# Data Ecosystems as enabler for future collaboration

GLOBAL PRODUCT DATA

INTEROPERABILITY

SUMMIT 2025

BOEING ELYSIUM LOCKHEED MARTIN NORTHROP GRUMMAN Parker PDES, Inc.® Connecting the Digital Enterprise

Bernd Feldvoss - Airbus

# Presenters Bio



Bernd Feldvoss is PLM Interoperability Standards Specialist at Airbus in Hamburg, Germany.

He joined Airbus in 1998 and worked as a Systems Engineer where he was involved in the development of Data Exchange Methods. During this time he participated in international working groups and made a contribution to the “Airbus Concurrent Engineering (ACE)” project. He was involved in projects including the launching of the A380 and establishing cDMU between the UK, Spain, France, and Germany. In 2022 he changed to Engineering Process Methods and Tools Architecture Team and is working as specialist in Product Data Interoperability Standards!

He represents Airbus on numerous committees including; the prostep ivip Technical Steering Committee and the JT Open Technical Review Board. Since 2022 He is European Co-Project Leader of LOTAR Project! He is also a member of the Global Collaboration Working Group in the Aerospace & Defense PLM Action Group.

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PLM Interoperabilty Standards Specialist

# Abstract



Upcoming technologies as dataspaces need to be taken into account for future collaboration ie instead of point to point connectivity a peer to peer architecture should be used. In Europe with Gaia-X such technology is under development.

In multiple branches pilot projects are under construction as Catena-X, Aerospace-X etc.

Main use cases at the moment are related to sustainability (Product Carbon Footprint (PCF), Digital Product Passport (DPP)), but also Demand Capacity Management are covered. This impacts that whole supply chain need to be treated incl. raw material eg mining companies etc.

Especially in area of Manufacturing several projects as Factory-X, Aerospace-X & Decade-X etc. are ongoing and with International Manufacturing-X Council a global coordination has been started.

# Agenda



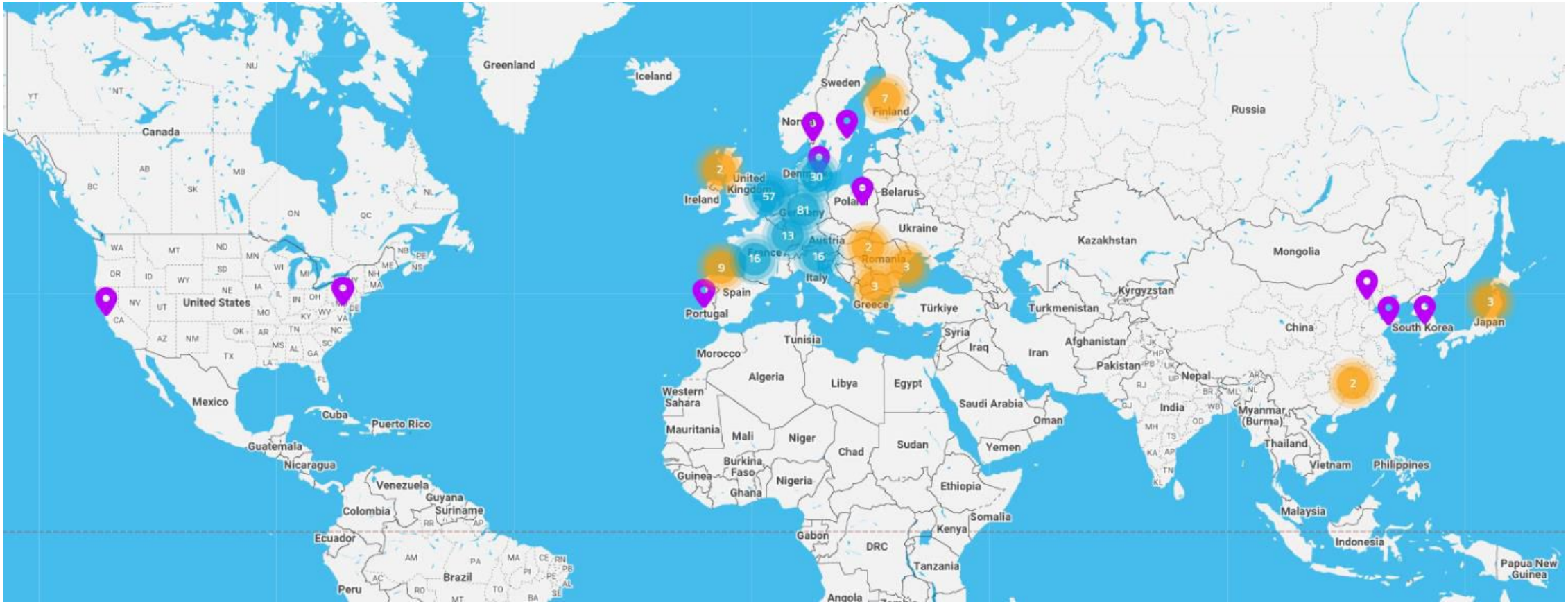
- Gaia-X
  - Catena-X
  - Manufacturing-X/Factory-X
  - Cooperants, Aerospace-X
  - Decade-X
- Associations
  - International Data Spaces Association (IDSA)
  - Industrial Digital Twin Association (IDTA)
  - International Manufacturing-X Council (IMXC)
  - Open Platform Communications (OPC)
- Outlook
- Q&A

- **Vision & Mission**
  - **VISION:** Enable trusted decentralised digital Ecosystems
  - **MISSION:** Creating the de facto standard to enable federated and trusted data and infrastructure ecosystems, by developing a set of specifications, rules, policies, and a verification framework

