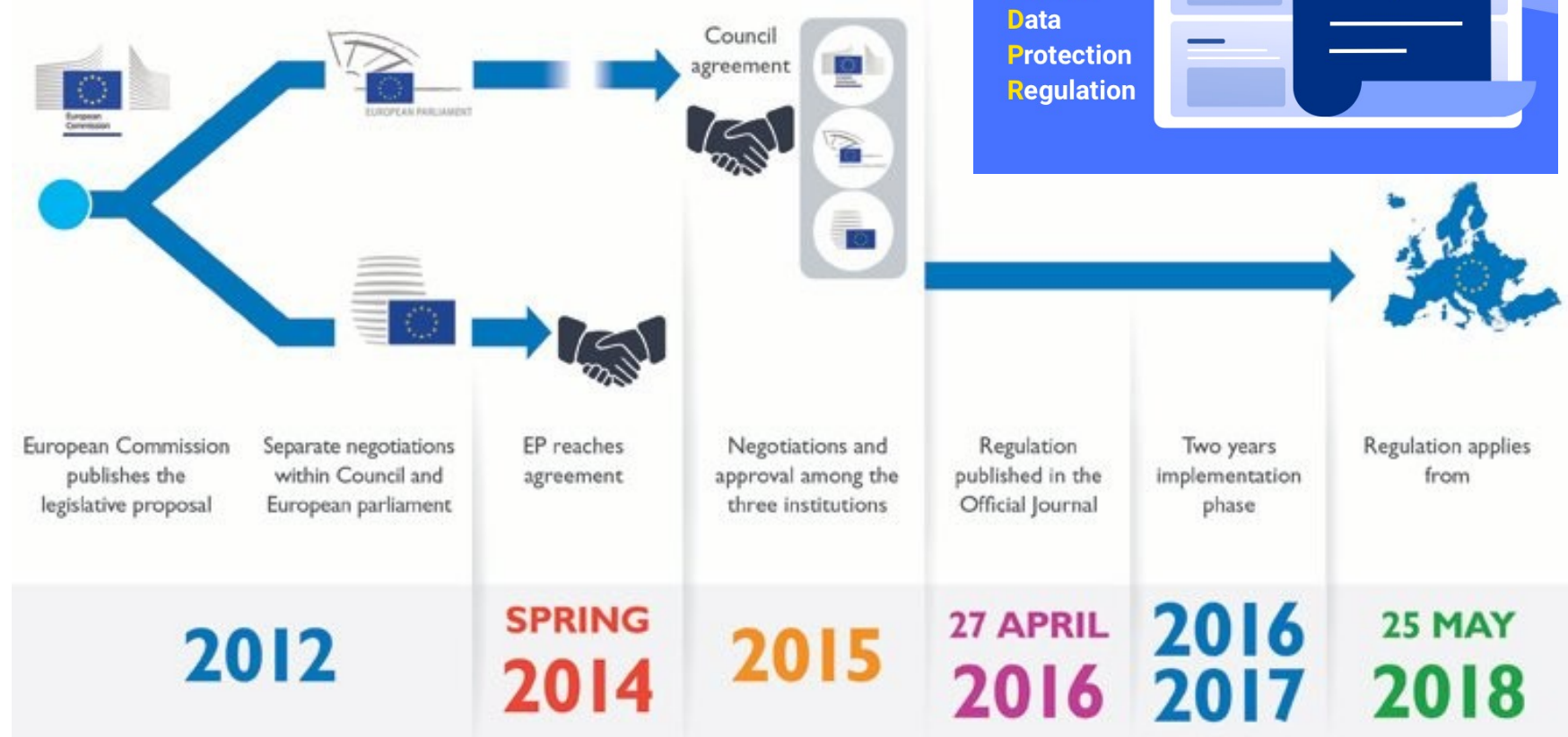
Maxime Lefrançois <https://maxime-lefrancois.info>

Course unit URL: <https://ci.mines-stetienne.fr/cps2/course/data>

General Data Protection Regulation (GDPR) (2016)

<https://gdpr.eu/>

- Requiring the consent of subjects for data processing
- Anonymizing collected data to protect privacy
- Providing data breach notifications
- Safely handling the transfer of data across borders
- Requiring certain companies to appoint a data protection officer to oversee GDPR compliance



General Data Protection Regulation (GDPR) (2016)

<https://gdpr.eu/>



[Home](#) [Checklist](#) [FAQ](#) [GDPR](#) [News & Updates](#)

Complete guide to GDPR compliance

GDPR.eu is a resource for organizations and individuals researching the General Data Protection Regulation. Here you'll find a library of straightforward and up-to-date information to help organizations achieve GDPR compliance.



Data Interoperability and Semantics

Part 5. The value of data

Part 5.3. The Data Governance Act (DGA)

ICM – Toolbox Engineering and Interoperability of Software Systems – Course unit on Data Interoperability and Semantics

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Course unit URL: <https://ci.mines-stetienne.fr/cps2/course/data>

The European Data Governance Act

(adopted 05/2022 – applicable 09/2023)



1)



<https://digital-strategy.ec.europa.eu/en/library/data-governance-act>

The European Data Governance Act

(adopted 05/2022 – applicable 09/2023)

3.6.2022

EN

Official Journal of the European Union

L 152/1

REGULATION (EU) 2022/868 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 30 May 2022

on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act)

(Text with EEA relevance)

<http://data.europa.eu/eli/reg/2022/868/oj>

Setting up a new European way of data governance will facilitate data sharing across sectors and Member States. It will create wealth for society, and provide control to citizens and trust to companies.

