



## Joint Forces to Enable Seamless Industrial Data Exchange for the Digital Product Passport

Recording is available here:

OPC Channel:

[https://www.youtube.com/watch?v=7BQSO4NF\\_A](https://www.youtube.com/watch?v=7BQSO4NF_A)

Catena-X Channel:

<https://www.youtube.com/watch?v=WwcyHM4c054&t=5s>



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Lead Dataspace Architect

# Agenda

1. **Catena-X**
2. Joint Initiative
3. White Paper
4. Joint Architecture
5. Resources

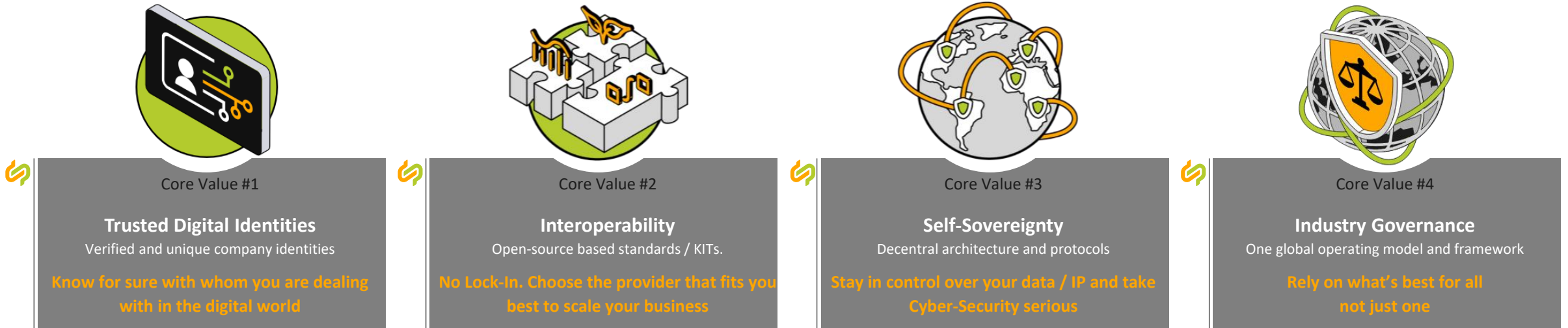
# What is Catena-X



Catena-X is the first globally trusted and collaborative data ecosystem for the automotive industry

- We are the first to offer multi-tier collaboration.
- We reduce costs and create synergies for business and IT.
- We are successful via radical collaboration.

# 4x architectural guardrails define our eco-system



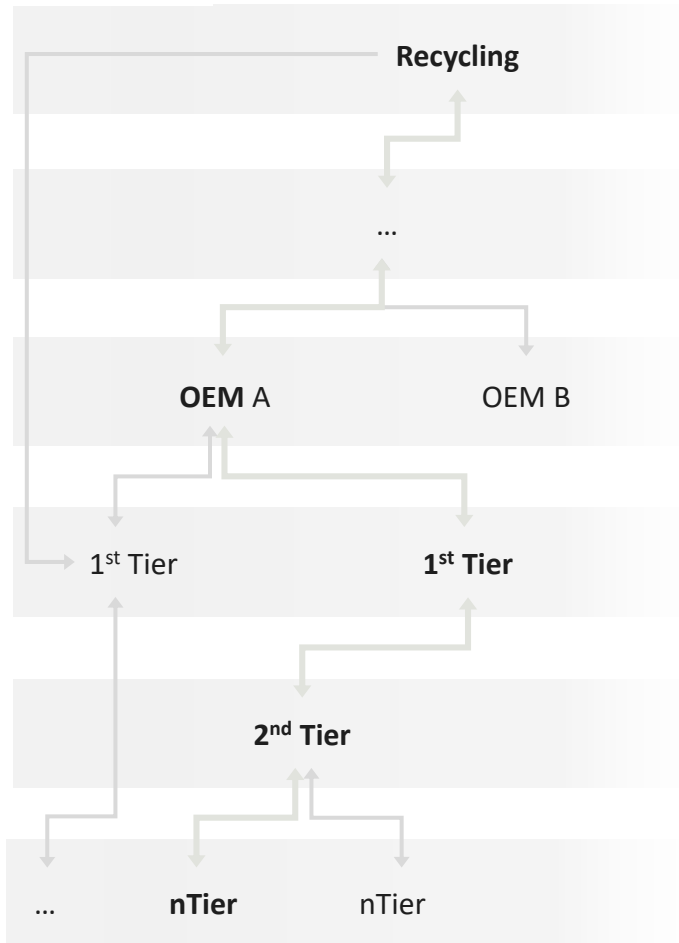
We believe within our global automotive industry, we only can create a true multi-tier collaboration when we empower existing players and solution providers. We believe that trust in your partners and control over your data are decisive in a digital world.  
Hence, we created an ecosystem from the industry for the industry