# Gaia-X: A global member driven association

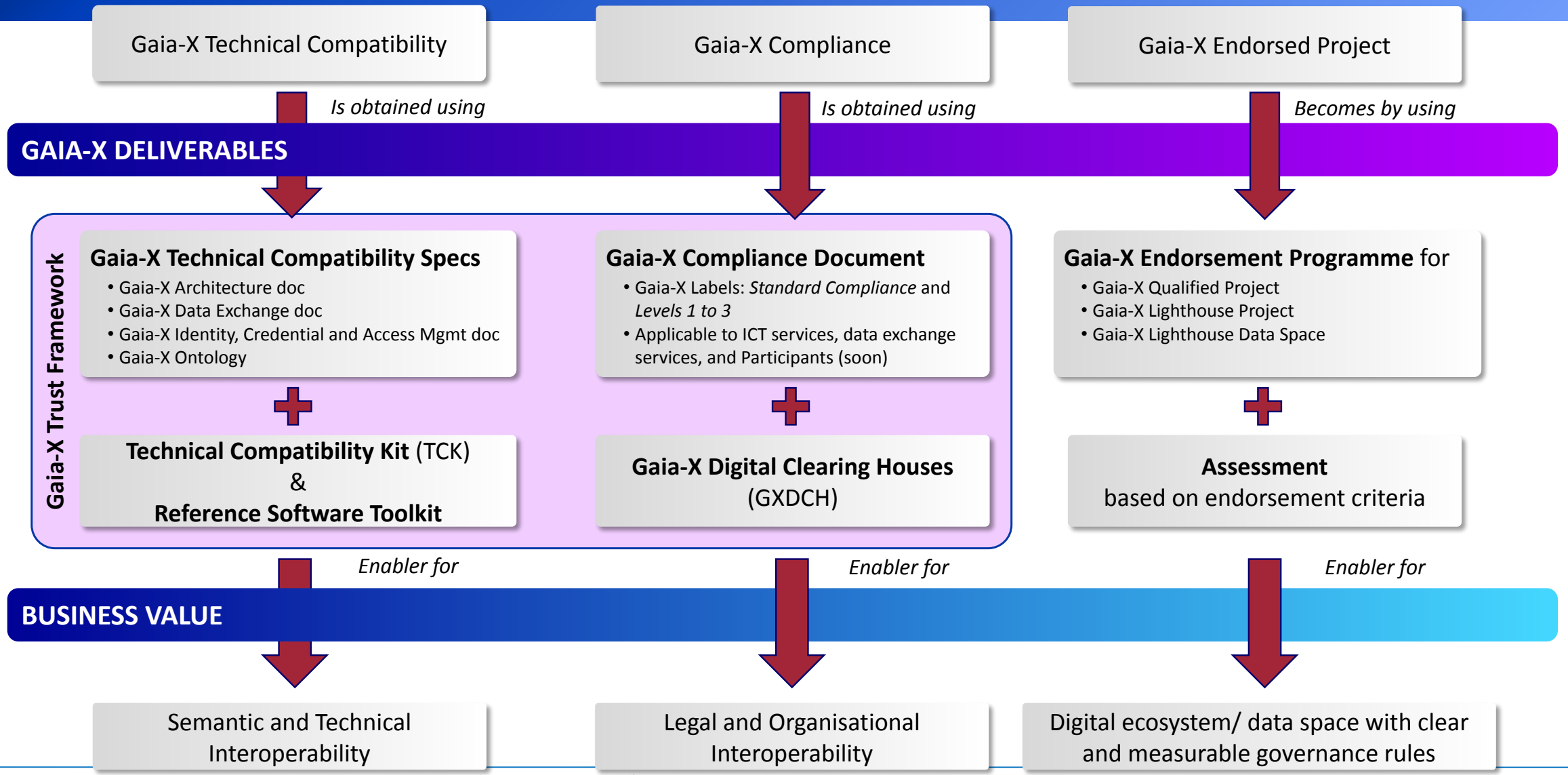


- Founded 2021 in Europe by 11 French and 11 German organisations
- Today ~250 members from around the world



# GAIA-X: Standard

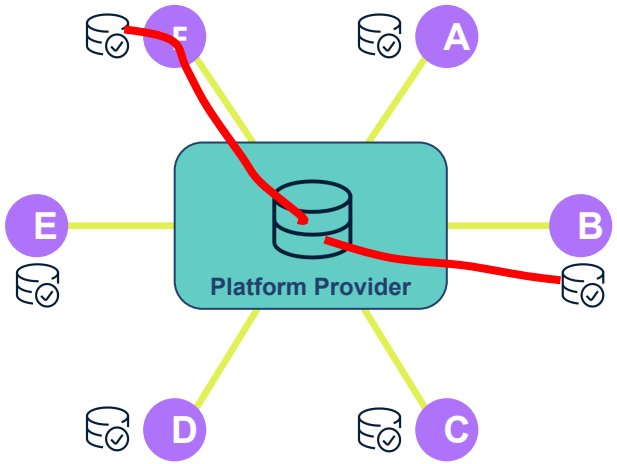




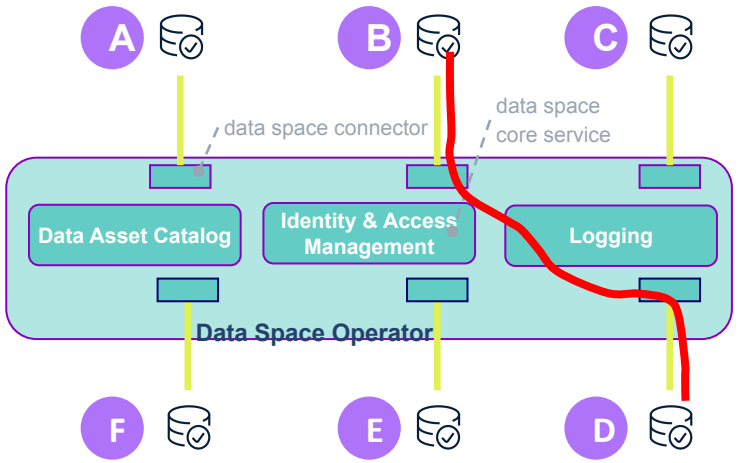
# Gaia-X: Ecosystem Realization - Data platforms, data spaces, and (data) ecosystems



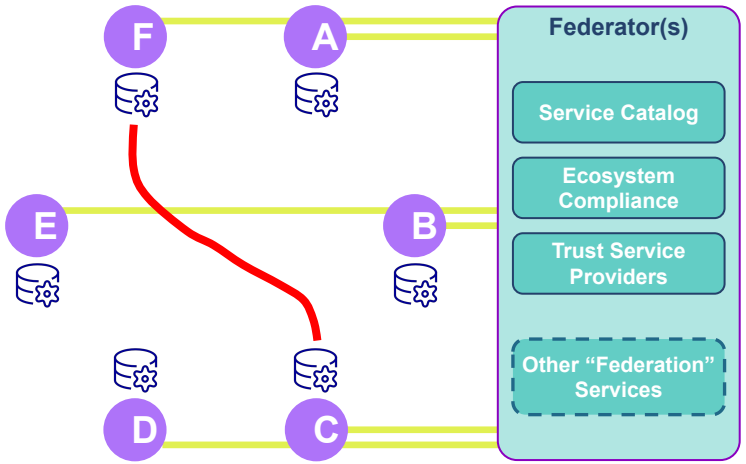
## Data Platform




## Data Space




## (Data) Ecosystem




lead concepts: **«API»**

A **(product) platform** is a set of elements (components, roles, processes, relationships, and interfaces) with a uniform architecture serving an organization as the basis for products and services for different customers.

**«data asset»**

A **data space** is a coordinated set of (i) technical standards, (ii) organizational policies, and (iii) core services under a (iv) specified governance model to enable and facilitate data exchange between its participants.

**«service»**

An **ecosystem** is the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize.

data warehouse (DWH) ⚫ data lake ⚫ data lake house ⚫ cloud data warehouse ⚫ data mesh ⚫ data hub ⚫ industry platform ⚫ one/two-sided platforms

Source: Strnadl C.F. & Schöning H. (2023). Datenplattformen, Datenräume und (Daten-)Ökosysteme – Einordnung und strategische Aspekte. In: Weber B. (Ed.), Data Governance. Springer, Kapitel 2.