2)



<https://digital-strategy.ec.europa.eu/en/policies/data-governance-act-explained>

Data Interoperability and Semantics

Part 5. The value of data

Part 5.4. The Data Act

ICM – Toolbox Engineering and Interoperability of Software Systems – Course unit on Data Interoperability and Semantics

M1 Cyber Physical and Social Systems – Course unit on Data Interoperability and Semantics

Maxime Lefrançois <https://maxime-lefrancois.info>

Course unit URL: <https://ci.mines-stetienne.fr/cps2/course/data>

The European Data Act

(adopted 01/2024 – applicable 09/2025)



1)



<https://ec.europa.eu/newsroom/dae/redirection/document/83517>

The European Data Act

(adopted 01/2024 – applicable 09/2025)



Official Journal
of the European Union

EN
Series L

2023/2854

22.12.2023

REGULATION (EU) 2023/2854 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 13 December 2023

on harmonised rules on fair access to and use of data and amending Regulation (EU) 2017/2394 and Directive (EU) 2020/1828
(Data Act)

(Text with EEA relevance)

<http://data.europa.eu/eli/reg/2023/2854/oj>

The Data Act will make **more data available** for use. It will set up rules on who can use and access what data for which purposes across all economic sectors in the EU.

2)



<https://digital-strategy.ec.europa.eu/en/factpages/data-act-explained>

The European Data Act

(adopted 01/2024 – applicable 09/2025)

Chapter VIII – Interoperability

Article 33 – Essential requirements regarding interoperability of data, of data sharing mechanisms and services, as well as of common European data spaces

- Participants in data spaces that offer data or data services to other participants shall comply with the following essential requirements to facilitate the interoperability of data, of data sharing mechanisms and services, as well as of common European data spaces which are purpose- or sector-specific or cross-sectoral interoperable frameworks for common standards and practices to share:
 - the dataset content, use restrictions, licences, data collection methodology, data quality and uncertainty shall be sufficiently described, where applicable, in a machine-readable format, to allow the recipient to find, access and use the data
 - the data structures, data formats, vocabularies, classification schemes, taxonomies and code lists, where available, shall be described in a publicly available and consistent manner
 - the technical means to access the data, such as application programming interfaces, and their terms of use and quality of service shall be sufficiently described to enable automatic access and transmission of data between parties, including continuously, in bulk download or in real-time in a machine-readable format where that is technically feasible and does not hamper the good functioning of the connected product
 - where applicable, the means to enable the interoperability of tools for automating the execution of data sharing agreements, such as smart contracts shall be provided

Data Interoperability and Semantics

Part 5. The value of data

Part 5.5. Data Spaces

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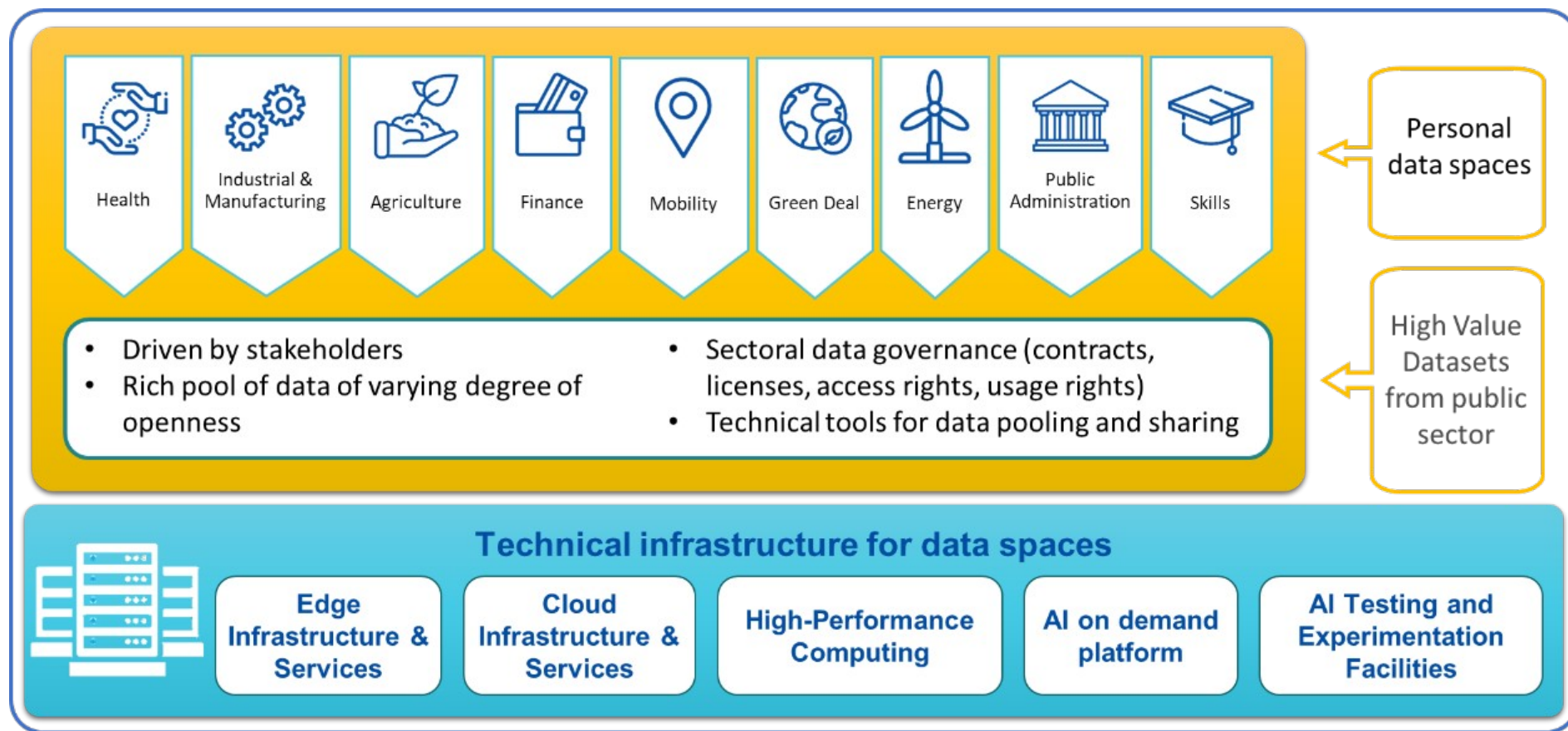
Maxime Lefrançois <https://maxime-lefrancois.info>

Course unit URL: <https://ci.mines-stetienne.fr/cps2/course/data>

Common European data spaces

“purpose or sector specific or cross-sectoral interoperable frameworks for common standards and practices to share or jointly process data for, inter alia, the development of new products and services, scientific research or civil society initiatives.”