New key industry capabilities: Enabling multi-tier collaboration and leverage cross domain synergies

# Four main alternatives

## Automotive Value Chain

- Use Case X -



Catena-X

**Industry standards** create interoperability between partners

- + Freedom of choice (vendors)
- + Cyber / IP Security
- + Trust / verification
- + Anti Trust clearance
- + Cross domain benefits
- + Scalability in business
- Significant change
- Initial complexity
- Every company covers own costs

### Today's Alternative 1

**Central Data Base** for all industry partners

- + No cost for supplier
- + Established / available
- Lock In
- Trust / verification
- Data protection / IP
- Cyber-Security
- Business process readiness
- Cross domain benefits

### Today's Alternative 2

**One IT Provider** for all partners of the same value chain

- + Trust / verification
- + One solution provider
- Freedom of choice / Anti Trust Clearance
- Enforce usage (nTier)
- Scalability in business
- Cross domain benefits

### Today's Alternative 3

**Every Partner has its own solution**

- + Freedom of choice
- + Short term costs
- Trust / verification
- Multi tier capability
- Scalability
- Overall costs
- Data protection / IP

# What makes Catena-X a sustainable and scalable ecosystem?

Catena-X ensures operational **effectiveness and scalability** along **three main areas**, **enabling**:

- ✓ ecosystem-wide collaboration,
- ✓ impactful business solutions, and
- ✓ a secure, scalable infrastructure for all participants.