# Lighthouse Data Spaces Qualified Projects

gaia-x

Catena-X
Automotive Network
Automotive Supply Chain
Catena-X

DATASPACE 4HEALTH LUXEMBOURG
Health
Dataspace4Health

DIGITAL TER-X 2050
Construction
Digital TER-X 2050

dynamo
Infrastructure & Technology
Dynamo

FAIR Data Spaces
Research, Infrastructure & Technology
FAIR Data Spaces

RegenAg-X
Agriculture
RegenAg-X

# Lighthouse Projects

ACCURATE
Manufacturing
Accurate

Boot-X
Infrastructure & Technology
Boot-X

COOPERANTS
Aeronautics, Space Sector
Cooperants

Data4 Industry-X
Manufacturing, Industry 4.0
Data4Industry-X

ECO
EONA-X
Mobility, Transport & Tourism
EONA-X

energy data-X
Energy
Energy data-X

EuPro Gigant
Manufacturing, Industry 4.0
EuProGigant

EuroDaT
The European Data Trustee
Finance
EuroDaT

gaia-x 4 future mobility
Mobility & Transport
Gaia-X4 Future Mobility

HEALTH-X dataLOFT
Health
HEALTH-X dataLOFT

Mobility Data Space
Mobility
Mobility Data Space (MDS)

omega-x
Energy
Omega-X

PONTUS-X
Manufacturing, Industry 4.0, AI & Cloud Services, Mobility, Aeronautics & Space, Agriculture
Pontus-X

PROMETHEUS-X
Education
PROMETHEUS-X

SC SN smart connected supplier network
Electronics Supply Chain
SCSN

Sovereign Cloud Stack
Cloud Services
Sovereign Cloud Stack

Structura-X
Cloud Services
Structura-X

TEAM-X
Trusted Ecosystem of Applied Medical Data eXchange
Health
TEAM-X

Learn more about Gaia-X endorsed projects here

# Gaia-X: Overview of actual Gaia-X Hubs




Learn more about hubs here

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# Gaia-X: Contacts



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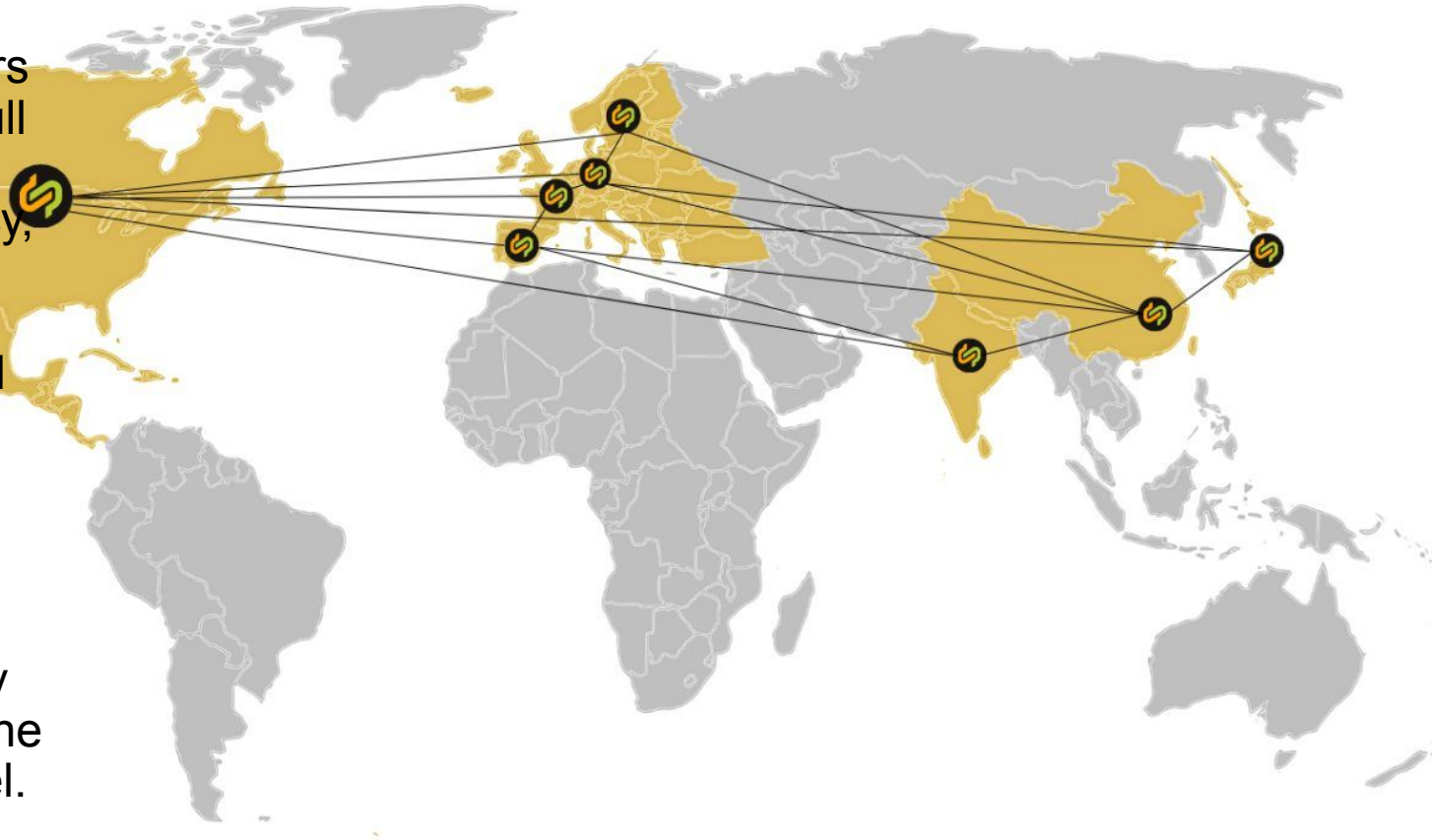
Catena-X
Your Automotive Network

- Catena-X is the first open and collaborative data ecosystem designed specifically for the automotive industry. It enables sovereign, standardized, and secure data exchange across the entire value chain – from OEMs and suppliers to mid-sized companies. All participants retain full control over their data at all times. The goal of Catena-X is to sustainably enhance transparency, efficiency, and resilience across the industry through shared standards.
- Driven by industry needs, Catena-X has evolved into a global network with strong support from regional partners known as “hubs.” In North America, Catena-X is represented by AIAG; in Shanghai by a broad initiative; in France by GALIA and the PFA; in Spain by SERNAUTO together with ANFAC; and in Sweden by Mobility Sweden. In Japan, Catena-X collaborates with the national Ouranos Ecosystem on a technical level.