[source: Data Act]



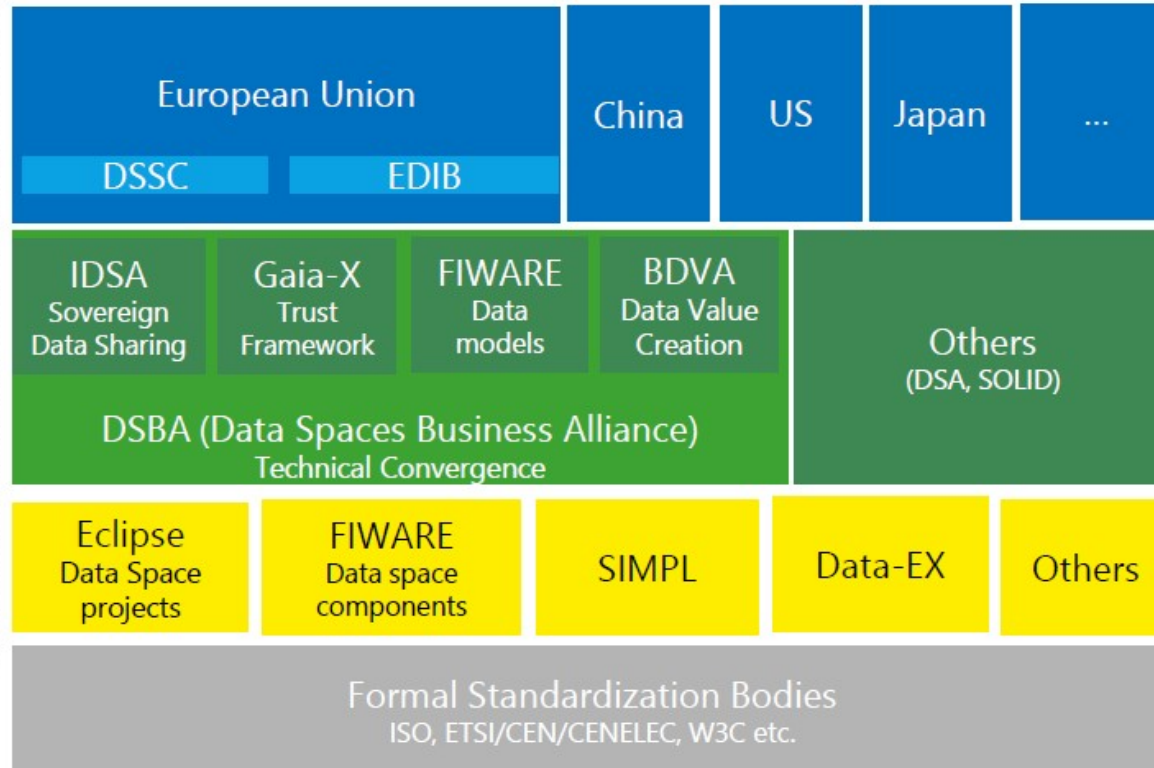
Regulatory, business, and technical foundation for Data Spaces within the Edge-Cloud-Continuum

Speaking with one voice, promoting one framework



Data Spaces Business Alliance

Unleashing the Data Economy



Data regulations in economic regions
Data strategies implementation

User requirements, Voice of the communities, coordinate technical specs and business requirements, support to "business design"

Technical implementation driven by OSS, place for the developer communities

Long-term investment security, adoption support etc. through norms and standards

<https://data-spaces-business-alliance.eu/download/33968/>

The Data Spaces Business Alliance

Unleashing the European Data Economy



<https://data-spaces-business-alliance.eu/>

Accelerating Business transformation in the Data Economy

The Data Spaces Business Alliance (DSBA) accelerates business transformation in the data economy. It's the first initiative of its kind, uniting industry players to realize a data-driven future in which organizations and individuals can unlock the full value of their data.

Data spaces are key to achieving sovereign, interoperable and trustworthy data-sharing across businesses and societies – a key step to the data economy of the future. The Alliance embraces this reality, converging the best skills, assets, and experience in Europe into a one-stop-shop for data spaces, from inception to deployment.