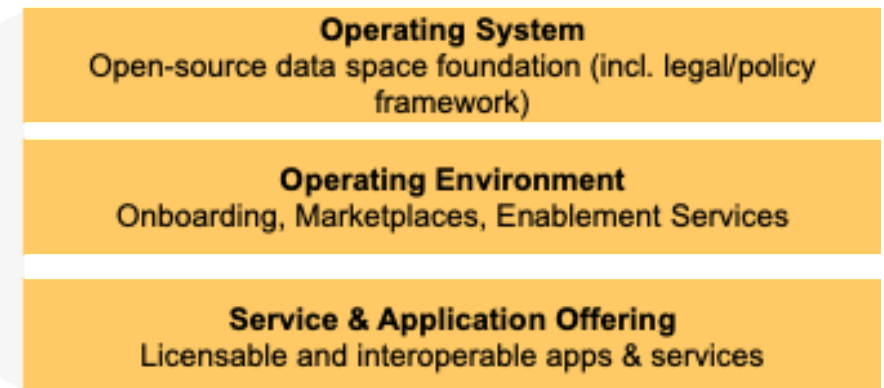
## Use Cases



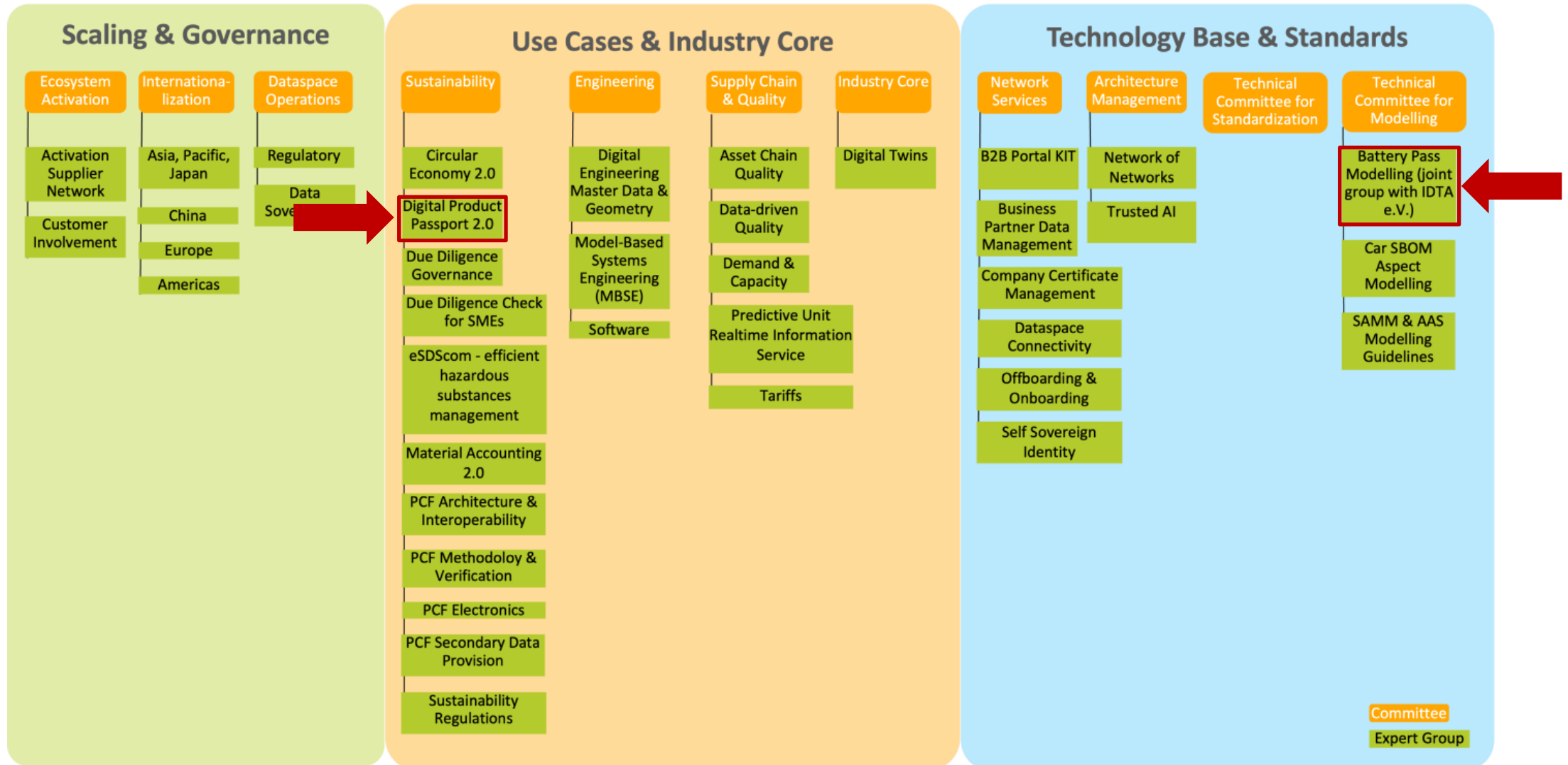
## Standards



## Interoperability



# Working Structure of the Catena-X Association



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# Press Release issued on 18.08.2025



## Joint Goals:

- Seamless Industrial Data Exchange
- Cross-Industry Data Interoperability
- Compliance with regulatory demands like the DPP

## 4 Strategic Areas of Collaboration:

- Reference Architecture Alignment
- Semantic Integration
- Open-Source Reference Implementations
- Industrial Ecosystem Enablement

# Digital product passports (DPP) as part of European broader regulatory

## European Green Deal

EU Plan: climate-neutral by 2050, safeguard biodiversity, establish a circular economy and eliminate pollution, while boosting the competitiveness of the European industry

agreed

### Ecodesign for Sustainable Product Regulation (ESPR)

- Proposed in Mar 2022, as central part to the Commission's strategy for eco-friendly and circular products
- Aims to promote environmental sustainability across a broader range of products

Requires **digital product passports based on harmonized European Standards (hEN)**

Entered into force

### Battery Regulation

- Entered into force in Aug 2023 replacing the EU Battery Directive
- Provides a legal framework aiming to promote sustainability, circularity, safety and transparency

Mandates a **battery passport** for all EV, LMT, and industrial (>2kWh) batteries starting Feb 2027

Proposal

### End-of-Life Vehicle Regulation

- Proposed in Jul 2023
- Will replace the End-of-life Vehicle Directive
- Governs the entire vehicle lifecycle, from design to end-of-life treatment

Mandates a **circularity vehicle passport**

# Example: Battery in EV



CATL delivers battery to Automotive OEM with (machine-readable) Digital Battery Passport, it includes battery PCF.



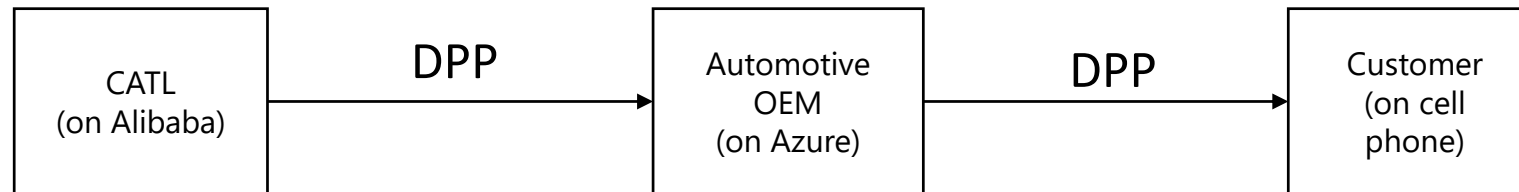
OEM installs the battery in their EV and uses PCF for total EV PCF calculation to be entered into DPP.



OEM creates DPP for EV, accessible via QR code sticker on car for customer to read.



