Accelerating global adoption of Catena-X with

Eclipse Tractus-X

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STOP!!!

Catena-X

International

Operational

Dataspace

≠

Eclipse Tractus-X

Open Source

Project

Catena-X

International

Operational

Dataspace

Catena-X Association

≠

Eclipse Tractus-X

Open Source

Project

Eclipse Foundation

Catena-X

Standards

Whitepapers, Guides &

Rulebooks

(with Non-Functional Requirements)

≠

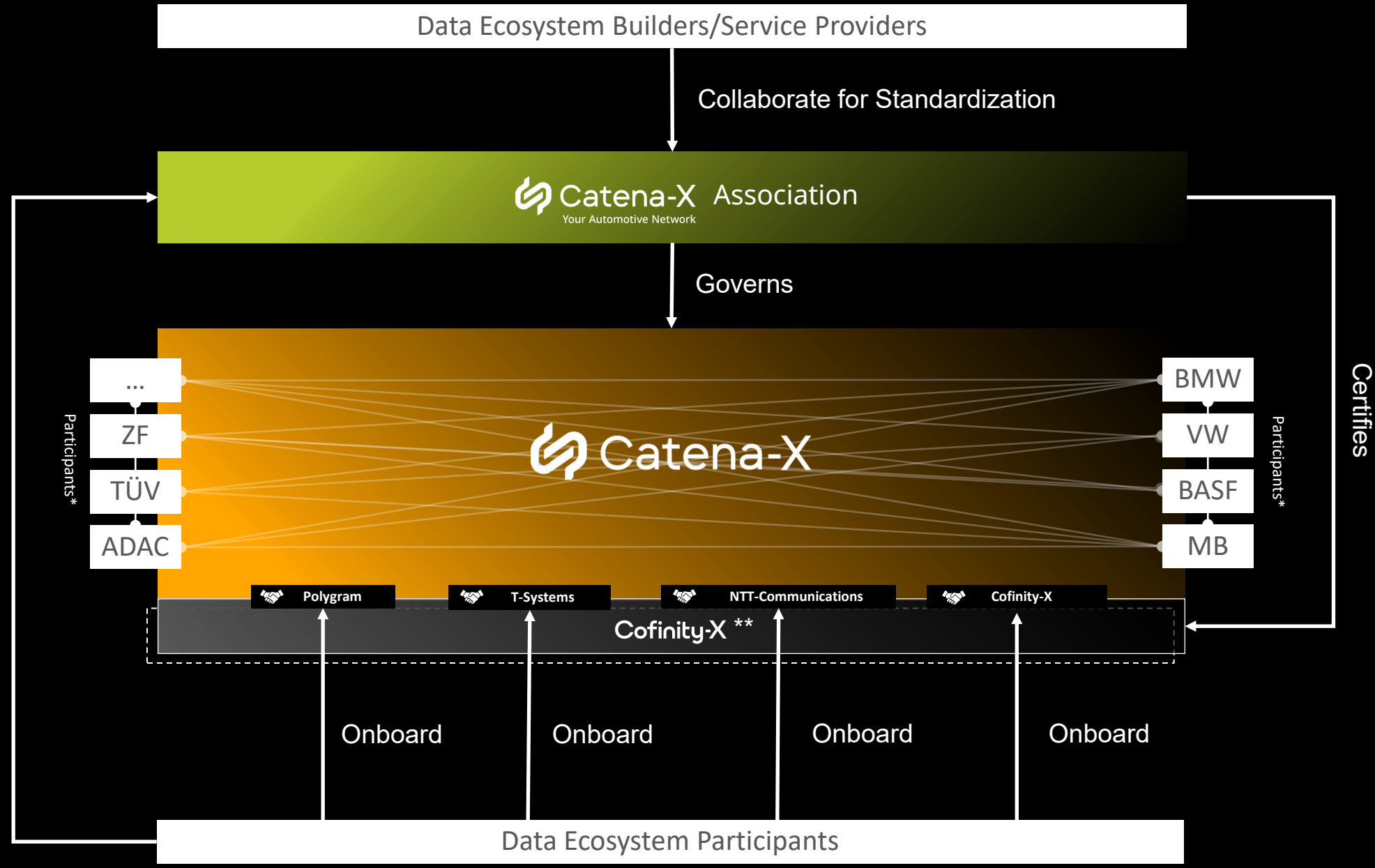
Eclipse Tractus-X

Reusable FOSS Components

& Use Cases (KITs) for

Manufacturing-X

Catena-X Overview



** Multi-opco is being worked for easier international scalation

*Companies listed in cofinity-x.com

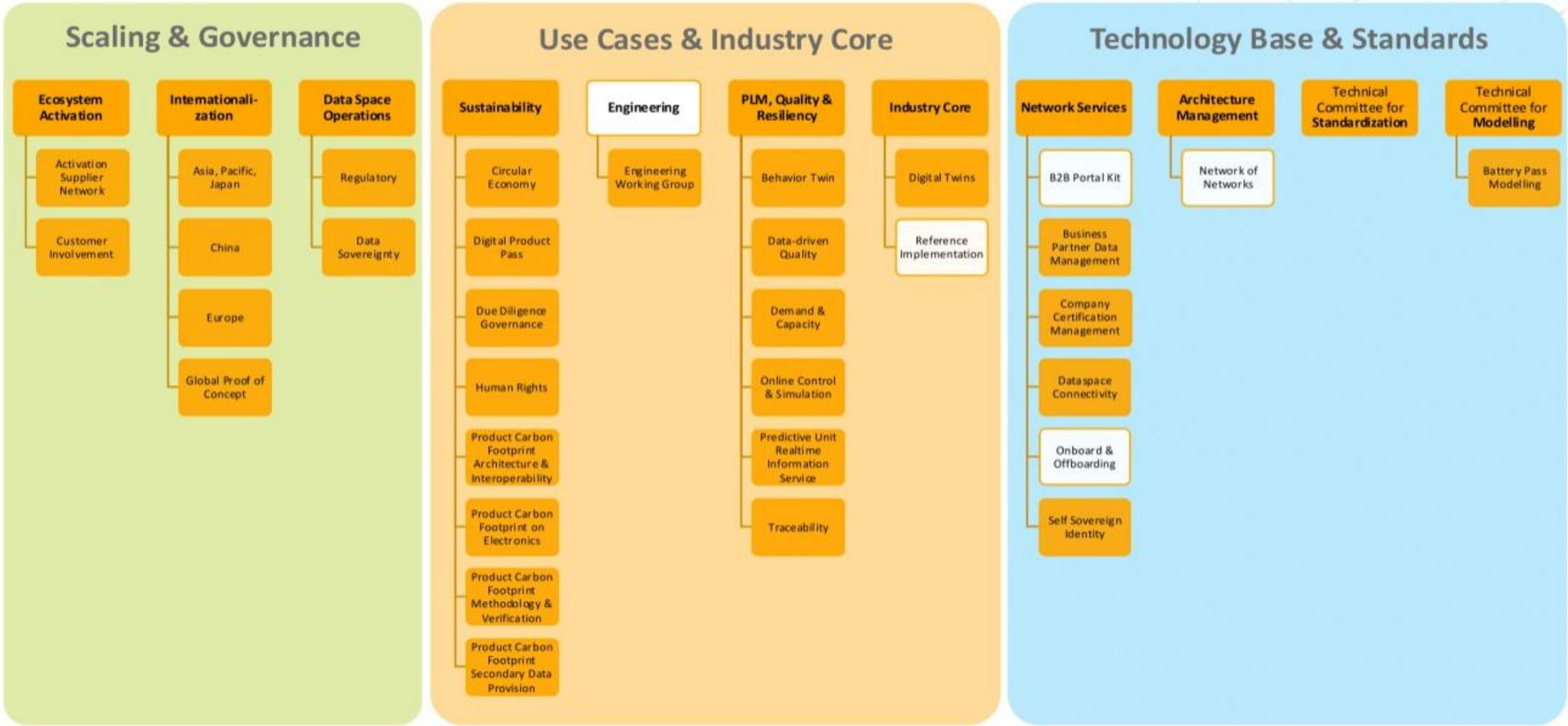
The Catena-X Association

We are Catena-X

for all members see full list

Catena-X Working Groups Overview

(Status 2025-01-01)



Association Bodies

Operational

Announced

Catena-X is the first industrial trusted and collaborative data ecosystem at global scale, with automotive DNA.

*Catena-X **connects partners** across the supply chain - from parts suppliers to car manufacturers - using shared rules and standards, not a central platform. This makes cooperation smoother and helps meet growing demands for quality, sustainability, and transparency.*

Key benefits:

- *Easier and fairer data sharing between partners*
- *Each company stays in control of its own data*
- *Supports goals like sustainability, traceability, and compliance*
- *Enabler for effective multi-tier collaboration*
- *Cost Reduction via Synergies for Business & TI*

From the industry, for the industry

The 1st trusted multi-tier business collaboration network is LIVE

Layer 1: Build & Govern

Full industry re-presentation

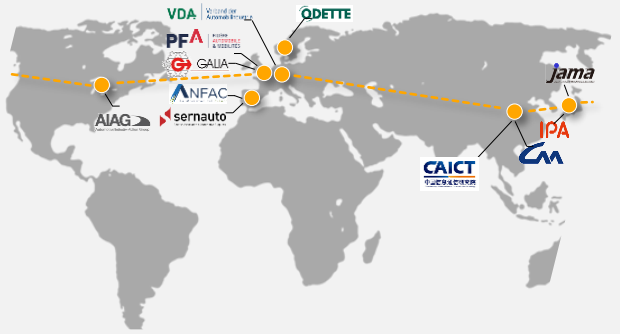
→ OEM/ supplier/ recycler/ SME/ research
→ Solution-/ service provider/ transfer org.