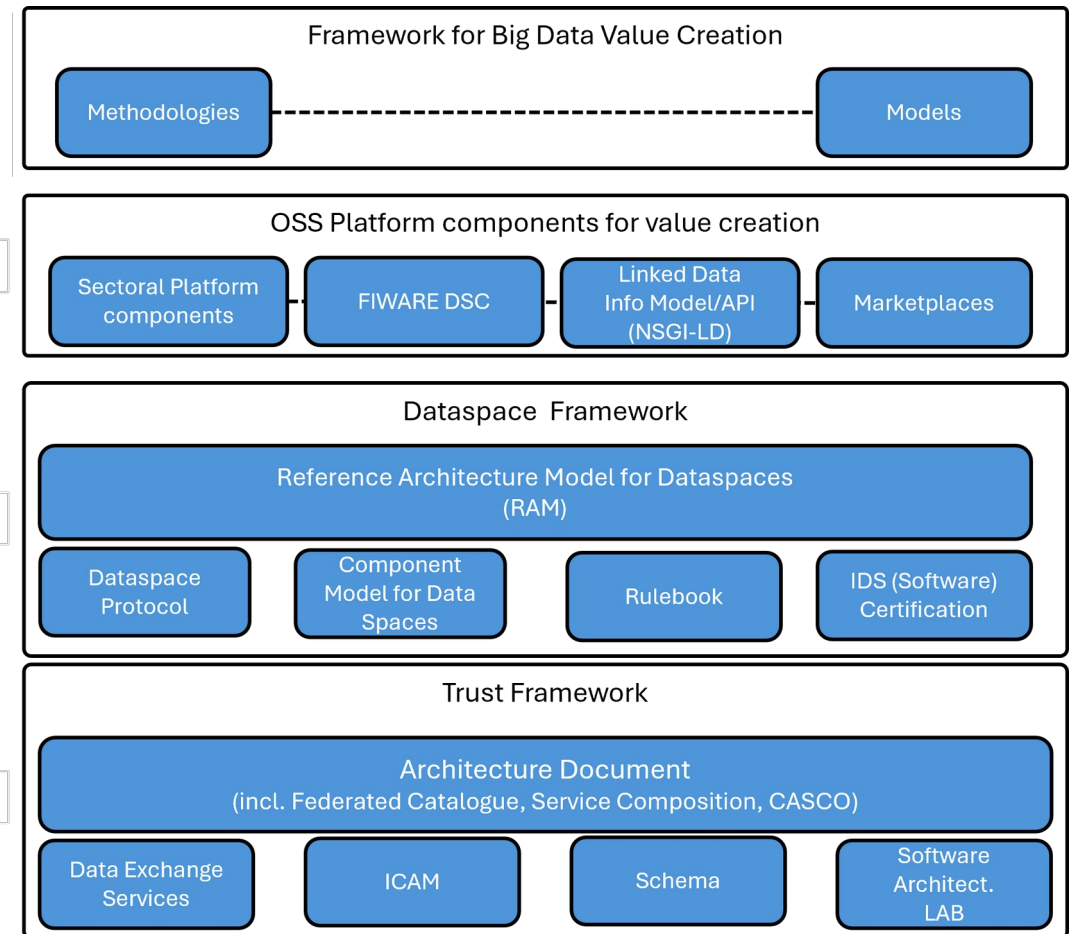
The Data Spaces Business Alliance are [Gaia-X](#) European Association for Data and Cloud AISBL, the Big Data Value Association ([BDVA](#)), [FIWARE Foundation](#), and the International Data Spaces Association ([IDSA](#)). Together they represent 1,000+ leading key industry players, associations, research organizations, innovators, and policymakers worldwide. With this cross-industry expertise, resources and know-how, the Alliance drives awareness, evangelizes technology, shapes standards, and enables integration across industries.

The Data Spaces Business Alliance

Unleashing the European Data Economy



<https://data-spaces-business-alliance.eu/>



DSBA HUBS LANDSCAPE



Gaia-X HUBS

* National Hubs
* Europe

- | | |
|----------------|-----------------------|
| 01 Austria | 12 Poland |
| 02 Belgium | 13 Portugal |
| 03 Finland | 14 Romania |
| 04 France | 15 Slovakia |
| 05 Germany | 16 Slovenia |
| 06 Greece | 17 South Korea |
| 07 Hungary | 18 Spain |
| 08 Italy | 19 USA, California |
| 09 Japan | 20 USA, Texas |
| 10 Luxembourg | 21 USA, Washington DC |
| 11 Netherlands | |



IDSAs HUBS & COMPETENCE CENTRES

* National Hubs
* Regional Competence Centers
* Europe

- | | |
|---|---|
| 01 Belgium, facilitated by IMEC Leuven | 11 CFIEC, China Future Internet Engineering Center Beijing, China |
| 02 Bulgaria, facilitated by GATE Sofia | 12 Fraunhofer ISST Dortmund, Germany |
| 03 Czech Republic, facilitated by Czech Technical University Prague | 13 L3S Research Center, Leibniz University Hannover, Germany |
| 04 Finland, facilitated by VTT Espoo | 14 Centifo Hub Patras, Greece |
| 05 France, facilitated by IMT Paris | 15 MediTech 4.0, Mediterranean Competence Center 4 Innovation Naples, Italy |
| 06 Greece, facilitated by CERTH/ITI Thessaloniki | 16 Tecnalia Bilbao, Spain |
| 07 Italy, facilitated by Cefriel Milan | |
| 08 Poland, facilitated by PSNC Poznan | |
| 09 Spain, facilitated by Innovalia Association Bilbao | |
| 10 The Netherlands, facilitated by TNO The Hague | |



FIWARE iHUBS

* Regional Hubs
* Europe
* Global

- | | |
|---|---|
| 01 A. Castro Servicios & Tecnología Montevideo, Uruguay | 19 IDEASFORUM Herne, Germany |
| 02 Astrid Wolfsburg, Germany | 20 I Hub Base Tokyo, Japan |
| 03 ATIO Barcelona, Spain | 21 iHub FIWARE Bridge Tunis, Tunisia |
| 04 Centifo Hub Patras, Greece | 22 IoT Lab iHub Geneva, Switzerland |
| 05 Ciudades del Futuro iHub Buenos Aires, Argentina | 23 La Lonja de la innovación Huelva, Spain |
| 06 Detecon FIWARE iHub Cologne, Germany | 24 LaNIF Mexico City, Mexico |
| 07 DigiCity Connect Atlanta, USA | 25 Madeira FiiHub FIWARE iHub Madeira, Portugal |
| 08 DIHBAI-TUR Balearic Islands, Spain | 26 Marso iHub Bogota, Colombia |
| 09 Faubourg Numérique Saint-Quentin, France | 27 Maroc Numeric Cluster Casablanca, Morocco |
| 10 FiiHub Azores DIH Azores, Portugal | 28 MEDIHub Napoli, Italy |
| 11 FiiHub Canary Islands Tenerife, Spain | 29 MIL Al-Madinah, Saudi Arabia |
| 12 FIWARE iHUB UPB Medellin, Colombia | 30 MindfulTech Institute Gatineau, Canada |
| 13 FIWARE Innova iHub Perugia, Italy | 31 MOA GLOBAL Santana de Parnaíba, Brazil |
| 14 FIWARE OIL iHub Lund, Sweden | 32 Nivid Technologies Sterling, USA |
| 15 FIWARE Space Bajadaz, Spain | 33 North Iberia FIWARE iHub La Rioja, Spain |
| 16 FIWARE Zone Seville, Spain | 34 Open MemoryLab FIWARE iHub Mikkeli, Finland |
| 17 Future City iHub Amersfoort, Netherlands | 35 Pleiades IoT innovation Cluster Athens, Greece |
| 18 Hellenic FIWARE iHub Athens, Greece | 36 Smarta Byar Smart Village Community Brookline, USA |
| | 37 The Texas Project iHub Austin, USA |
| | 38 TOURiLab Fuerteventura, Spain |
| | 39 Urban SP Miami, USA |