# Core elements of Standardisation

1. Data Formats
2. APIs and Interfaces
3. Processes
4. Security Standards

## PCF Rulebook (Status 06/2025)

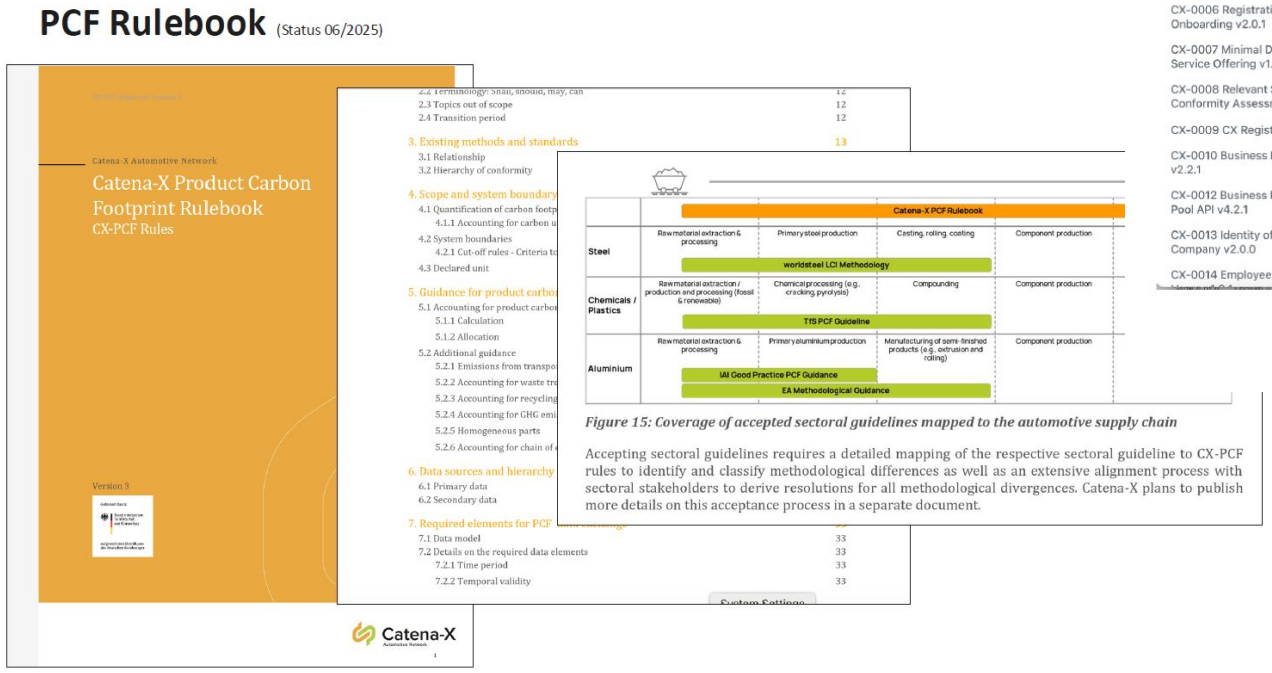
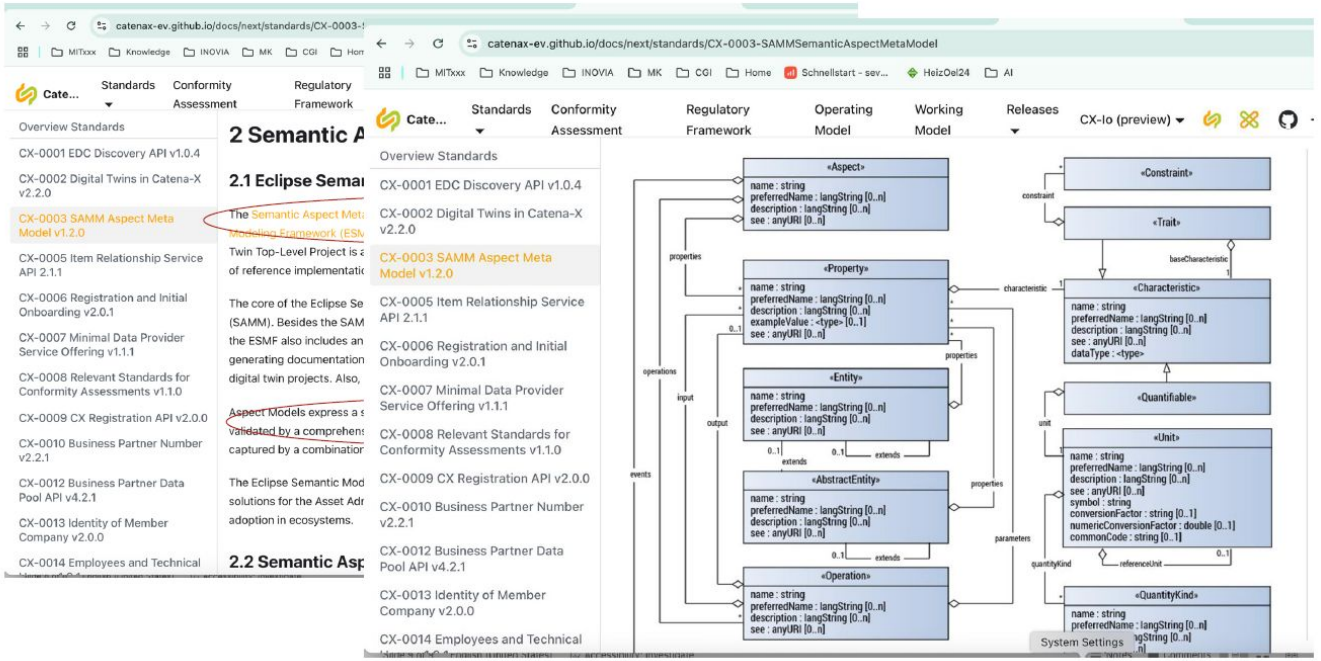



*Figure 15: Coverage of accepted sectoral guidelines mapped to the automotive supply chain*

Accepting sectoral guidelines requires a detailed mapping of the respective sectoral guideline to CX-PCF rules to identify and classify methodological differences as well as an extensive alignment process with sectoral stakeholders to derive resolutions for all methodological divergences. Catena-X plans to publish more details on this acceptance process in a separate document.

## Semantic Aspect Meta Model (Status 06/2025)



# Initiative to digitize supply chains in the industry

- The stakeholders of Plattform Industrie 4.0 have a major goal: to implement the DataSpace Industrie 4.0 and the transformation to a digitally networked industry across the board. Business, politics and academia have started the joint initiative Manufacturing-X. Companies will become able to autonomously and jointly use data across the entire production and supply chain. This makes digital innovations possible for more resilience, sustainability and competitiveness. The initiative must be developed on a European and global level right from the start – just like our value creation networks are organized.