Customer buys EV and scans QR code with their cell phone, gets directed to human-readable version of DPP.



# Example: Data in Battery DPP (“Battery Passport”)



Digital Nameplate (serial number, manufacturer address, year of manufacturing)



Materials used, which ones are hazardous and where they came from



Product Carbon Footprint (PCF – Scope 1, 2 & 3 emissions, calculation method, CO2 equivalence)

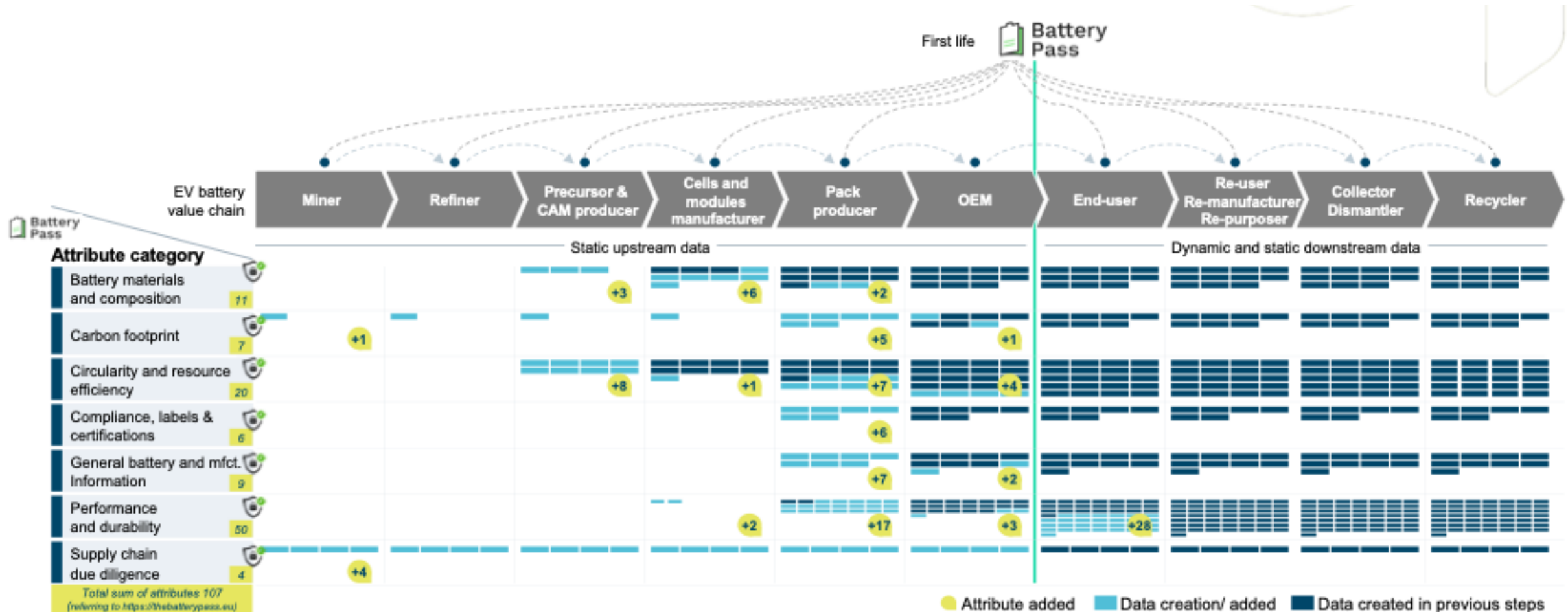


Remaining Useful Lifetime: Number of charging cycles, cell condition



Owner info: Current owner, contact information

# Example Use Case to drive our joint interests forward



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# Architecture Whitepaper is a first joint deliverable



## Foundation

- Decentralized data spaces using the Eclipse Dataspace Components (EDC) Connector
- Semantic interoperability through standardized data models
- Identity, Access & Policy Management for trusted, secure, policy-driven data access
- Traceability and compliance frameworks to support regulation and quality assurance

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# Better Together: DPP with an IEC standardized interface & data format/model/semantics