BDVA i-SPACES

* Regional Hubs
* Europe

- | | |
|--|---|
| 01 Attica Hub for the Economy of Data and Devices Athens, Greece | 19 DataLife Santiago de Compostela, Spain |
| 02 AIR4S (Universidad Politécnica de Madrid) Madrid, Spain | 20 DIHAISEC Lebnitz, Germany |
| 03 Aragón DIH (ITA) Aragón, Spain | 21 DIH TECHNICOM Košice, Slovakia |
| 04 BIGDATACoE (Eurecat) Barcelona, Spain | 22 ECIPA Venice, Italy |
| 05 CeADAR Dublin, Ireland | 23 Edinburgh International Data Facility (EPCC) Edinburgh, United Kingdom |
| 06 DIH GIGAL Vigo, Spain | 24 HPC4Poland (Poland Super Computing Centre) Poznań, Poland |
| 07 ICE Data Center (RISE) Luleå, Sweden | 25 Latvian IT Cluster DIH Riga, Latvia |
| 08 ITI Valencia, Spain | 26 Linz Center of Mechatronics GmbH Linz, Austria |
| 09 Know-Center Graz Graz, Austria | 27 nZEB Smart Home DIH Thessaloniki, Greece |
| 10 EGI Amsterdam, Netherlands | 28 Machine Intelligent Garage London, UK |
| 11 Gemini (Sintef) Trondheim, Norway | 29 MediTech Naples, Italy |
| 12 SCAL (CINECA) Bologna, Italy | 30 Plan4All Horní Brzda, Czech Republic |
| 13 Stichting Smart Connected Supplier Network Eindhoven, Netherlands | 31 Ruder Bošković Institute Digital Innovation Hub Zagreb, Croatia |
| 14 PRODUTECH DIH Porto, Portugal | 32 Smart Data Innovation Lab (KIT) Karlsruhe, Germany |
| 15 TeraLab (Institut Mines-Télécom) Paris, France | 33 Transilvania Digital Innovation Hub Cluj-Napoca, Romania |
| 16 Algebra Lab Zagreb, Croatia | 34 Innovation Cluster Drachten (ICD) Drachten, Netherlands |
| 17 Belgrade Data Innovation Hub Belgrade, Serbia | 35 Minasmart Grenoble, France |
| 18 Cybersecurity Hub, z.s. Czech Republic | 36 Munich Innovation Hub for applied AI Munich, Germany |
| | 37 UDG Gorizia, Montenegro |

EUROPE



GLOBAL



**INTERNATIONAL DATA
SPACES ASSOCIATION**



153



A holistic approach to bring data spaces to global scale

INTERNATIONAL DATA
SPACES ASSOCIATION

IDSA on its way to a global standard – with the dataspace protocol in its core

Global Standardization



Aligning architectures, market proliferation and thought leadership on data spaces



Consensus and harmonization



Data Connectors speaking Dataspace Protocol



Global market adoption



Fostering market adoption: Increasing readiness level and extensive use of IDS concepts

IDSA Rulebook for
holistic governance
view

**Reference
Architecture** as
technology-agnostic
framework on
conceptual model

Dataspace Protocol
as detailed specification
and essence for
interoperability

Certification for
reliable, industry grade
components

Diverse landscape of
usable components and
radar as orientation
for ecosystem building
and future investments

Running Data Spaces
as impressive impact
stories

The Data Spaces Radar
Map View

Geographical Focus

- ☐
- Europe
-
- ☐
- European
-
- ☐
- International
-
- ☐
- Local
-
- ☐
- National (scope is onl...
-
- ☐
- Regional

Countries

- ☐
- Austria
-
- ☐
- Belgium
-
- ☐
- Belgium, Finland
-
- ☐
- Bulgaria
-
- ☐
- Croatia
-
- ☐
- Cyprus
-
- ☐
- Czech Republic
-
- ☐
- Denmark
-
- ☐
- Estonia
-
- ☐
- Finland
-
- ☐
- Finland, Spain
-
- ☐
- France
-
- ☐
- France, Germany, Greece, Italy, Neth...

Filter results:

☐ All EU Member States☐ Community of Practice ☒ Data Space ☐ Use Case

- Agricult... Agriculture... Autom... Autom...
- Buildin... Built E... Cross ... Cultura...
- Energy Finance Geoinf... Green ...
- Green ... Health Langua... Logistics
- Manufa... Media Mobility Open s...