- 11 Use Cases

**11 Use Cases for horizontal and vertical data transfer**

Integrated Toolchains and Collaborative Engineering

Information Update and Change Service

Collaborative Information Logistics

Condition Monitoring led Services

Modular Production

Manufacturing as a Service - On Demand Manufacturing

Autonomous Operation-as-a-Service


Traceability

Energy-Consumption and Load Management

Carbon Footprint Management

Circular Economy

# Cooperants - Collaborative Processes and Services for Aeronautics and Space

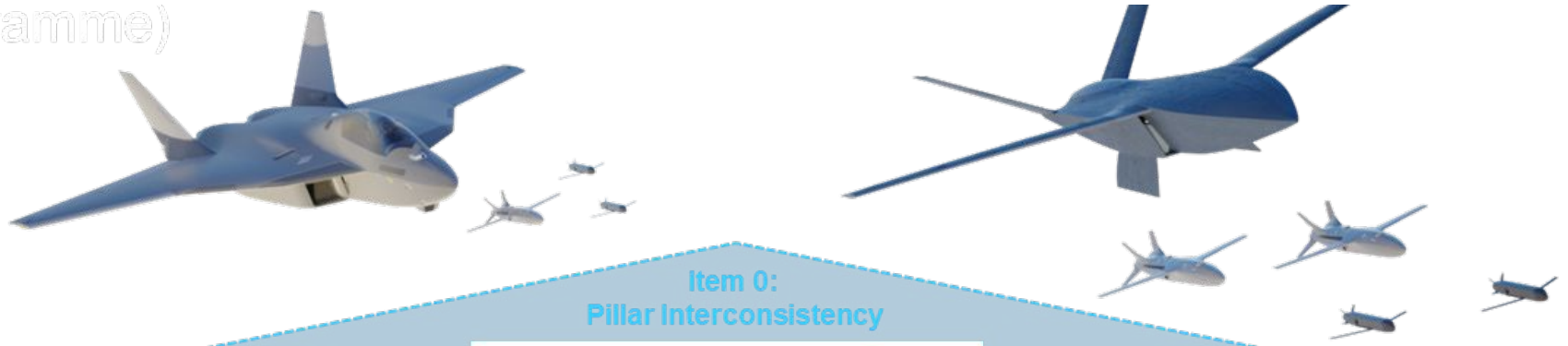
- Use Cases
  - Advanced Smart Services
    - Agile Manufacturing Support
    - Digital Project Management Officestomer
    - Engineering Dashboard
    - Functional Digital Twin
    - Holowork
    - Prime Supplier Collaboration
    - Robotic Digital Twin
    - Intelligent Requirement Assistant
    - Vehicle Anomaly Detection
  - Pilot Missions
    - Robotic Pilot
    - Flow Solver Pilot
    - Bartolomeo Pilot
    - Dual Use Pilot (FCAS)
  - Labors
    - Virtual Reality Lab
    - Digital Cleanroom

# Cooperants - Design Pillars of Future Combat Air System



COOPERANTS

(NGWS programme)



**Item 0: Pillar Interconsistency**

AIRBUS · DASSAULT AVIATION · Indra

| Pillars | New Generation Fighter | Engine | Remote Carriers | Combat Cloud | Simulation | Sensors | Enhanced Low Observability |
|---|---|---|---|---|---|---|---|
| Key partners | DASSAULT AVIATION | EUMET | AIRBUS | AIRBUS | Co-contracting of partners | Indra | AIRBUS |
| Associate partners | AIRBUS | ITP Aero | MBDA MISSILE SYSTEMS<br>SATNUS | THALES<br>Indra | AIRBUS<br>DASSAULT AVIATION<br>Indra | FCMS<br>THALES | AIRBUS<br>DASSAULT AVIATION |

**Item 8: Common Working Environment (CWE)**
(IT platforms, IT applications, DDMS layer)

AIRBUS · DASSAULT AVIATION · Indra

# Building a digital ecosystem for an efficient and sustainable Aerospace Supply Chain.

**Addressing Aerospace specific challenges..**

**Production Increase**
Steep production ramp-up requiring multi-tier visibility and collaboration to react efficiently

**Supply Chain Resilience**
High risks of supply chain disruptions

**Regulatory Landscape**
Increasingly diverse regulatory landscape and classification requirements (e.g. Export Control)

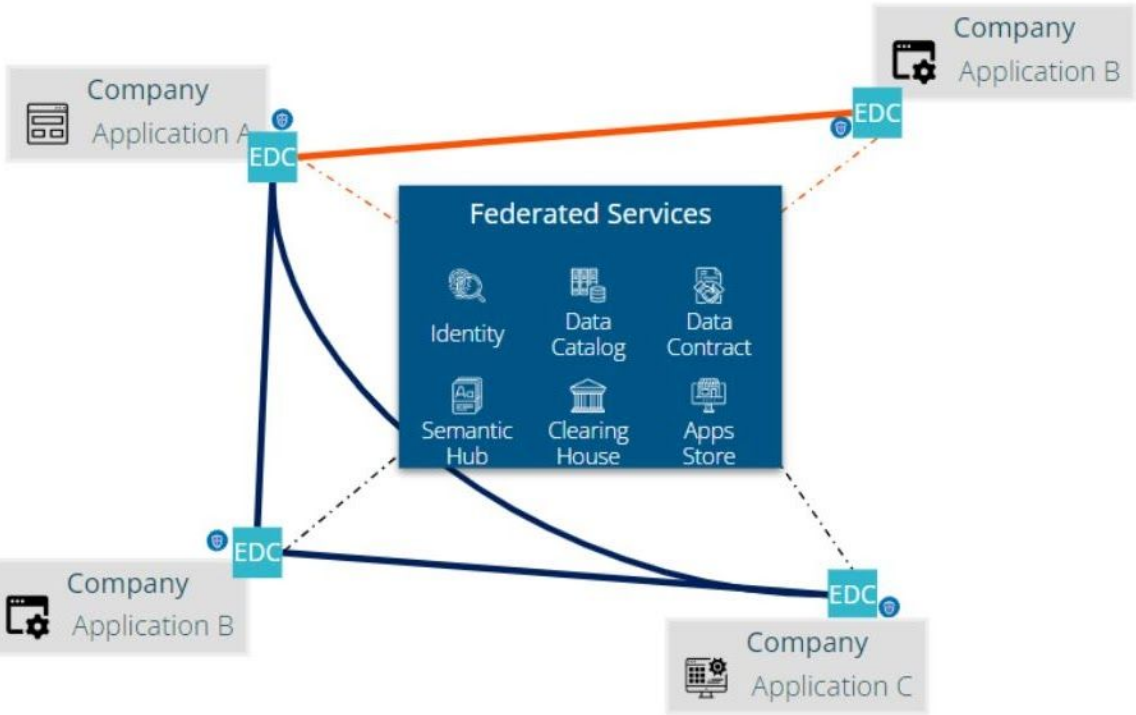
**Sustainability Targets**
Necessity to address sustainability challenges (CO2 emissions, substance, recycling)

**...with a diverse project set-up...**

AIRBUS, Capgemini engineering, ADVANCED MATERIALS CONCEPTS, ZAL, SYNERGETICON, SAP, T Systems, DIEHL Aviation, Fraunhofer, SUPPLYON, gemineers, toolcraft, PRAWEST, DLR Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center