**Interface:** OpenAPI-compatible (HTTP REST and Data Space Protocol)

**Data Format:** OPC UA Nodeset file

**Data Model:** OPC UA Modelling Language

**Semantics:** VDMA Companion Specs & IDTA/Catena-X Templates

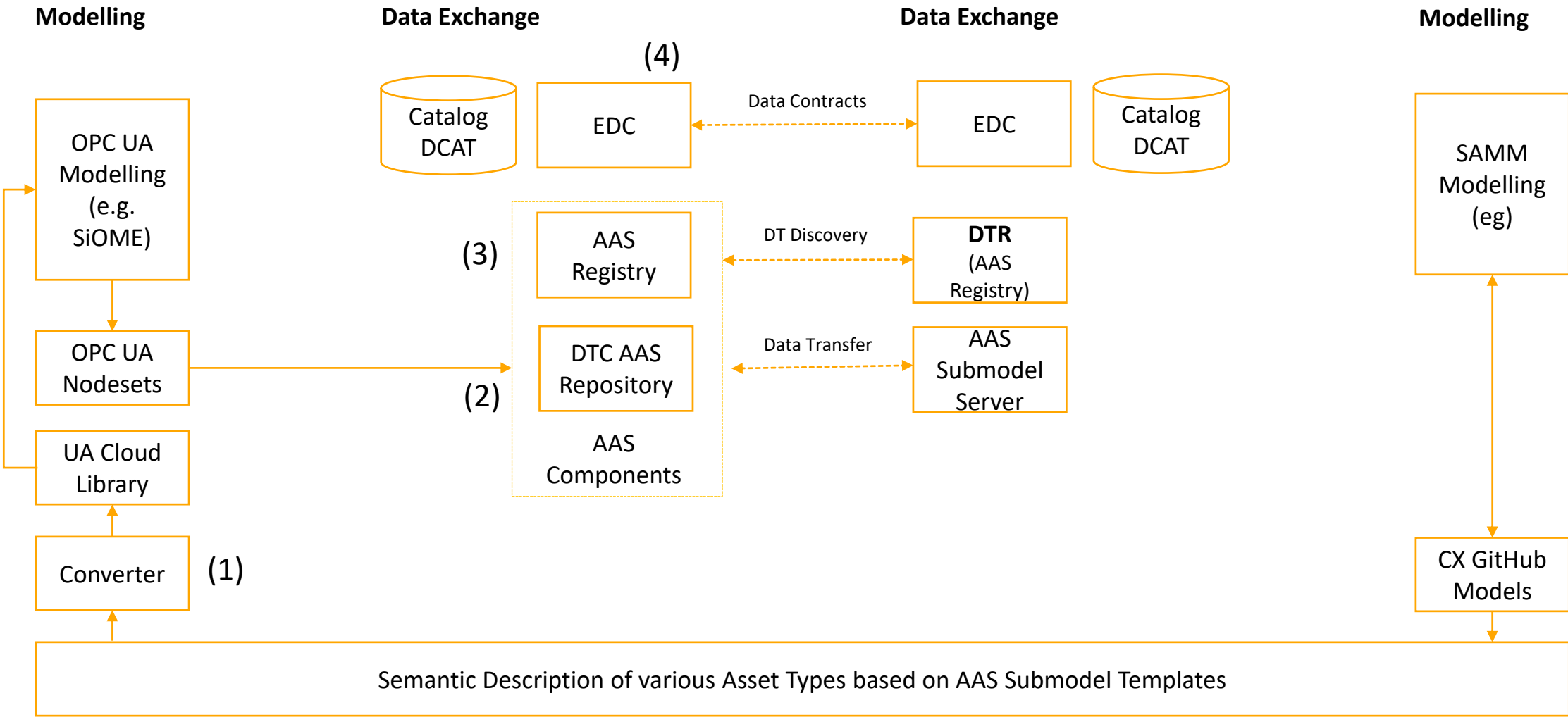
# OPC Foundation and Catena-X Architecture Alignment