Data Space

Tout

Development Stage

Tout

Source of Funding

Tout

Reference Architecture Used

Tout

Period

01/01/2018 07/01/2024

Freeform Search

Search

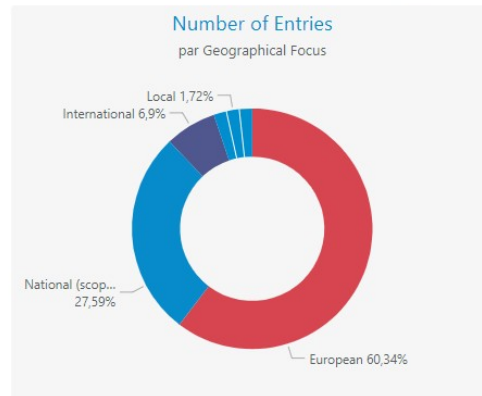
Radar View

Chart View

Map View

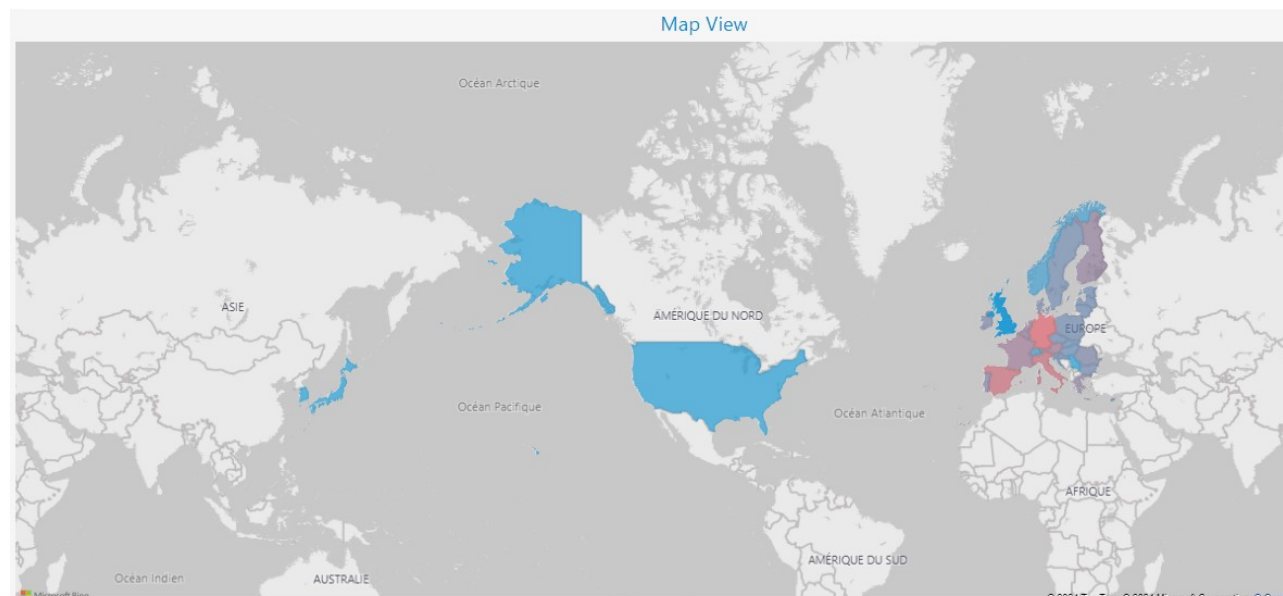
Table View

Building Blocks



Relevant Entries

Name	Type
Würth C-Part Supply	Use Case
Wind Energy Generation Data Space	Use Case
Wind and Solar Assets modeling	Use Case
WHIRLPOOL After -Sale Consumer Services powered by Predictive Analytics	Use Case
Volkswagen Autoeuropa Intra-logistics process planning powered by simulation	Use Case
VELES Project (HORIZON WINERA)	Use Case