overall:
Global Industry Representation

Layer 2: Scale

Global re-presentation

→ regional alliances (US, FR, ES, JP, CN, …)
→ local hubs



overall:
~ pot. 7,000 companies addressed

Layer 3: Transfer

X-Industry re-presentation

→ comparability & interoperability
→ re-use/ synergies

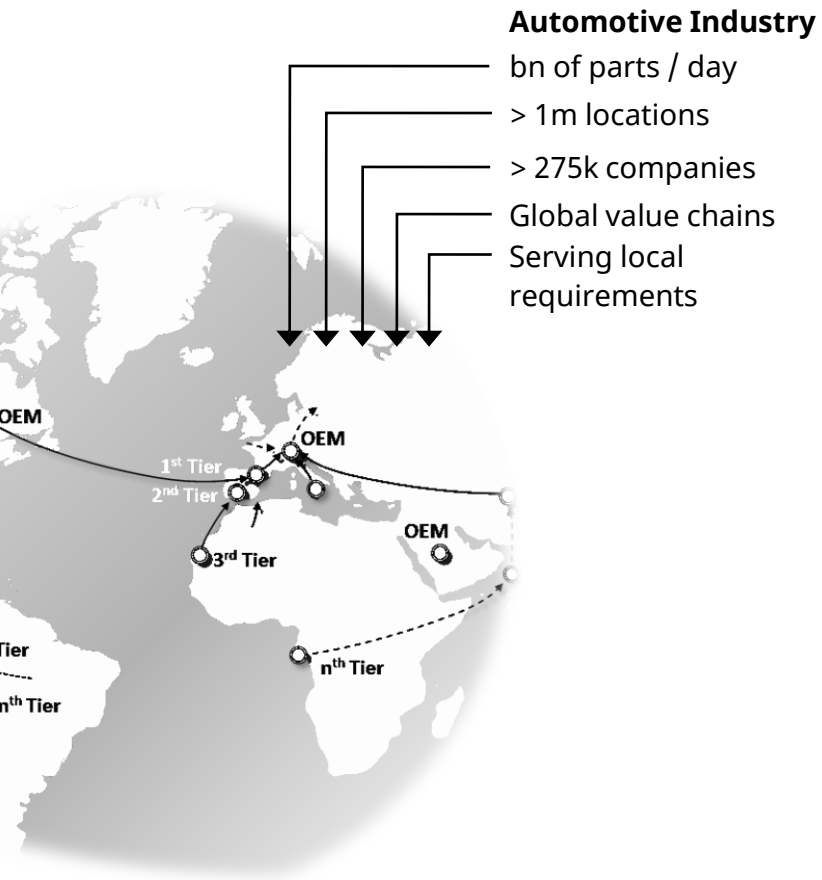
Selected industry Eco-Systems Partners

Temp. guidance-/ Collaboration Partner
(when needed)

Trusted & interoperable data exchange: **Governed by the industry**

Our automotive business processes require an update of the industry operating model

Motivation: “License to operate and grow”



Resiliency

Resilient Supply Chains

- Business Partner Identification
- Location Certification
- Bolster supply performance
- Optimize inventory / logistics
- …

Compliance

Trusted Sustainability

- Report validated CO^2_e-Values
- Cover regional variance
- Release of Product Passports
- Supply Chain Due Diligence
- …

Cost down

Effective Quality

- Trace parts / campaign mgt.
- Live quality loops
- Behavior Twins
- …

require

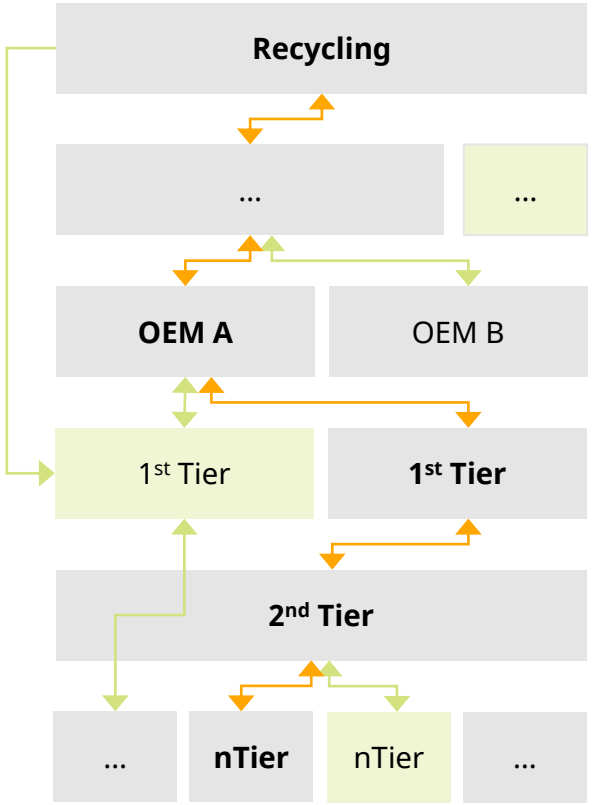
multi-tier collaboration along the value chain

It is a digital challenge!

How to enable Multi-Tier Collaboration?

Four main alternatives

Automotive Value Chain
– Use Case X –



Alternative 1

1x central Data Base for all industry partners

+ No cost for supplier
+ Established / available

– Trust / Verification
– Data Protection / IP
– Cyber-Security
– Business Process Readiness

Alternative 2

One IT Provider for all partners of the same value chain

+ Trust / Verification
+ One solution provider

– Compliance / AntiTrust
– Scalability in Business
– Enforce Usage (nTier)
– Costs / Synergies

Alternative 3

Industry standards to create inter-operability between providers

+ Freedom of Choice (vendors) → Anti Trust
+ Data Protection / Cyber Security
+ Trust / Verification
+ Scalability in Business

– Industry Transformation
– Initial Complexity

Alternative 4

Every Partner has its own solution

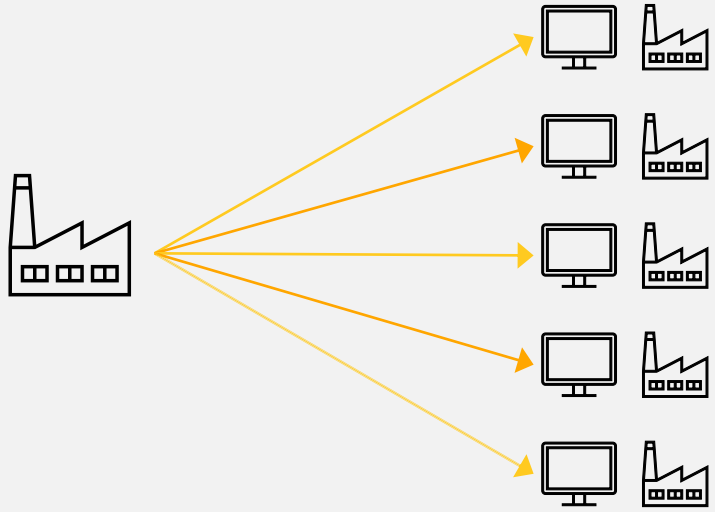
+ Data Protection / IP
+ Freedom of Choice

– Trust / Verification
– Business Compliance
– Compatibility / Logic
– Scalability in Business
– Overall Costs

Problem Statement & Catena-X Solution

Current Challenge

100 Customer = 100 Different Ways & Systems



No Standards

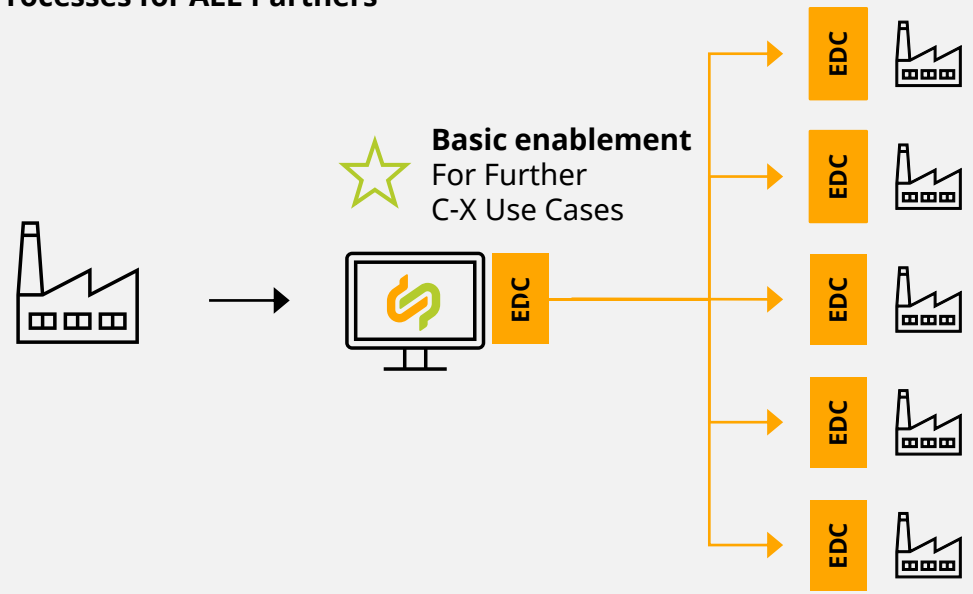
Individual B2B portals

Outdated Certificates

Manual Validation

Catena-X Solution

Standardized Data Models & Processes for ALL Partners



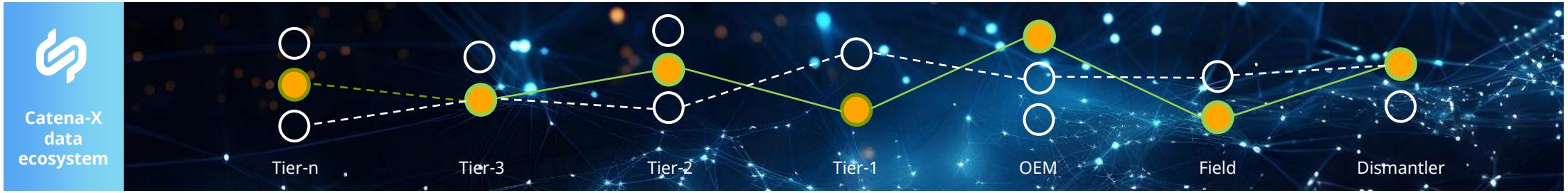
Standardized Data models

Interoperable Data exchange

Harmonized Validation (tba.)