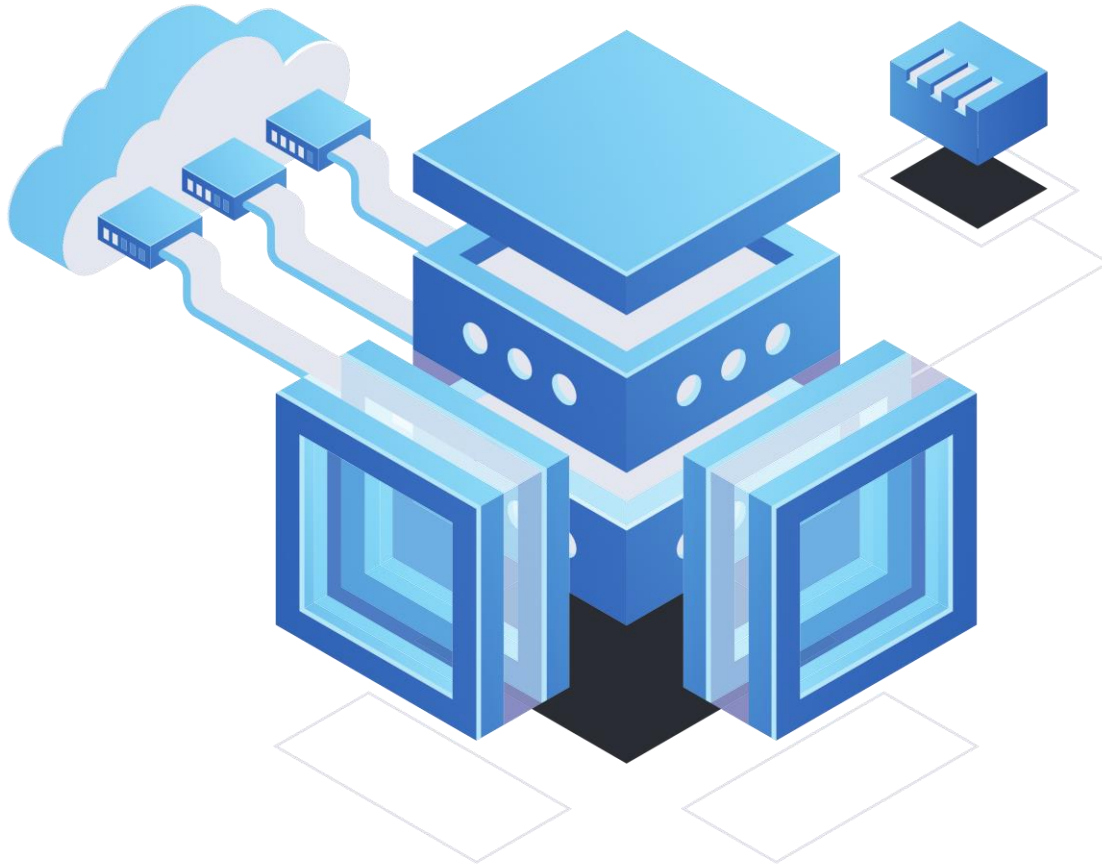
## Participant using OPC technology stack



## Catena-X Participant utilizing C-X tech stack



# Dataspace Connectors



One example is the Eclipse Dataspace Connector, an **open-source framework** hosted by the Eclipse Foundation for building **secure, globally-scalable data-sharing services**. EDC provides highly customizable components for creating control planes, decentralized identity systems, and federated data catalogs. **Backed by leading companies and cloud providers**, EDC gives developers the tools they need to deliver innovative solutions for data exchange networks. Other projects are targeting dataspace connectivity issues, e.g. Data4Industry.

Next step: Integration and testing of Dataspace Connectors.

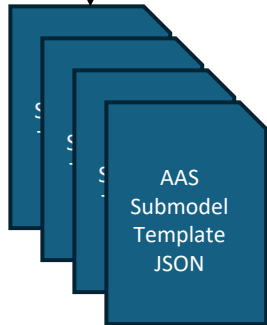
# AAS Submodel Template -> OPC UA Nodeset Conversion Tool