Project duration:
April 2024 - June 2026

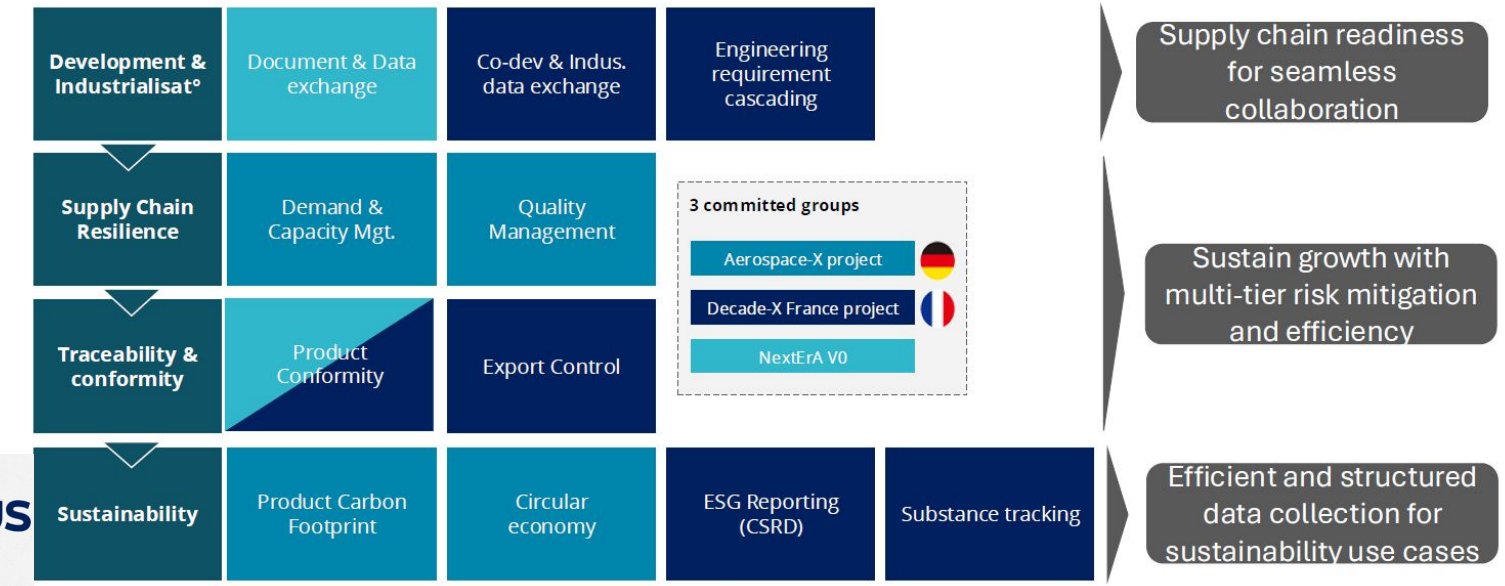
Funded by the European Union
NextGenerationEU
Supported by



# Digital ECosystem for Aerospace and DEfence

DECADE-X is dedicated to creating a collaborative ecosystem for data exchange for the aerospace and defence industry, enabling shared insights and leveraging innovation. Through this ecosystem, critical industry challenges are being addressed by exploring various business use cases across four key business domains:

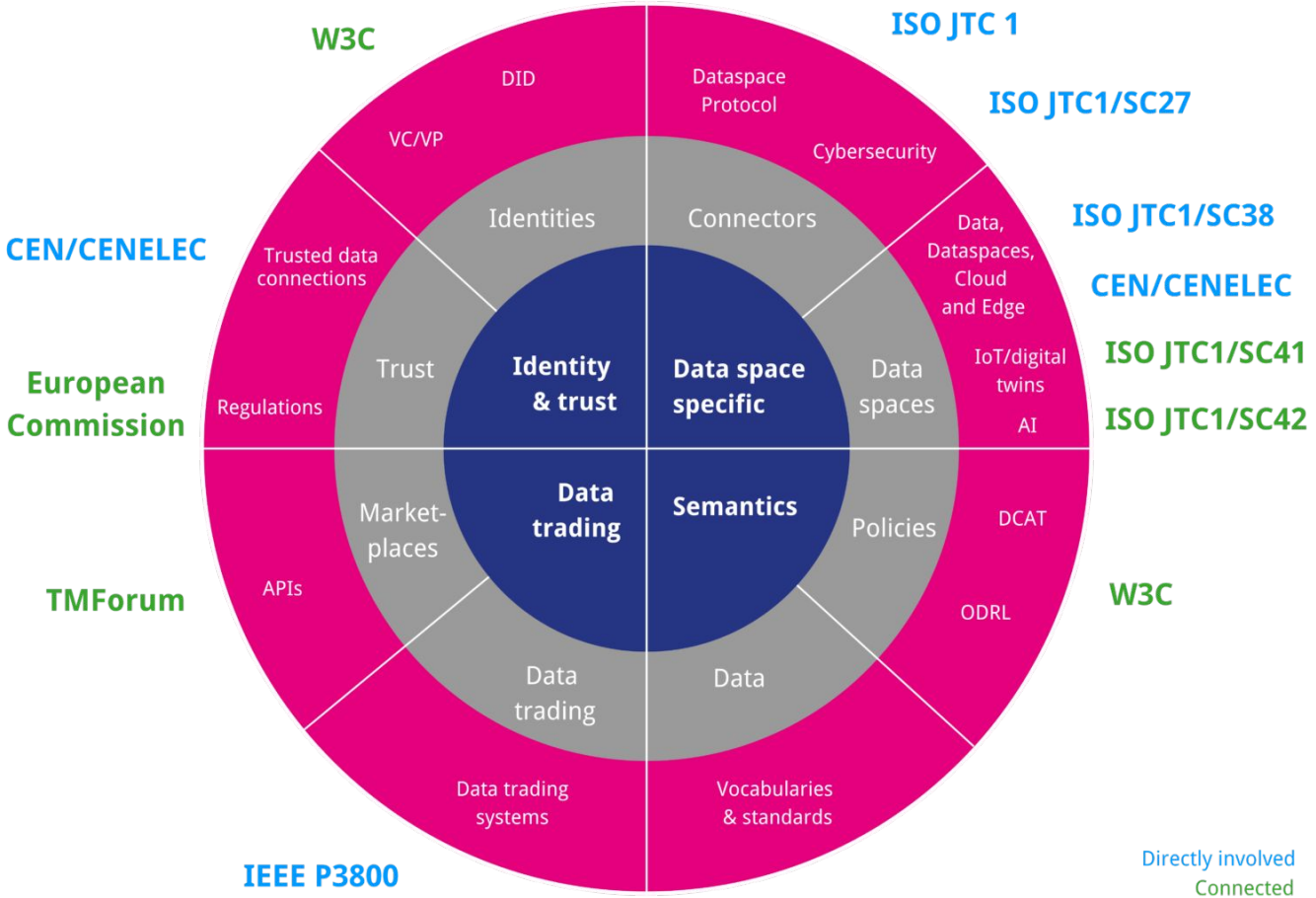
- Development & Industrialisation
- Supply Chain Resilience
- Traceability & Conformity
- Sustainability