Ecosystem data

Catena-X developed an open, collaborative ecosystem for data exchange along the value chain



Trusted Identities

Verified and unique company identities

Self Sovereignty

Decentral Architecture with full control over your data

Interoperability

Unified open-source-based standards and KITs

Legal Framework

One global operating model and legal framework

Catena-X is **not a database** to store and collect data but an **open ecosystem** to share data in a better way – **standardized, secure and simple.**

Success Stories

Voices from some **Catena-X Champions**

Testimonials

Active data sharing and support of use cases Battery Passport, Product Carbon Footprint and Demand&Capacity Management.

Focus on Product Carbon Footprint and Quality Management. Onboarding strategy for supplier in preparation.

„We focus on continuous roll-out of Catena-X BPDM solutions to maximize process efficiencies and data quality in our master data management.“

SCHAEFFLER

“Data-driven quality revolutionizes quality. It will substitute physical parts handling by AI based digital analysis. With Catena-X we standardize and scale our processes with our partners leading to efficiency e.g., by enabling the detection of failure patterns and anomalies before they lead to customer dissatisfaction.”

Axel Boeringer, Senior Vice President Quality Management, Bosch

BOSCH

We see enormous potential for Catena-X as a **single global standard** for future collaboration with partners to achieve **cost-efficient integrations** for use cases and support **fast scaling**.

MAGNA

“Catena-X enables us to drive the digital transformation of the industry while increasing the efficiency and sustainability of our processes. Through close collaboration with our partners, we are creating robust, transparent und sustainable supply chains that are equipped to meet the challenges of the future.”

Dirk Große-Lohheide, Member of the Board of Management of the Volkswagen Brand responsible for Procurement and Member of the Extended Executive Committee

VOLKSWAGEN AKTIENGESELLSCHAFT

Main focus is set on Quality Mgt. and Location Certificates to build the synergetic digital network-foundation for regulatory changes (e.g. CO_{2e}, Battery Passport). A dedicated onboarding team will support 2025/26 target achievement.

Catena-X enables meeting regulatory requirements such as Battery Pass more efficiently and provides trusted data exchange.

DRÄXLMAIER

Key Priorities in 2025 are:
Demand Capacity Management, Product Carbon Footprint, and our clear onboarding strategy. Onboarding is key to strengthen data exchange with business partners to generate value using specific use cases.

Mercedes-Benz

Industrial data ecosystems are essential for secure data exchange, ensuring transparency in global supply chains, and addressing new cross-sector requirements.

Example

PCF-Reporting at SAP and Supplier Witte

Challenge

- Isolated communication of Product Carbon Footprint values (PCF)
- No standardized way of calculating the PCF

Using Catena-X

- Automated data flow streamlines PCF assessment
- Standardized calculation of the PCF value along the value chain

Result

3–5x

higher efficiency in PCF calculation compared to manual approach

~10,000 €

savings per PCF calculation compared to audit-based process

Example

Quality Improvements at BMW and Bosch

Challenge

- Labor-intensive, parts-based inspections of components
- Detection of anomalies often only after the failure occurs

Using Catena-X

- Data-driven instead of a parts-based approach
- Early warning analyses based on standardized field data

Result

4 Months earlier detection

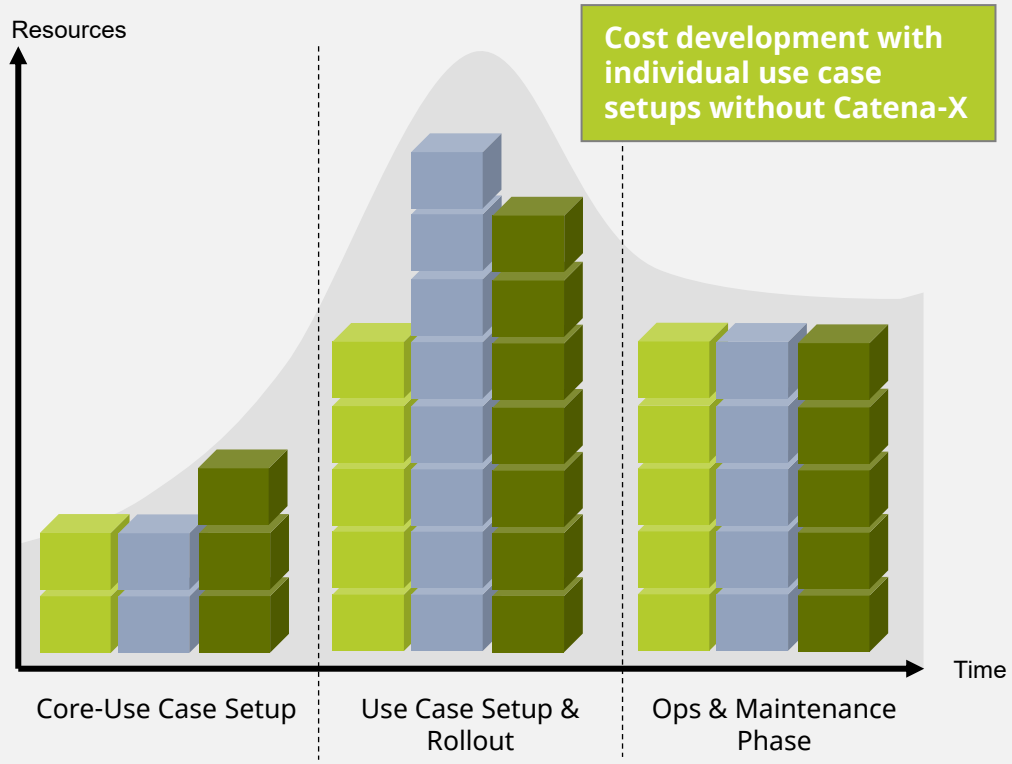
of patterns and anomalies, often before a failure occurs

Catena-X as foundation for Inter-Company Business Optimization (Example: Large, globally acting Corporation)