Dataspace Protocol V1.0 → ISO Standard

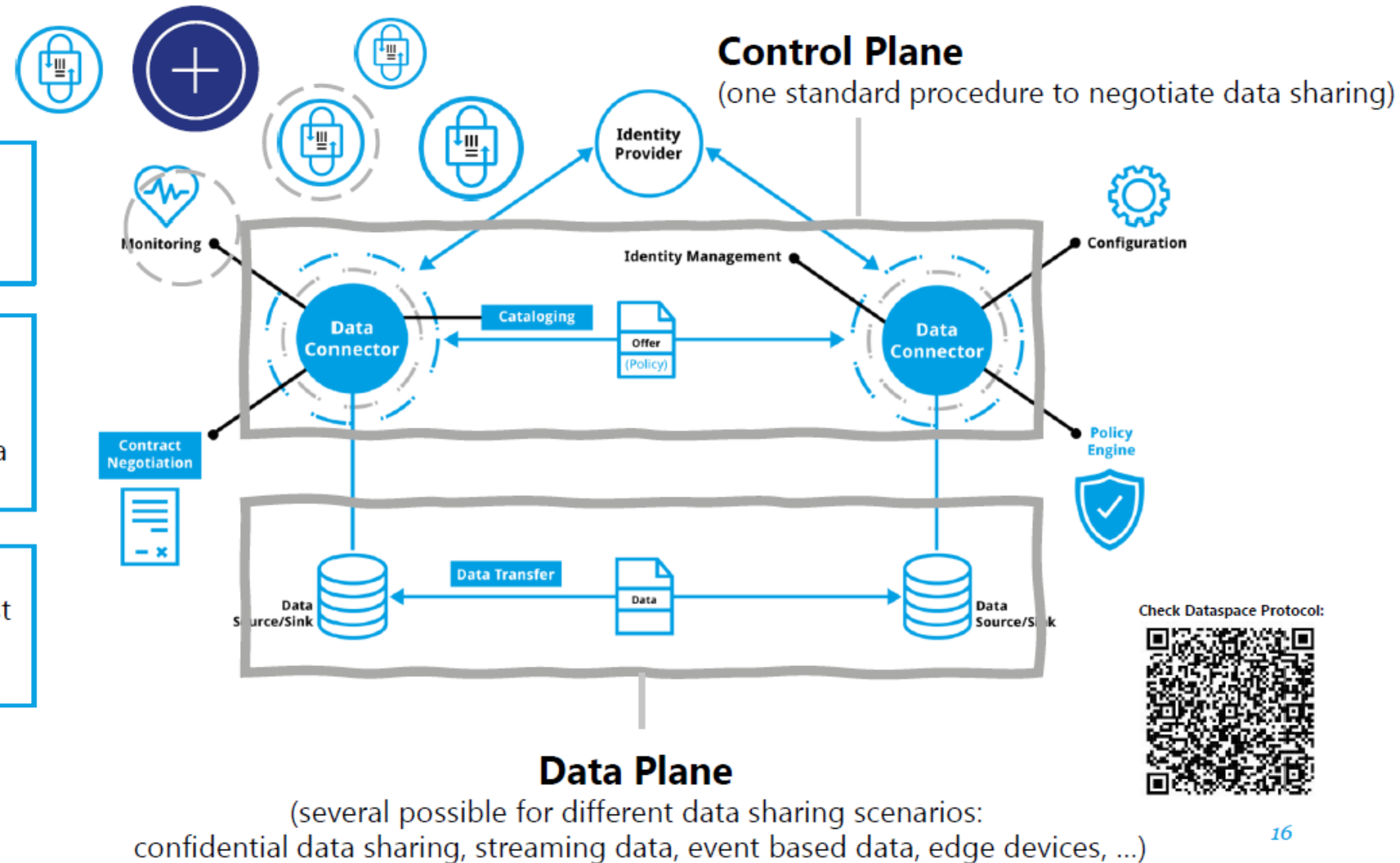
INTERNATIONAL DATA
SPACES ASSOCIATION

Enables standardized data exchange across different data space instances.

Ensures standardized data exchange mechanism between different frameworks, products, or services.

Provides the needed schemas and protocols for cataloging data, negotiating contracts and usage agreements, and accessing data within a data space.

Organizations using this protocol can align with industry standards, foster best practices, and unlock new data-driven business models and opportunities.



Check Dataspace Protocol:



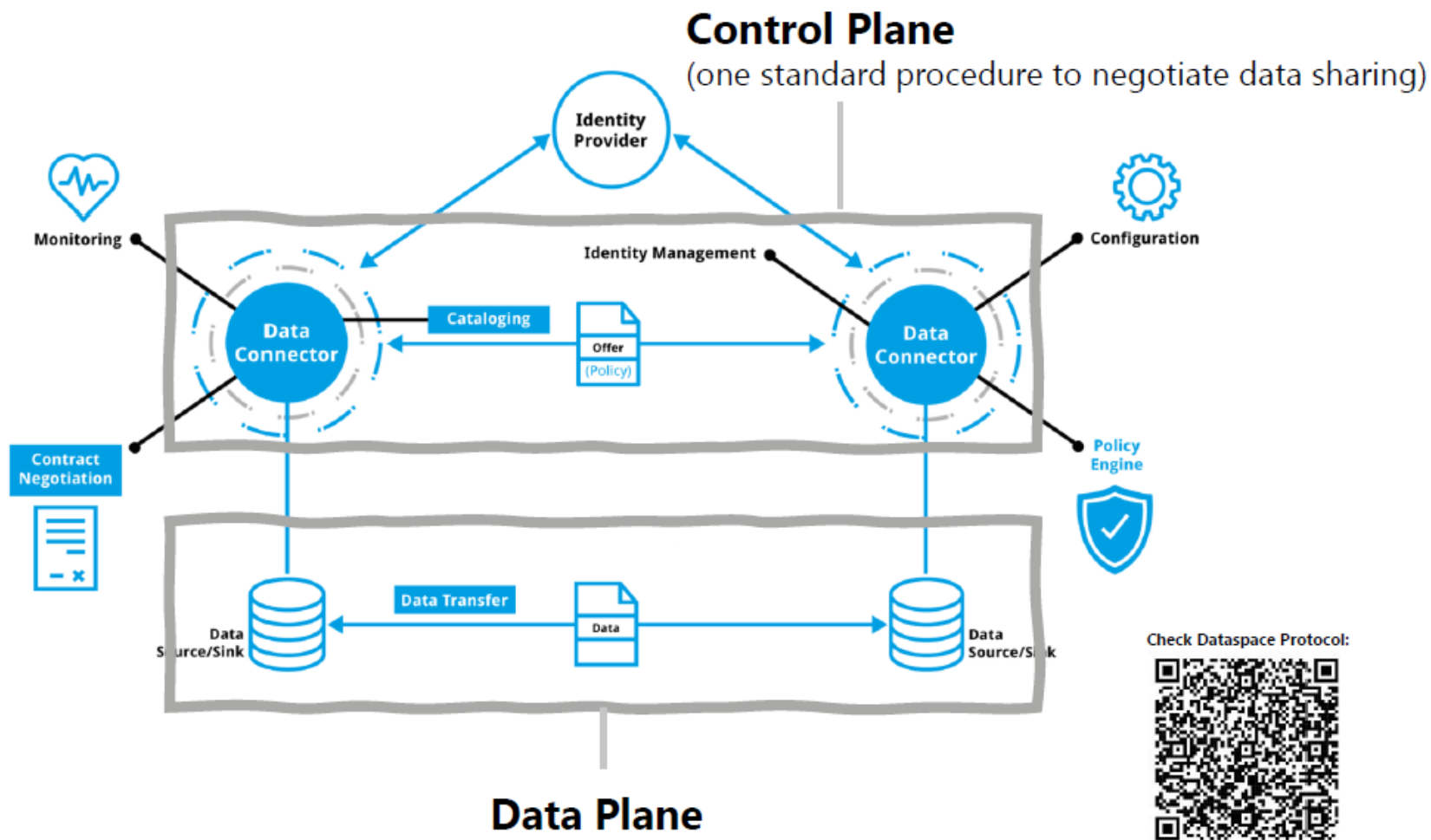
Dataspace Protocol V1.0 → ISO Standard

Enables standardized data exchange across different data space instances.

Control Plane decides who can access the data and how.