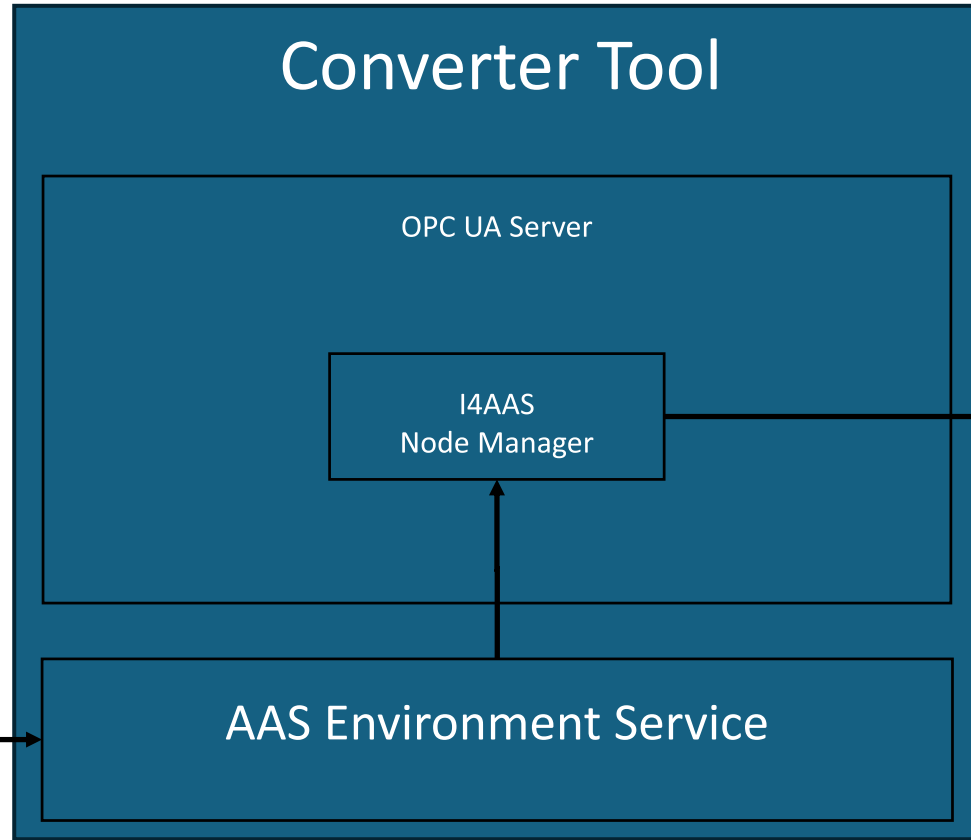
IDTA



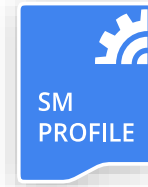
Download



Import



Export

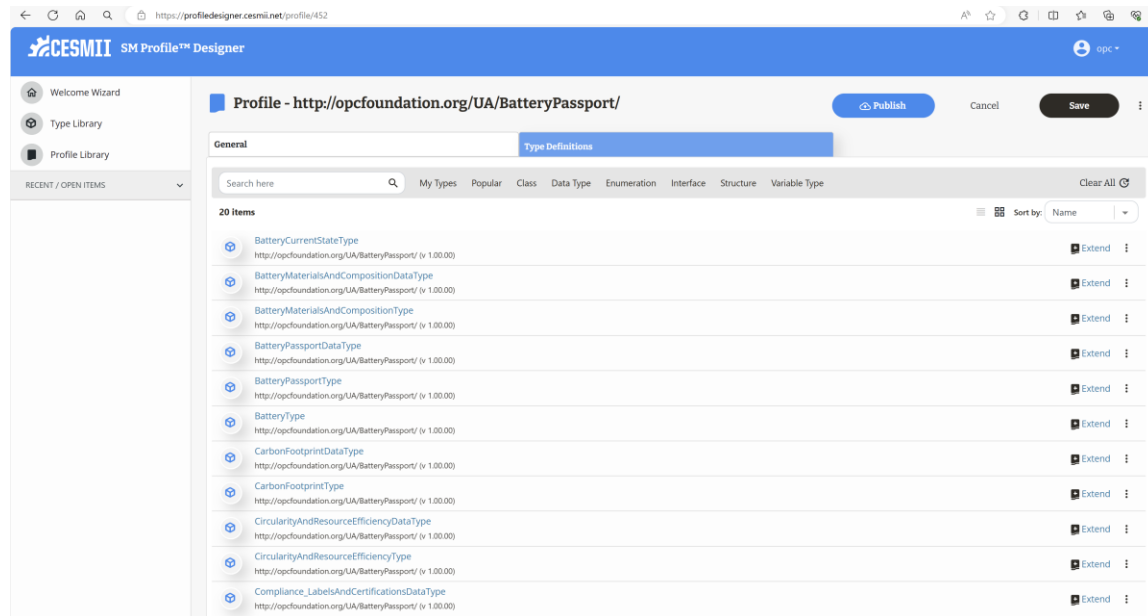
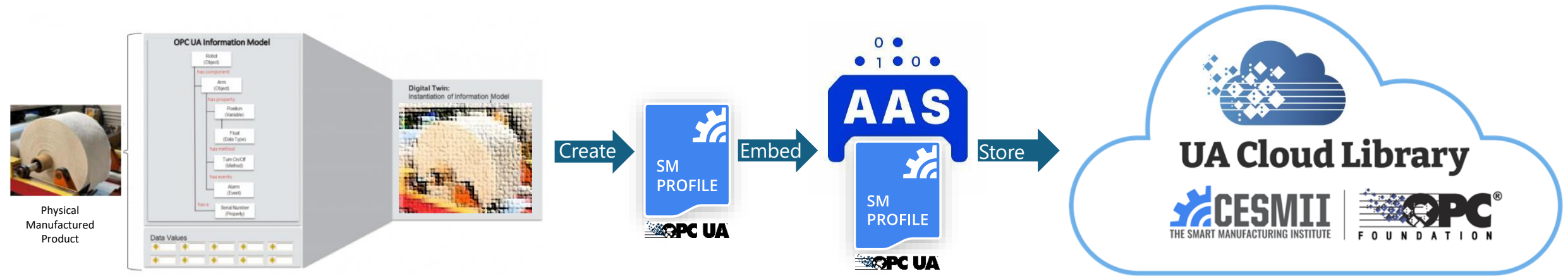


OPC UA  
Nodeset  
XML

Store



# Use Case: Combining Ecosystems – OPC UA & AAS implementing EU Digital Product Passport Together with OPCF/DTC/CESMII/Manufacturing USA



profiledesigner.cesmii.net (free online OPC UA editor)