Development of savings potential over time

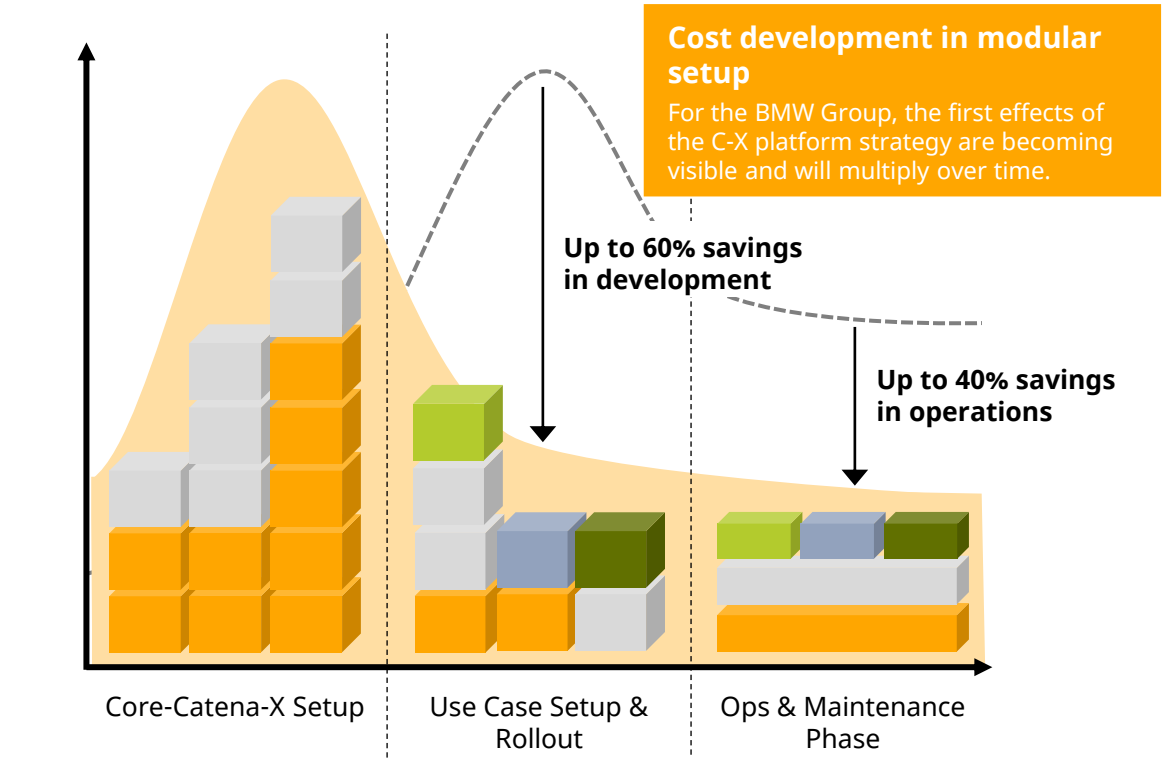
Without Catena-X

... mostly individual Use Case enablement



Same scope with Catena-X

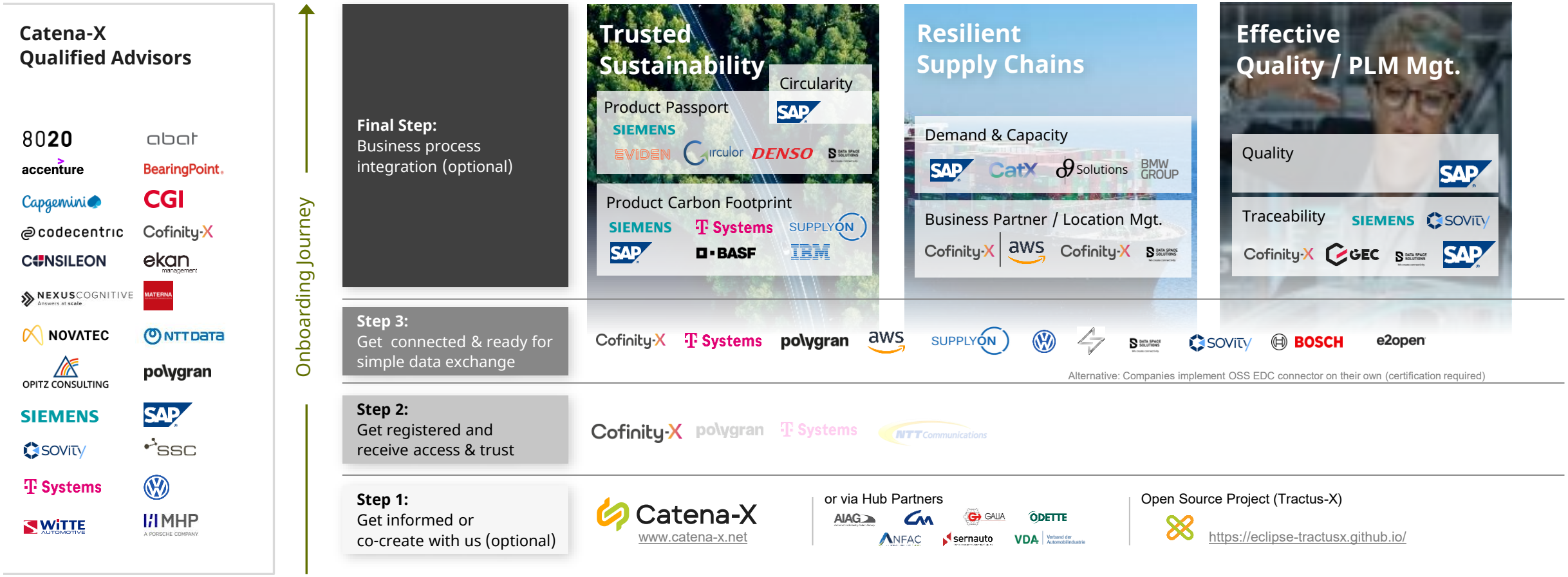
... synergetic modules and scalable Infrastructure



The Role of Tractus-X

Catena-X certified partners portfolio

3 steps to value creation (04/2025)



Radical collaboration in action

Catena-X results as of 12/2025:

- → **Scalable / trusted standards for top industry problems** (21x KITs, >40 certified services)
- → **Fully operational development** (Tractus-X) **& operating environment** (Cofinity-X)
- → **Global and cross Industry Alignment** (US, EU, CN)
- → **Conformity Assessment Body** (Deloitte / TÜV)

Catena-X Development Environment

7,7 %

7,6 %

SW-Development "ready to use" CX **KITs**

Open Source Tractus-X [Eclipse Foundation]
Metric: # Commits Q4/2025

Standards for Top Industry Problems

Resiliency
Resilient Supply Chains

- Demand & Capacity Mgt.
- PURIS (Short term supply mgt.)
- Business Partner Mgt.
- Certificate Mgt.

Compliance
Trusted Sustainability

- CO_2 Footprint (CSRD, IKB)
- EcoPass / BatteryPass
- Environmental and Social Services
- Circularity

Cost Down
Effective Quality

- Quality Mgt.
- Traceability
- Remaining Useful Life
- Health Indicator

Network Foundation

- Industry Core
- Connector
- Data Chain
- Digital Twin
- Operating Model
- and many more

Some of our Use Cases

Quick wins and short-term enabler

Traceability

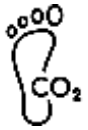
- Trace components and subcomponents along the whole value chain using Digital Twins
- Narrow down quality issues significantly faster

Quality Management

- Receive quality performance data from the customer
- Root cause analysis and collaborative data evaluation

Regulatory must haves within the next 1-2 years

Product Carbon Footprint



- Enablement of uniform CO2 Reporting
- Compliance with PCF regulations

Circular Economy / Digital Product Pass

- Product information in one place (e.g. material composition & origin)
- Compliance with battery regulations (Battery Pass)

ESG Monitoring (LkSG)

- Facilitating ESG data reporting transparency
- Compliance with supply chain due diligence regulations

Process improvement enablers

Business Partner Data Management

- Harmonized, complete & quality-checked data
- Reduction of data maintenance costs & improved data actuality

Demand & Capacity Management

- Improved planning reliability & accuracy
- Early detection of problems & ability to avoid capacity bottlenecks reducing costs

Digital Behavior Twin

- Model-based product design & innovative collaboration
- Access to solutions and evaluation procedures for SMEs

More Use Cases +

- ✓ Manufacturing as a Service (MaaS)
- ✓ Modular Production
- ✓ PURIS – Predictive Unit Realtime Information Service
- ✓ Online Control and Simulation

+ Many More to Come!

Tractus X

Dataspace

Adoption

Powered by **Tractus-X** Open-Source KITs

Eclipse Tractus-X KIT (Keep It Together)

KITs are **available to everyone** as part of the Eclipse Tractus-X open-source project, which facilitates participation in the design and development of Dataspaces Based on Catena-X. KITs have a broad applicability and are **not limited** to the **automotive value chain**. There is at least one KIT to support companies for every use case.

TRANSPARENCY

COST REDUCTION

INNOVATION

INTEROPERABLITY

STANDARIZATION

COLLABORATION

Vision/Mission | Business Value(s) | Tutorials/ Videos | Whitepaper (e.g., Context)

Scope for Standardization/Certification

Semantic Models | Logic/Schema | Business Processes | Access & Usage Policies

API Specifications | Protocols | Sample Data | Reference Implementation | Architecture

Conformity Assessment Criteria

Quick Setup Guide | Deployment Scripts

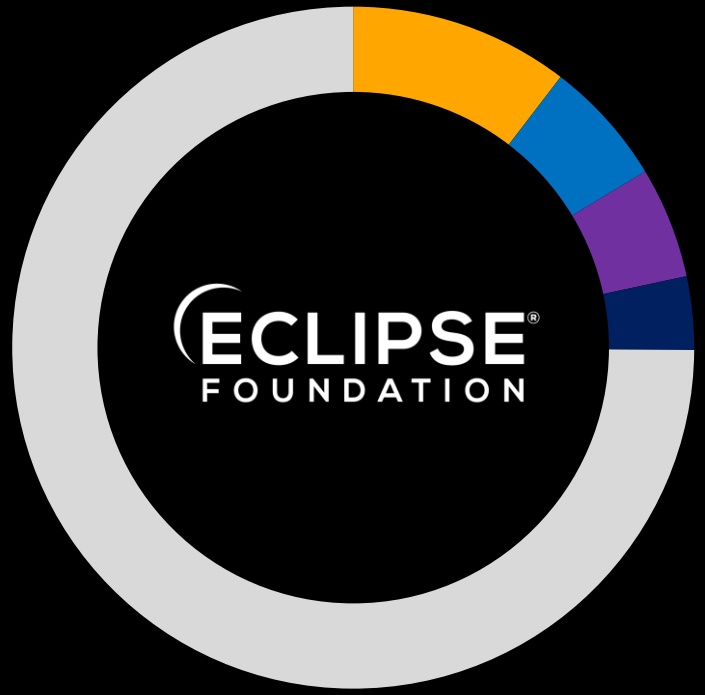
Tractus-X offers a dedicated set of tools to empower and stimulate interoperable solutions for each step of the customer journey.

ECLIPSE

Tractus-X™

Where we build dataspaces!

Contributions



Eclipse Tractus-X

IS

Top #1

- Eclipse Tractus-X
- OpenHW Group CORE-V Cores
- Eclipse SUMO™
- Eclipse OpenJ9
- Other

Actual state in and trends of Eclipse Tractus-X

68.62%

862

Contributors

*__489__ Active Participants

*__1,104__ __New__ Participants

44

Committers

Stable Committers Numbers with __High__ Interest to Growth all over the world!

5

Project Leads

New Senior Committers are getting promoted to Project Leads.