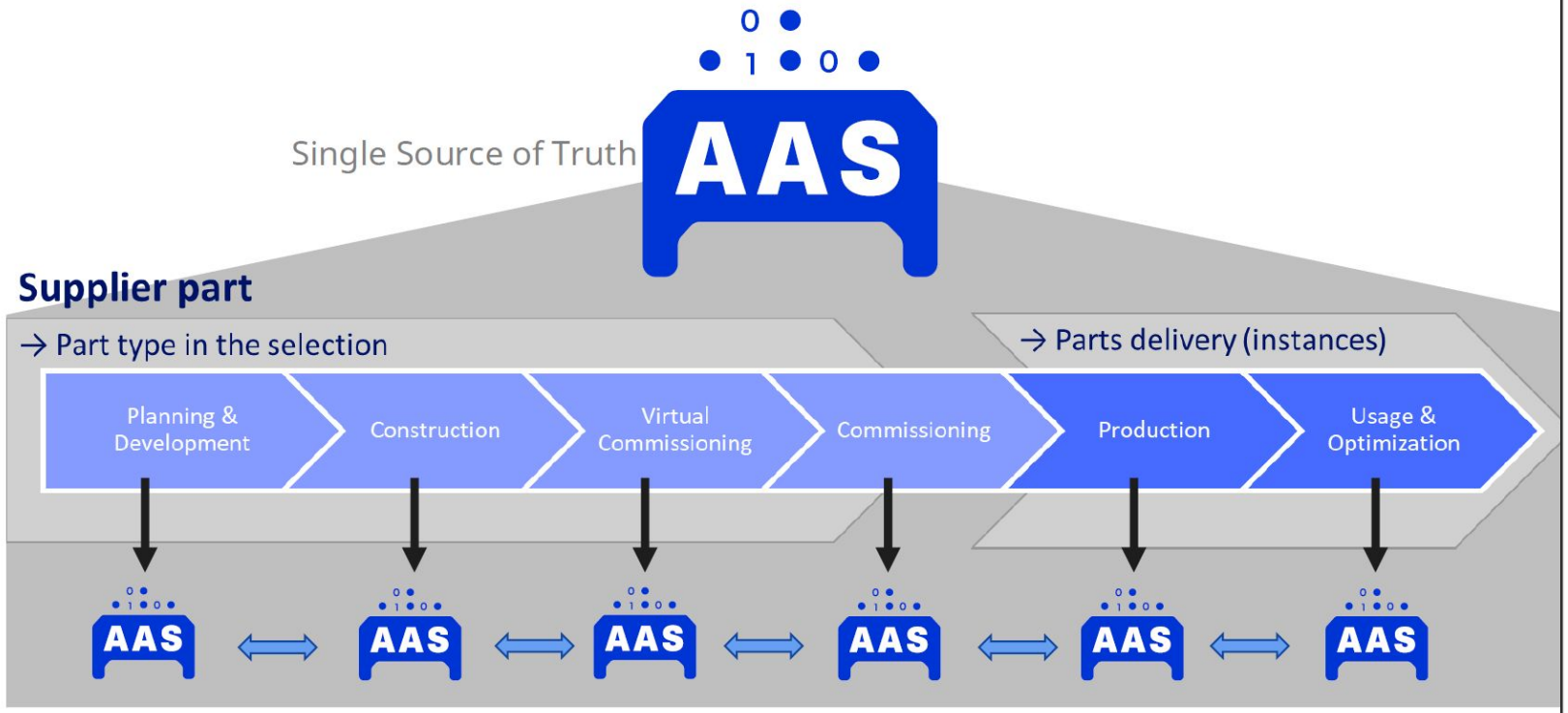

BOOST AEROSPACE · Collins Aerospace · LIEBHERR · THALES · AIRBUS

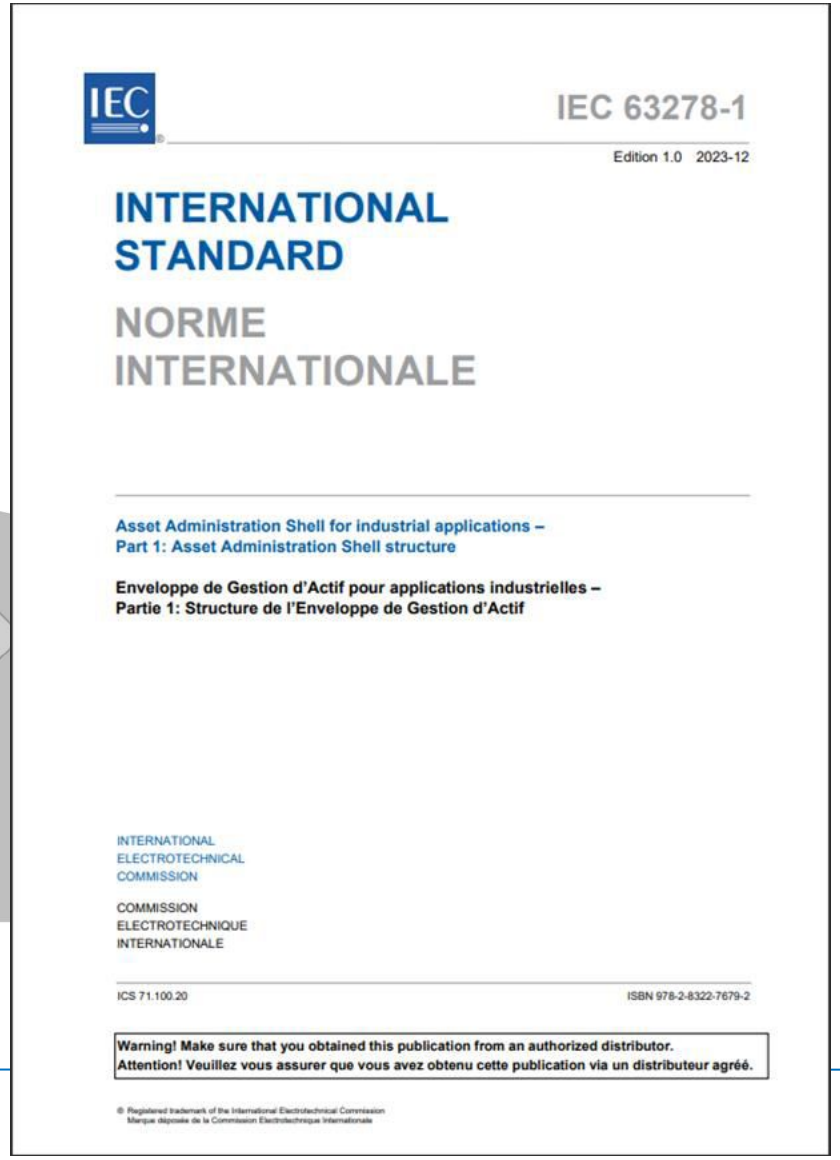
# Trustworthy and sovereign data sharing enable the data economy

[Dataspace Protocol] → ISO/IEC 20151
[IDS Reference Architecture]
[IDSA Rulebook]
[Standardization]



- Asset Administration Shell (AAS - IEC 63278)



IEC

IEC 63278-1

Edition 1.0 2023-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Asset Administration Shell for industrial applications – Part 1: Asset Administration Shell structure

Enveloppe de Gestion d'Actif pour applications industrielles – Partie 1: Structure de l'Enveloppe de Gestion d'Actif

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 71.100.20

ISBN 978-2-8322-7679-2

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# Industrial Digital Twin Association (IDTA)




**AAS Specification in Version 3.0**

- Part 1: Metamodel
- Part 2: Application Programming Interfaces
- Part 3: Data Specification
- Part 4: Security
- Part 5: Package File Format (AASX)