Data Plane is where the action (data sharing) happens.

Conceptually divided, can be combined practically



(several possible for different data sharing scenarios:
confidential data sharing, streaming data, event based data, edge devices, ...)

Make the connection and enable data economy

The key to data spaces is the data connector

INTERNATIONAL DATA
SPACES ASSOCIATION



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



Standardized Data Exchange

What does this mean? How does Dataspace Protocol ensure that?

INTERNATIONAL DATA
SPACES ASSOCIATION



Catalog

A public transportation authority decides to share its transit schedules with app developers.



Contract Negotiation

An app developer wants to use these schedules to create a route planning application.



Transfer Process

Once the agreement is in place, the actual data transfer begins.

What happens?

Problem

Inconsistent data formats for schedules across different platforms.

Need for clear terms regarding the use and distribution of the transit data.

Ensuring secure, efficient, and reliable transfer of transit data.

Role of DSP

Standardizes the format for publishing transit schedules.

Facilitates agreement on data usage terms and conditions.

Manages the secure and efficient transfer of the agreed-upon data.

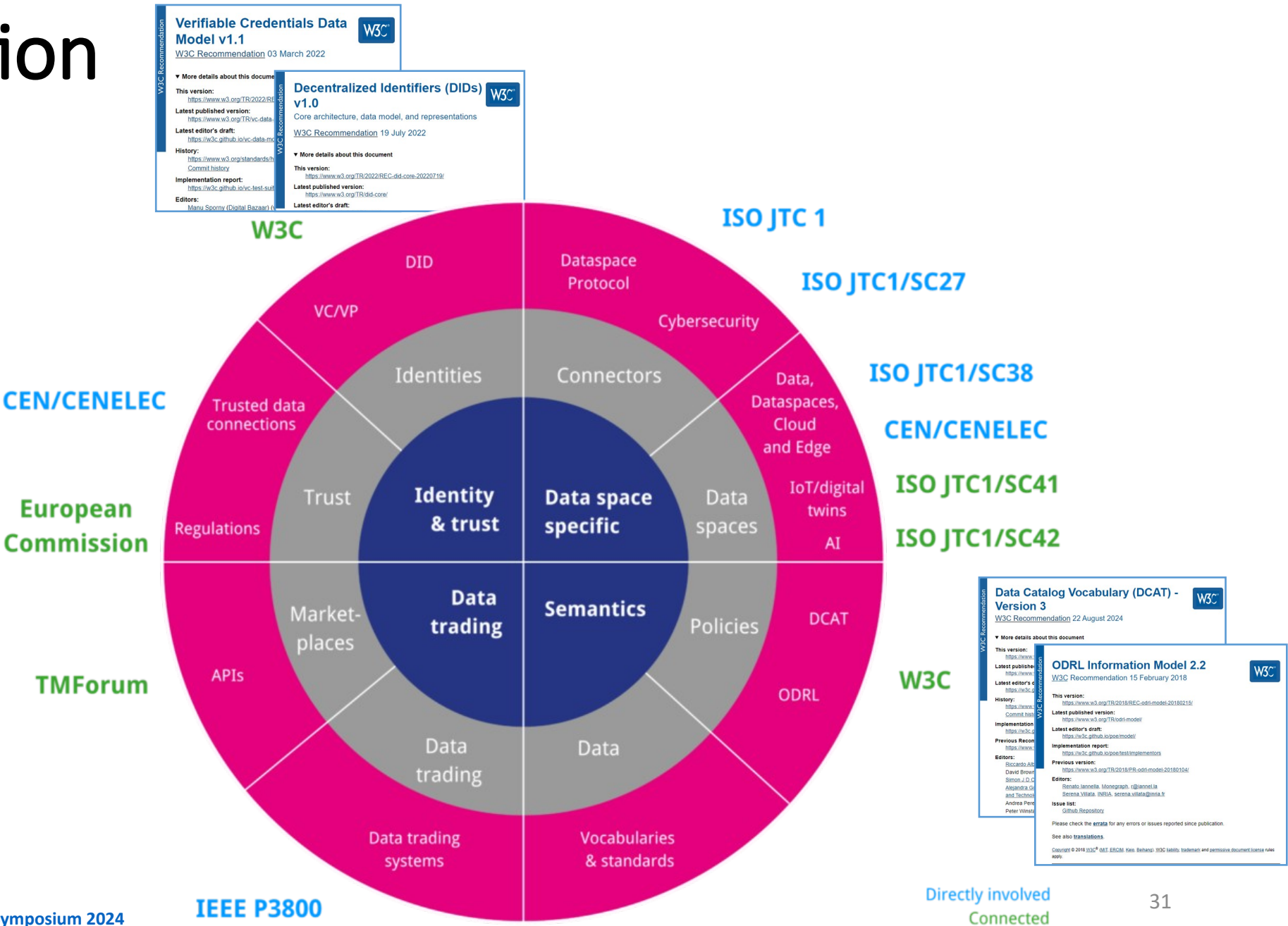
Specification Example

Data provider publishes schedules using 'DCAT Catalogs' and sets access rules with 'ODRL Policies'.

Developer and authority negotiate using 'Contract Offer' messages, leading to a 'Contract Agreement'.

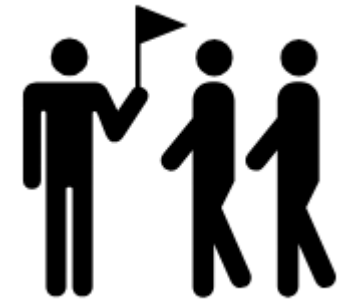
Data transfer is executed through 'Connector-to-Connector Communication' and 'Data Transfer Requests'.

Standardization activities



Data Interoperability and Semantics

< Part 5. The European Data Strategy >



A guided tour !

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Maxime Lefrançois <https://maxime-lefrancois.info>

Course unit URL: <https://ci.mines-stetienne.fr/cps2/course/data>