Main source: https://metrics.eclipse.org/projects/automotive.tractusx

*Additional Source: Eclipse TX org in Github OSS Insights

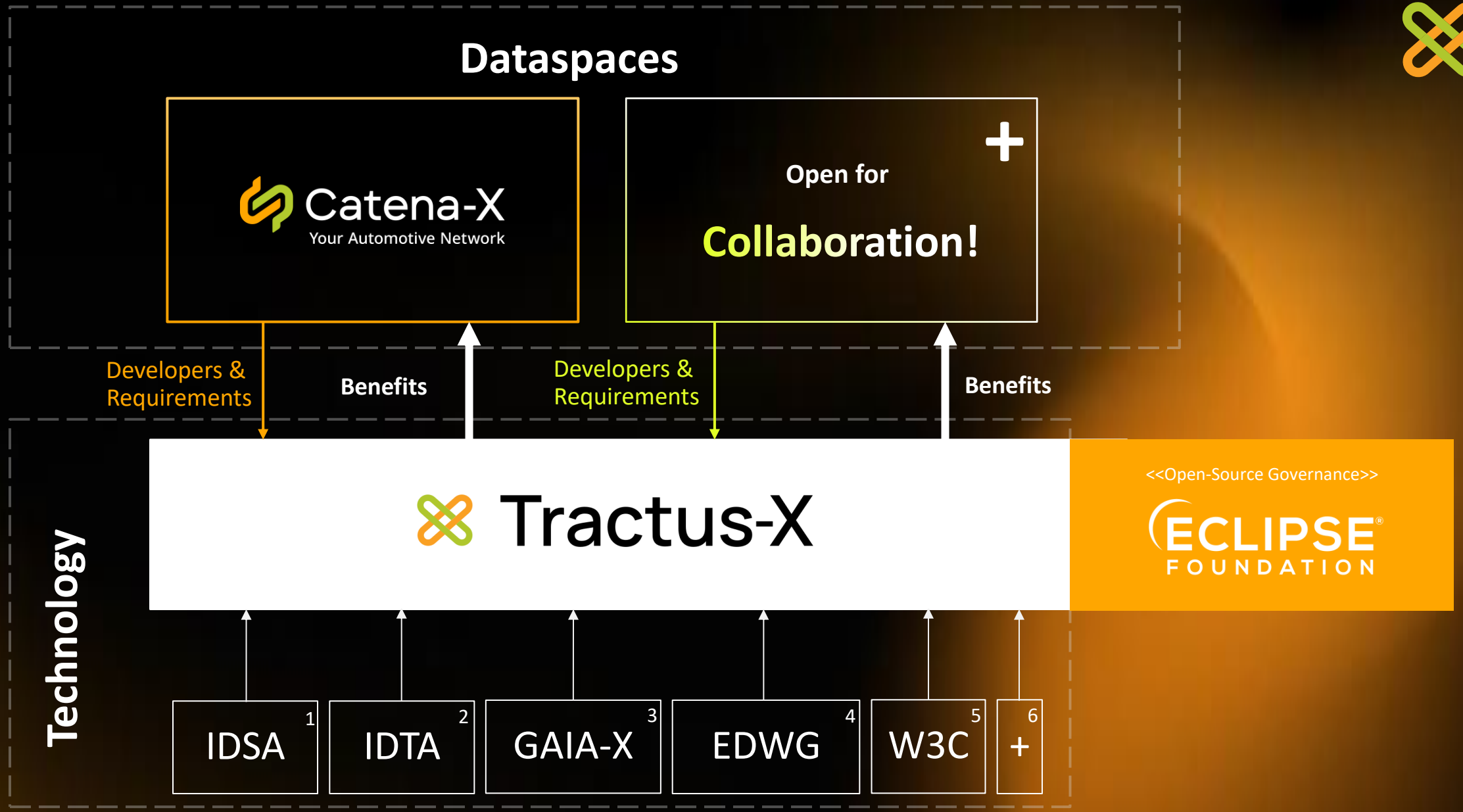
Trends from last 12 months

*Companies listed in cofinity-x.com

ECLIPSE TRACTUS-X

is not just for

AUTOMOTIVE



1. International Dataspace 2. Industrial Digital Twins & More 3. Data Sovereignty 4. Decentral Data Exchange 5. Secure + Web3.0 6. Innovative

RE-USE → IMPROVE → COMBINE → REPEAT

Dataspaces

Catena-X
Your Automotive Network

Ready for -X
Collaboration!

Open for +
Collaboration!

1,2,3,4,5,6

Tractus-X

Where we build dataspaces!

1. International Dataspace
2. Industrial Digital Twins & More
3. Data Sovereignty
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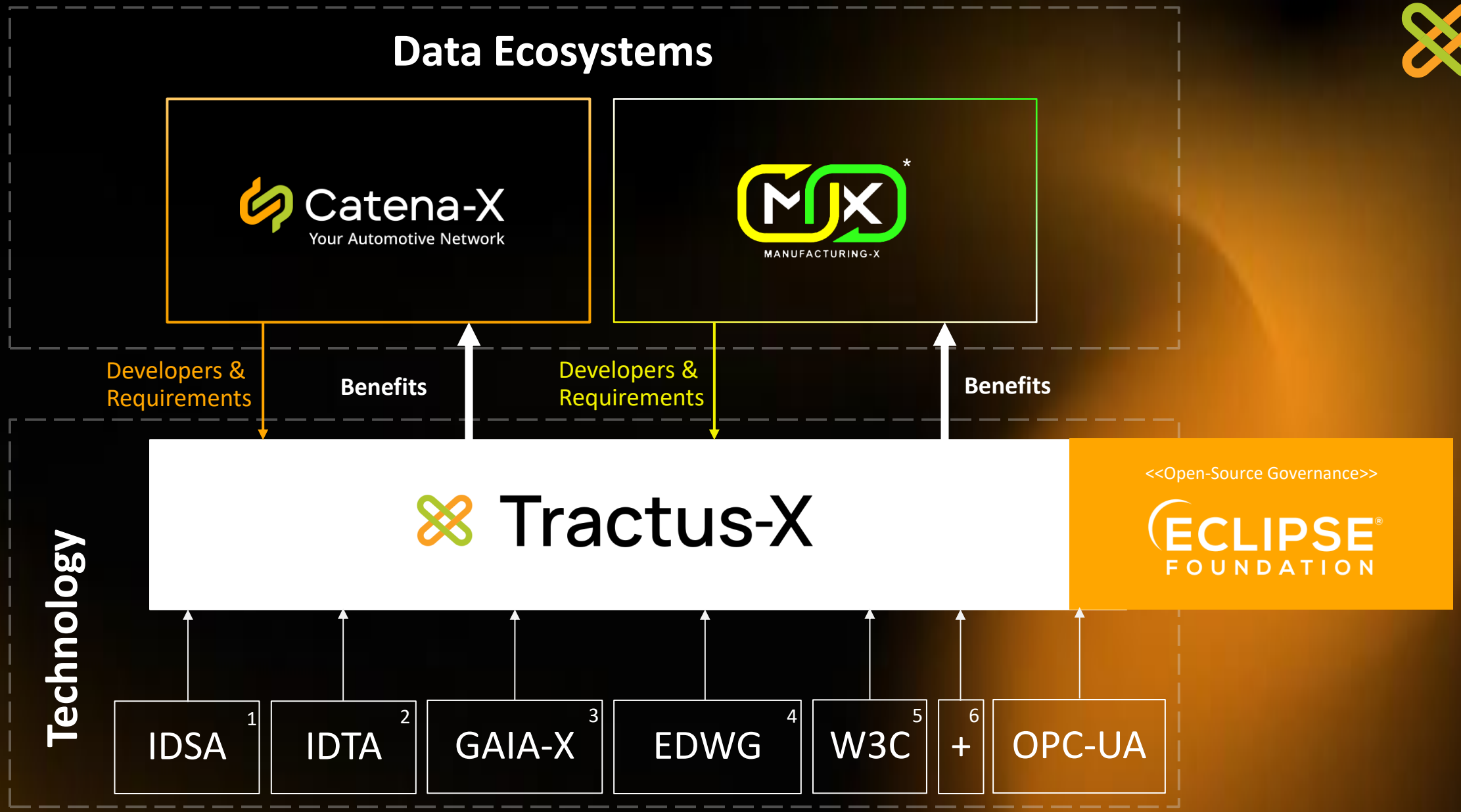
5. Secure + Web3.0
6. Innovative

SUCCESS STORIES

*Chem-X, Construct-X, Energy-Data-X, Factory-X, Semi-Conductor-X



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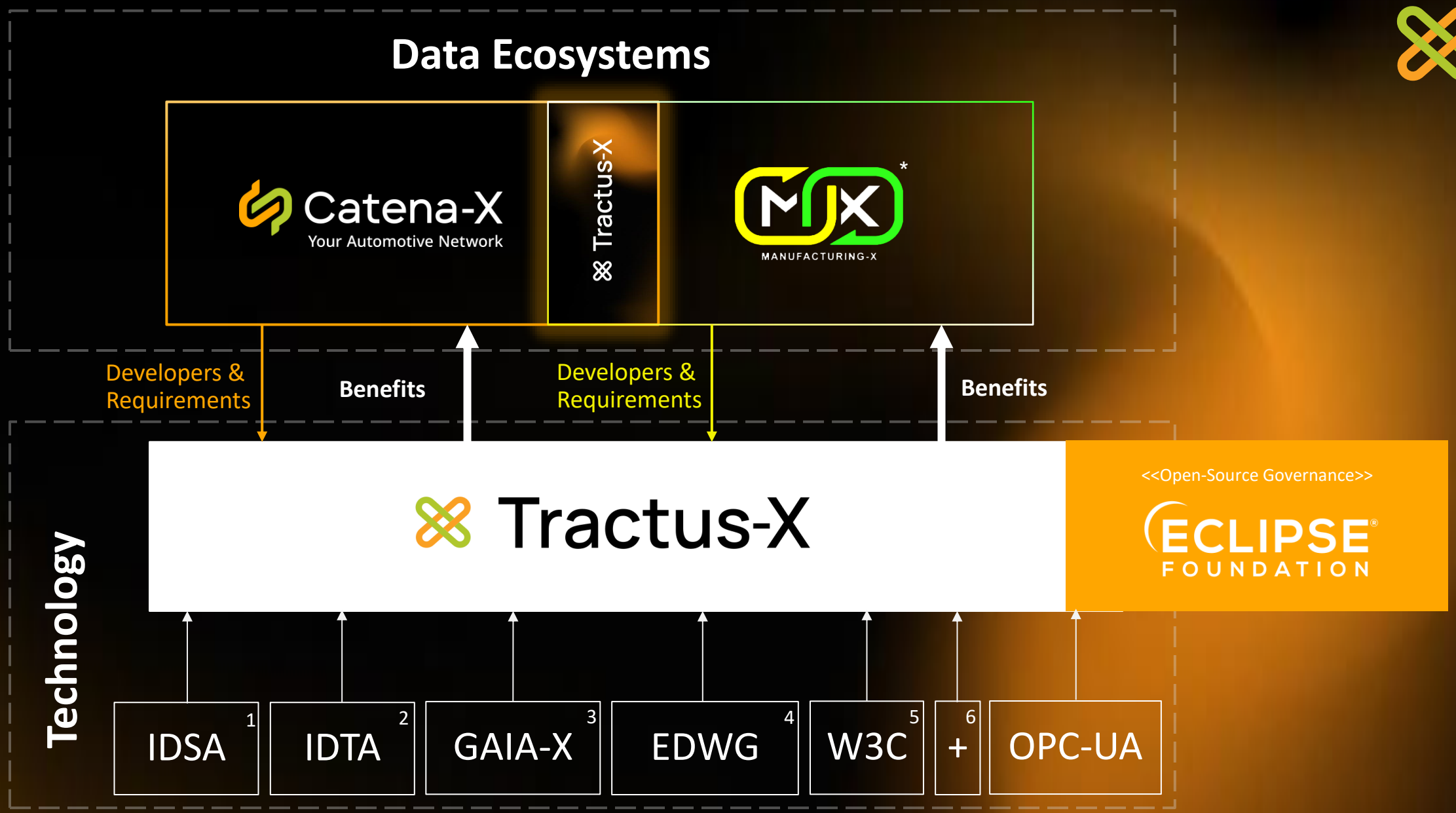