## Standardised Information Models

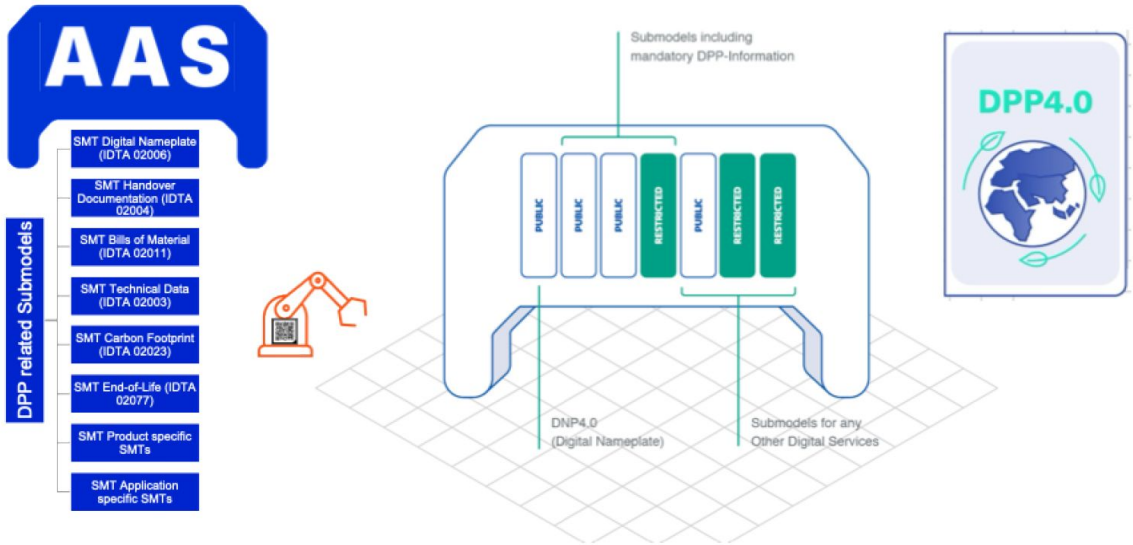
| | | | | |
|---|---|---|---|---|
| Digital Nameplate | Contact Information | Handover Documentation | Module Type Package (MTP) | OPC UA Server Data Sheet |
| Software Nameplate | Technical Data | Product Carbon Footprint | Energy Monitoring | Time Series Data |
| Engineering of Power Drives Trains | Bill of Material (BOM) | MCAD / ECAD | Plant Asset Management | Simulation |
| Reliability | Functional Safety | Control Component Type/Instance | Service Notification | Sizing of power drive trains |
| Asset Interface Description | Maintenance | Plant Asset Managment | Capability Description | DEXPI |

**85+** Submodels in the IDTA repository published or in development
Submodels (industrialdigitaltwin.org)

IDTA the platform for agile information models development

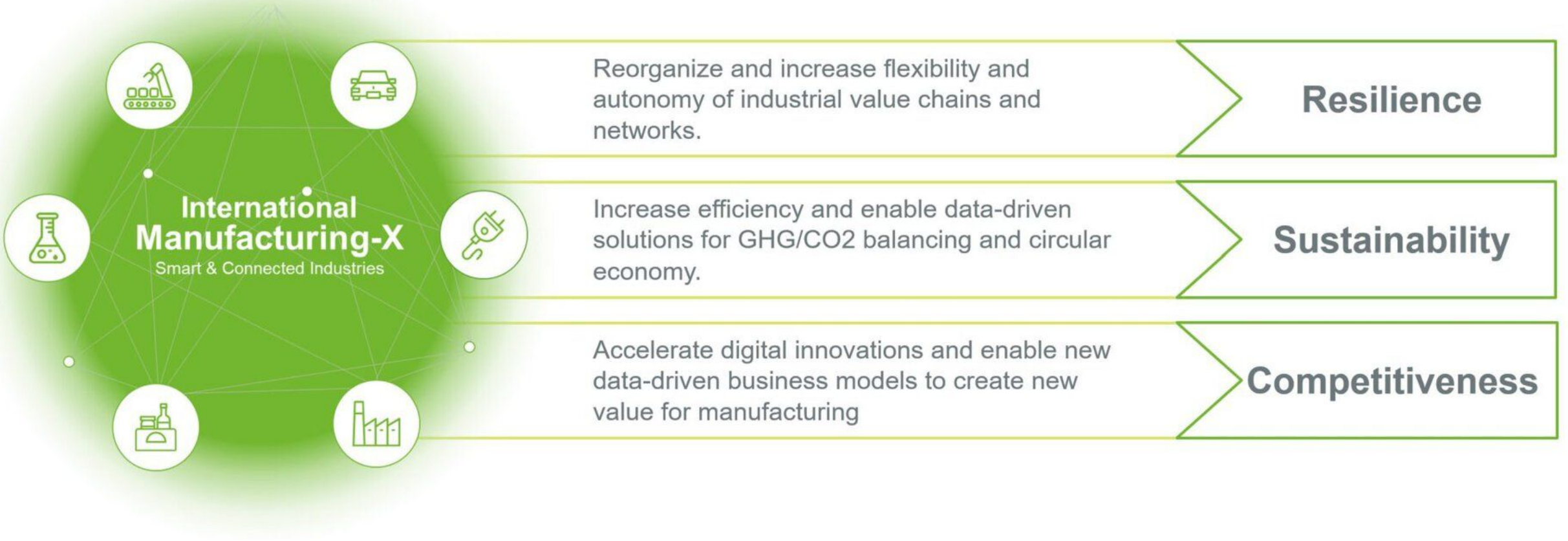
AAS the industry solution for the Digital Product Passport

## Digital Product Passport



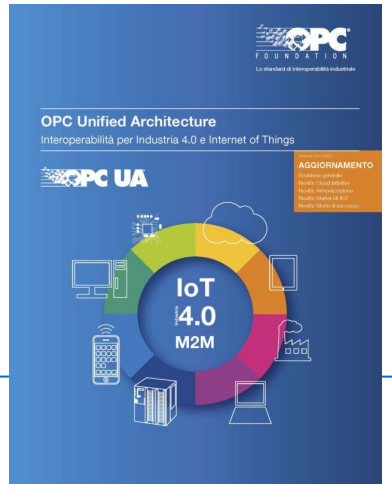
# International Manufacturing-X Council (IMXC)

- The IMX Council (IMXC) will implement a federated, decentralized and collaborative data ecosystem for smart manufacturing. Open, global and cross-industry, following FAIR Data Principles.



- OPC is the interoperability standard for the secure and reliable exchange of data in the industrial automation space and in other industries. It is platform independent and ensures the seamless flow of information among devices from multiple vendors. The OPC Foundation is responsible for the development and maintenance of this standard.

- The OPC standard is a series of specifications developed by industry vendors, end-users and software developers. These specifications define the interface between Clients and Servers, as well as Servers and Servers, including access to real-time data, monitoring of alarms and events, access to historical data and other applications.



# Outlook

- ISO/IEC JTC 1/SC 38: Cloud computing and distributed platforms → ISO/IEC DIS 20151: Dataspace concepts and characteristics
- CEN/CENELEC JTC 24: Digital Product Passport (DPP)
- CEN/CENELEC JTC 25: Data management, Dataspaces, Cloud and Edge

- Rethinking of supply chain ie whole supply chain from raw material until recycling has to be taken into account
- Avoiding redundant copies of data ⇒ Federated System
- Developing common metadata model
- Cross disciplinary approach
- Openness of Systems

# Thank you!