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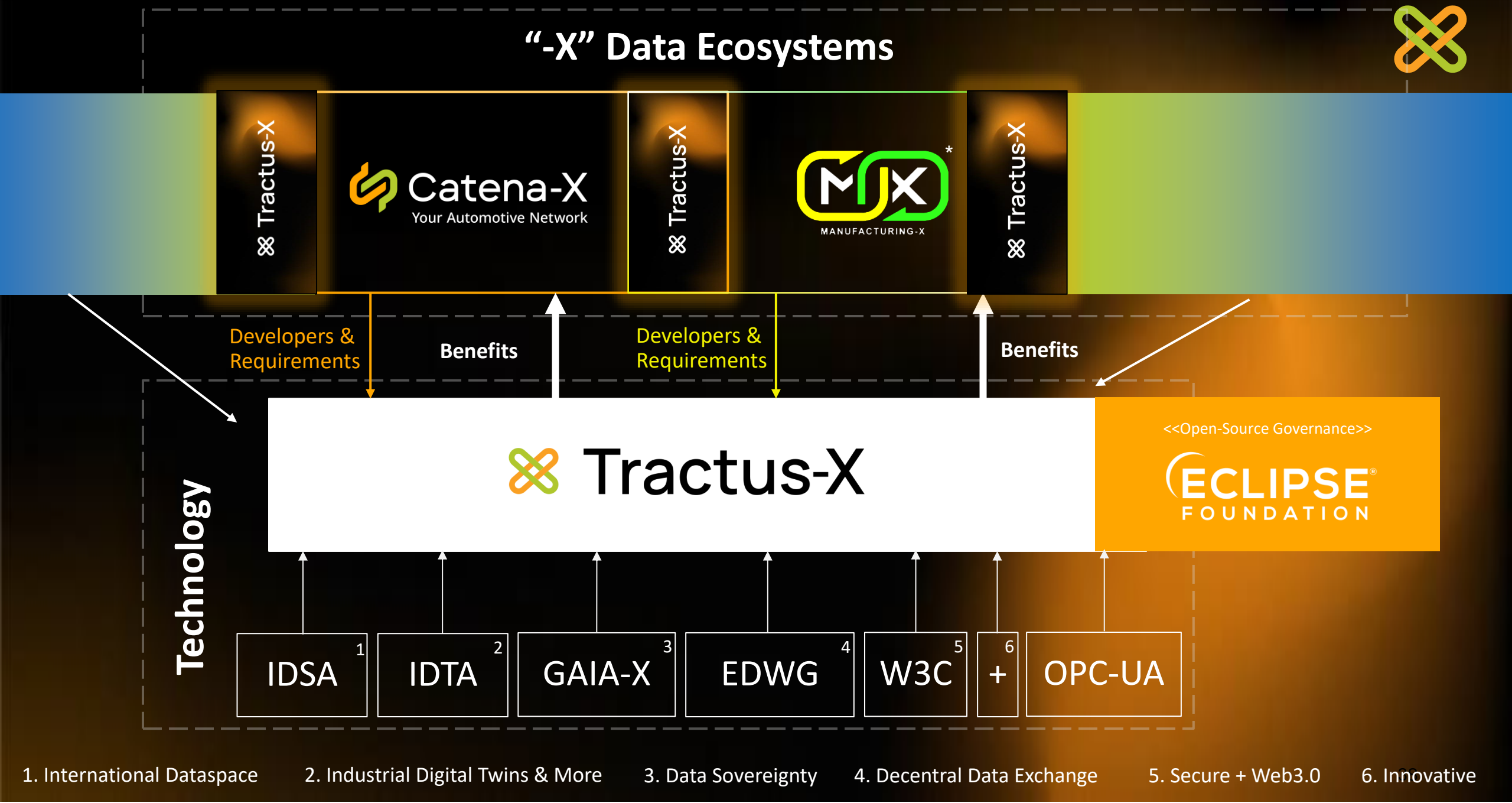
"-X" Data Ecosystems



1. International Dataspace
2. Industrial Digital Twins & More
3. Data Sovereignty
4. Decentral Data Exchange
5. Secure + Web3.0
6. Innovative

Emerging Industrial Dataspaces

Gaia-X & IDSA

Trust and Governance Framework & Technology Base for Dataspaces to assure data sovereignty. (2020)

Catena-X

Founded in 2020 is the **First Gaia-X Reference Implementation** to become productive. (2023). Provides a solid Open-source base for other dataspaces (Tractus-X).

Manufacturing-X

Born from the **Platform Industrie 4.0 project**, it propose the multi-interoperability of –X Dataspaces in bigger manufacturing domain. (2022)

Factory-X & Aerospace-X

Aligned with Catena-X, other –X networks are being built for other industries. Intending to **use Tractus-X as base** for the technological kickstart. (2024). A light house project for Manufacturing-X.

More –X Networks

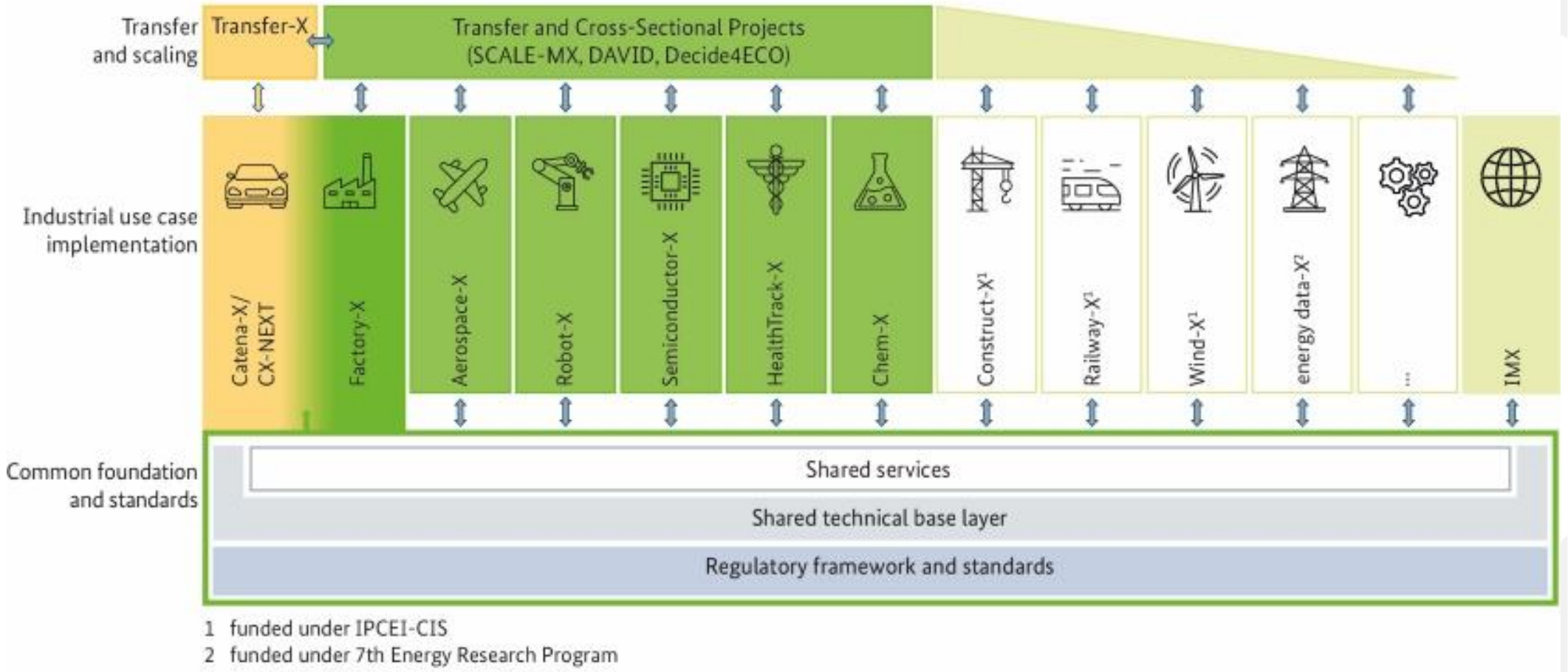
In the future is planned and predicted that several **–X dataspaces** will **emerge for different industries**.
Example: Energy-Data-X, HealthTrack-X, Robot-X, Semiconductor-X Chem-X…

Funded by:

Funded by the European Union
NextGenerationEU

Federal Ministry for Economic Affairs and Energy

Emphasizing cross-project collaboration



Source: https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Dossier/manufacturing-x.html

Some Available Components

KITs

(Documentation)

Eclipse Tractus-X Portal & Identity Management	Eclipse Tractus-X Marketplace	Eclipse Tractus-X Digital Twin Registry
Eclipse Tractus-X Dataspace Connector	Eclipse Tractus-X Identity Hub (Wallet)	Eclipse Tractus-X Umbrella (One Click Dataspace)
Eclipse Tractus-X Tractus-X SDK	Eclipse Tractus-X Issuer Components	Eclipse Tractus-X Semantic Models + Semantic Hub
Eclipse Tractus-X Discovery Services	Eclipse Tractus-X PURIS	Eclipse Tractus-X Business Partner Management
Eclipse Tractus-X Digital Product Passport	Eclipse Tractus-X Item Relationship Service	Eclipse Tractus-X Trace-X

+

The Open-Source Connector KIT

One Reference Implementation: Eclipse Tractus-X Connector (EDC)

More implementations: T-Systems, Sovity, VW, AWS, Bosch, SAP + More

OPEN SOURCE – FOR FREE

Uses the Eclipse Dataspace Components Framework (DSP & DCP) – Vendor Neutral

CLOUD

Helm Charts Deployment

SIMPLE

Token Refresh Simplification

FLEXIBLE

Supports any HTTP Endpoint

SECURE

SELF-SOVEREIGN IDENTITIES

FAST

Endpoint Data Reference

SCALABLE

Federated Catalog & Managed Domains

WIDELY USED

INTEROPERABLE & EXTENDABLE

The Digital Twin KIT

Reference Implementation: Eclipse Tractus-X Digital Twin Registry (DTR))

More Implementations: BOSCH, SAP, Cofinity-X + More

COMPLIANT

AAS SPEC 1 (METAMODEL) + 2 (API SPEC) FROM THE IDTA**

EXTENDABLE

SUPPORTS REFERENCE TO DSP CONNECTORS

DECENTRAL

OPERATED BY EACH PARTICIPANT

SEMANTICS

ALLOW THE DEFINITION OF OWN SEMANTICS IN SAMM METAMODELS

**Planned to implement Spec 3-4 (AAS Security) via BASYX

Tractus-X Product Carbon Footprint

Reference Implementations:

- SiGREEN (Siemens)
- SDX (SAP)
- SPF (SupplyOn)
- SDE (T-Systems)

Example Payload

The following json shows an exemplary payload for a requested PCF value.

Payload


```
{
  "specVersion" : "urn:io.catenax.pcf:datamodel:version:7.0.0",
  "companyIds" : [ "urn:bpn:id:BPNL000000000DWF", "urn:vat:id:DE123456789"],
  "extWBCSD_productCodeCpc" : "011-99000",
  "created" : "2022-05-22T21:47:32Z",
  "companyName" : "My Corp",
  "extWBCSD_pfStatus" : "Active",
  "version" : 0,
  "productName" : "My Product Name",
  "pcf" : {
    "biogenicCarbonEmissionsOtherThanCO2" : 1.0,
    "distributionStagePcfExcludingBiogenic" : 1.5,
```


Catena-X and TFS
PCF Verification Framework

Version 1.0 open for public Consultation

Catena-X

TOGETHER FOR SUSTAINABILITY

Catena-X Automotive Network

Catena-X Product Carbon Footprint Rulebook

CX-PCF Rules

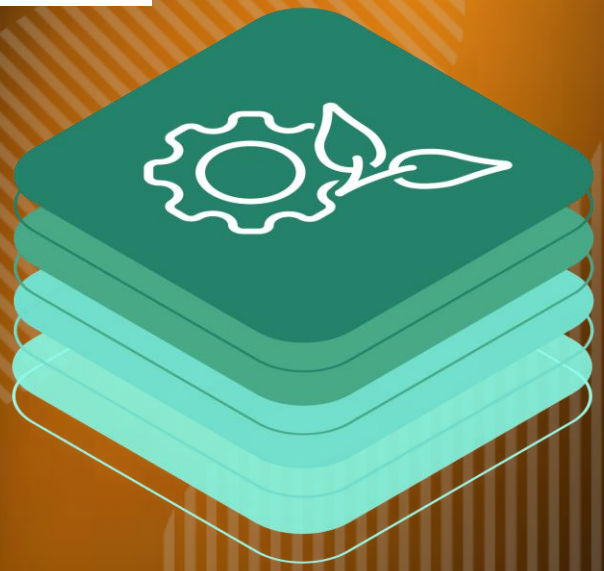
Version 3

Gefördert durch:

Bundesministerium für Wirtschaft und Klimaschutz

aufgrund eines Beschlusses des Deutschen Bundestages

Catena-X Automotive Network



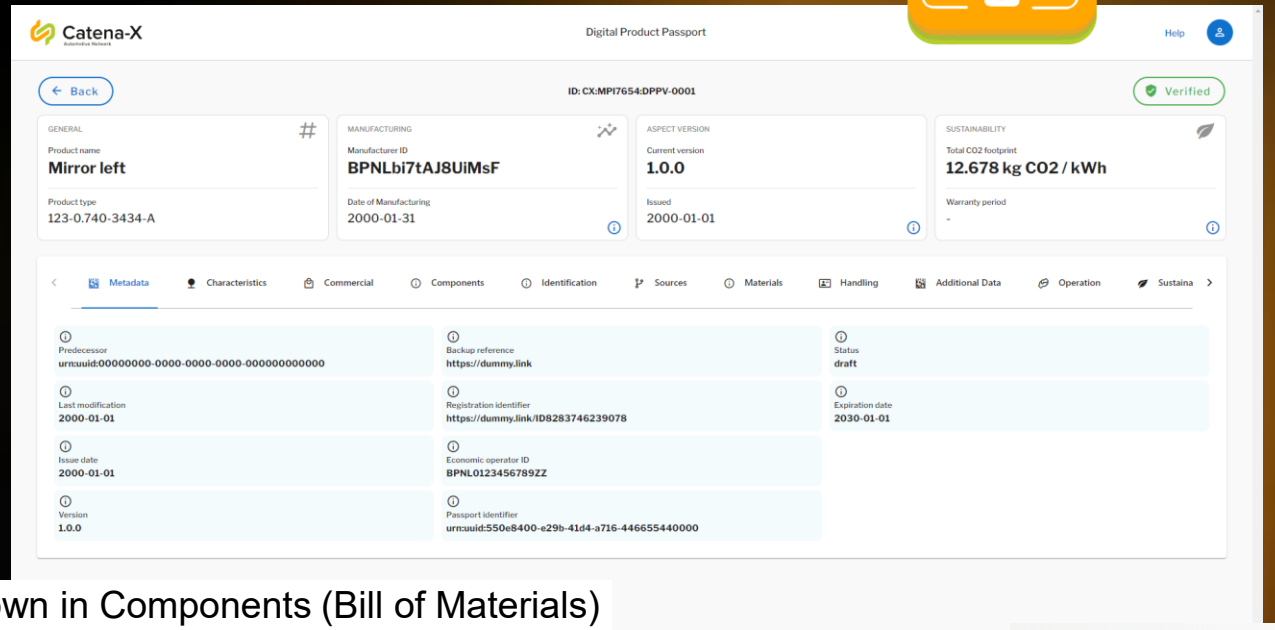
Tractus-X Digital Product Passport

Reference Implementations: Path.Era (Siemens), MHP, SAP + More

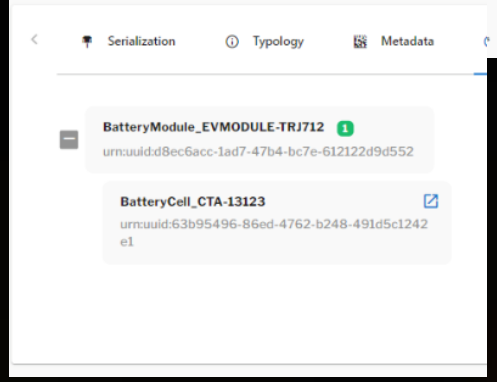
+ In a Digital Twin (AAS 3.0 from IDTA)

+ Data Model with Eco Design Regulation

Digital Product Passport Application



Drill Down in Components (Bill of Materials)



Battery Pass Application

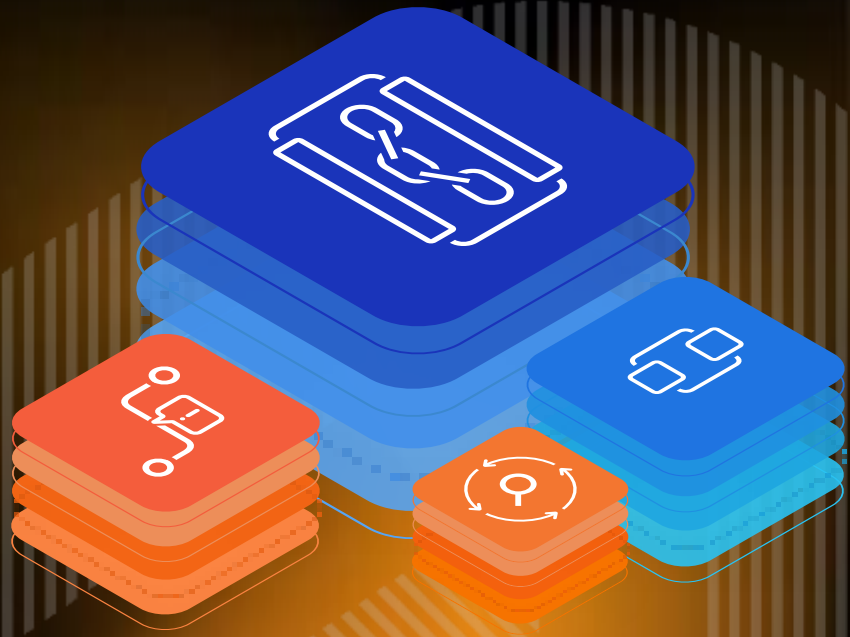
Digital Product Passport **Verification** Framework

Tractus-X Traceability & Industry Core

Engineering | Traceability | PCF | DPP | Quality | +

Industry Core

Dataspace Foundation



Search projects

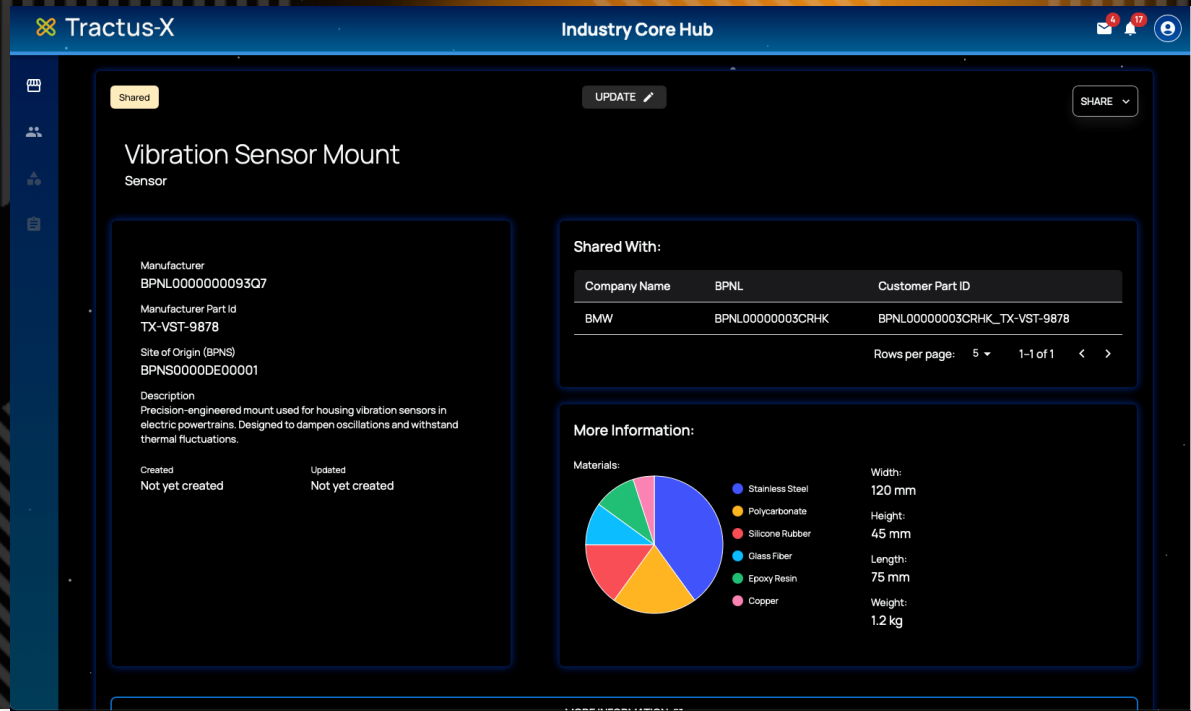
AI

tractusx-sdk 0.0.7

```
pip install tractusx-sdk
```

Industry Core Hub

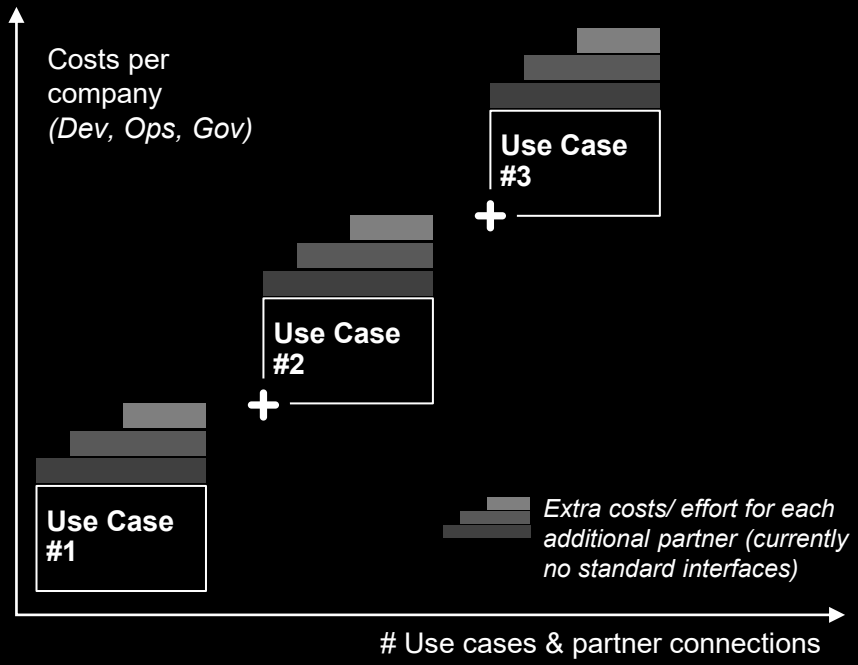
TRACE -X



Why Industry Core?

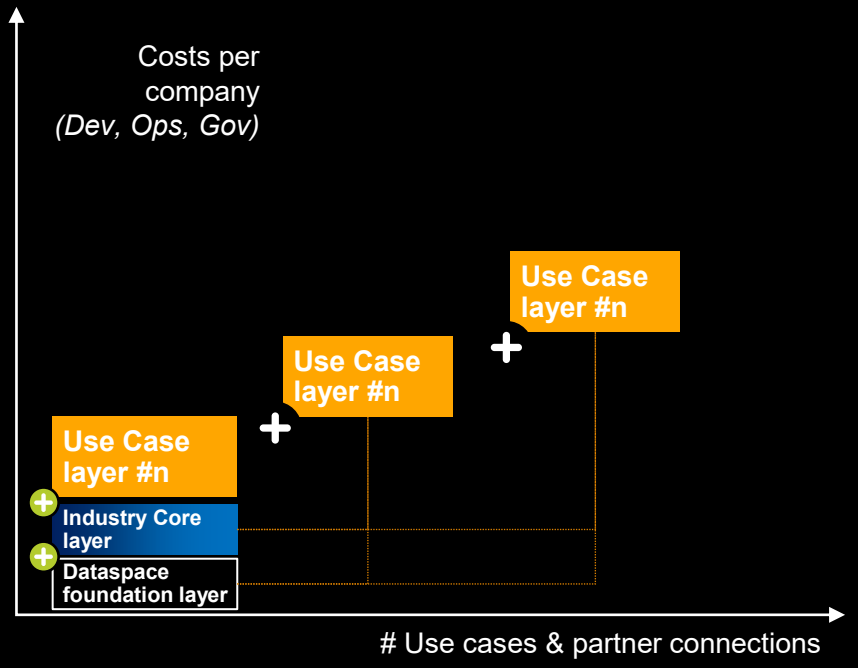
Cutting costs and speeding up time to value by cross use case synergies → The larger the Industry Core, the greater the synergies.

TODAY without Catena-X Industry Core

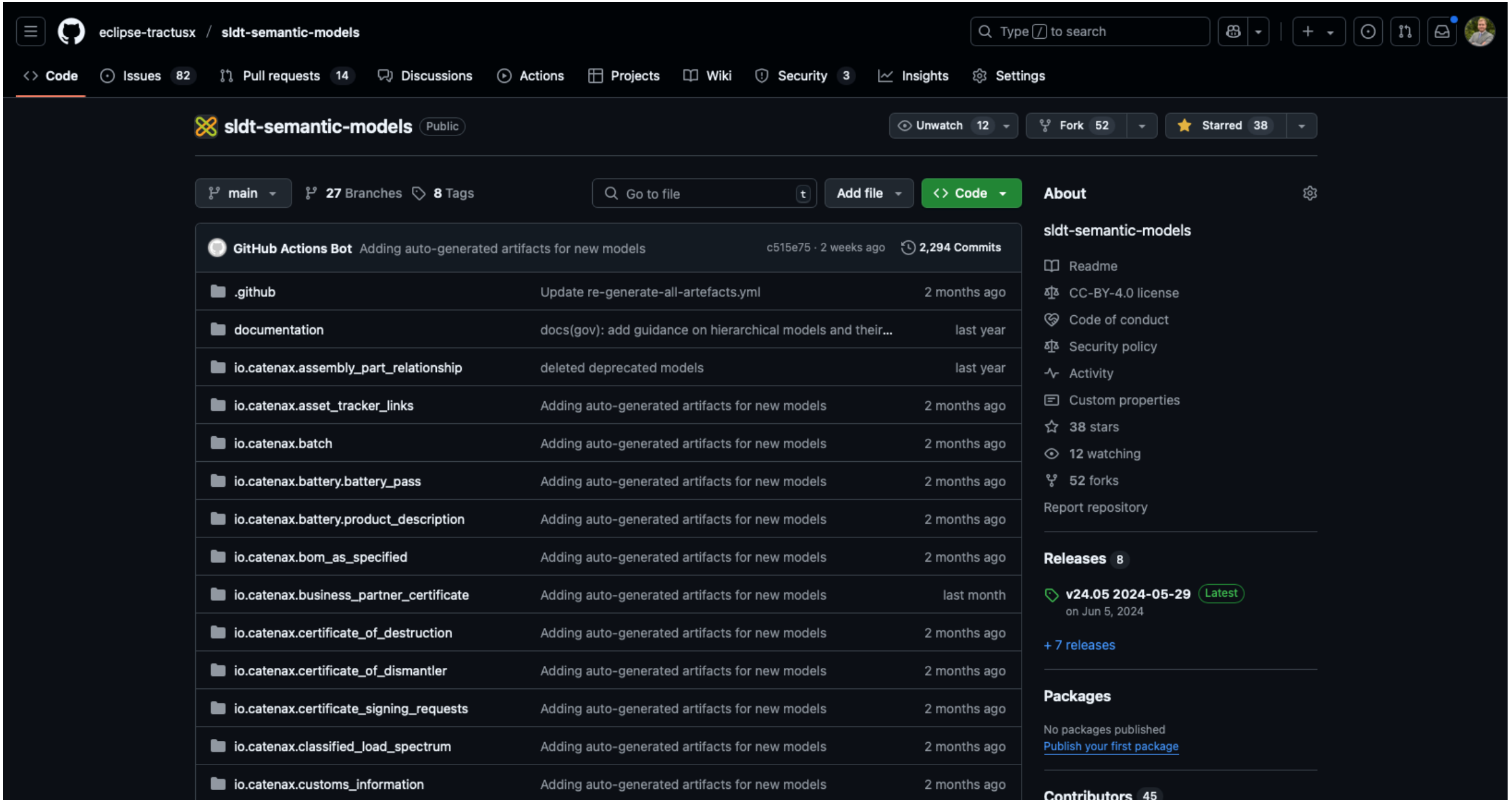


- Limited to none cross use case synergies
- Rising Ops costs for n-partner connections
- Massive governance & policy handling

TOMORROW with Catena-X Industry Core



- Freedom of choice
- Improved cyber security
- Synergies of horizontal platform
- Boost your existing landscape and providers



Catena-X Website and all Use Cases

Get to know Eclipse Tractus-X

¡No dudes en contactar! - Feel free to contact me!

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Catena-X
Your Automotive Network

Do you have questions?
Feel free to contact us!

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