## CarbonFootprintAAS

### Loaded Nodesets

http://opcfoundation.org/UA/  
http://industrialdigitaltwin.org/UA/CarbonFootprintAAS/

### Required Nodesets Missing from UA Cloud Library

(none)

### Nodeset Browser

- [-] Root
  - [-] Objects
    - [+] Server
    - [+] Aliases
    - [+] Locations
    - [+] Asset Admin Shells
  - [-] Submodels
    - [-] CarbonFootprint
      - [+] TransportCarbonFootprint
      - [+] ProductCarbonFootprint
  - [+] Concept Descriptions
  - [+] Types
  - [+] Views

### Selected Node Value

[Edit](#)

(none)

### Nodeset File

[Copy](#)

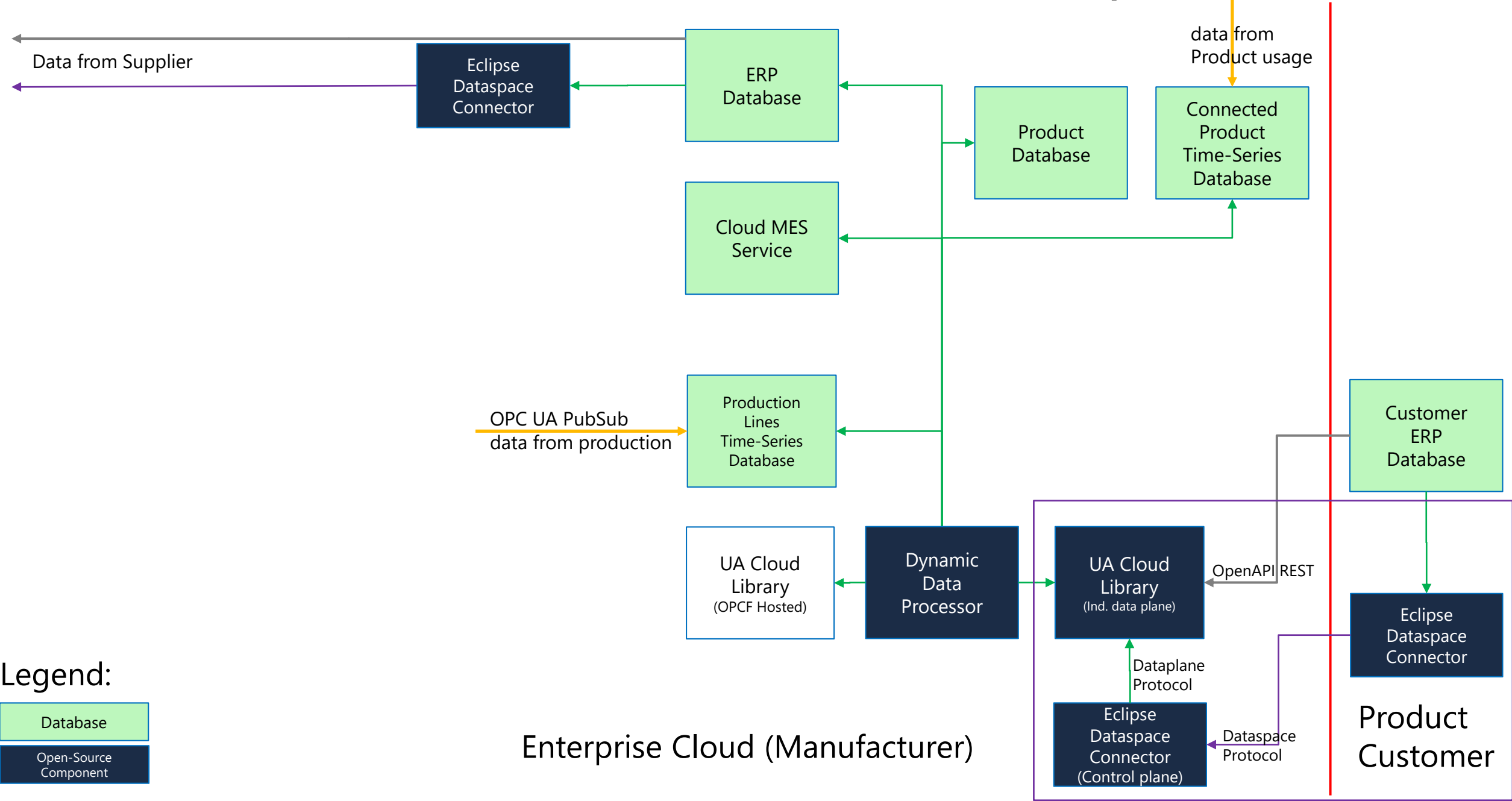
### Download node values

[Download](#)

### Save node values

[Save](#)

# OPC Foundation Cloud Initiative Reference Architecture (Dataspaces-relevant)

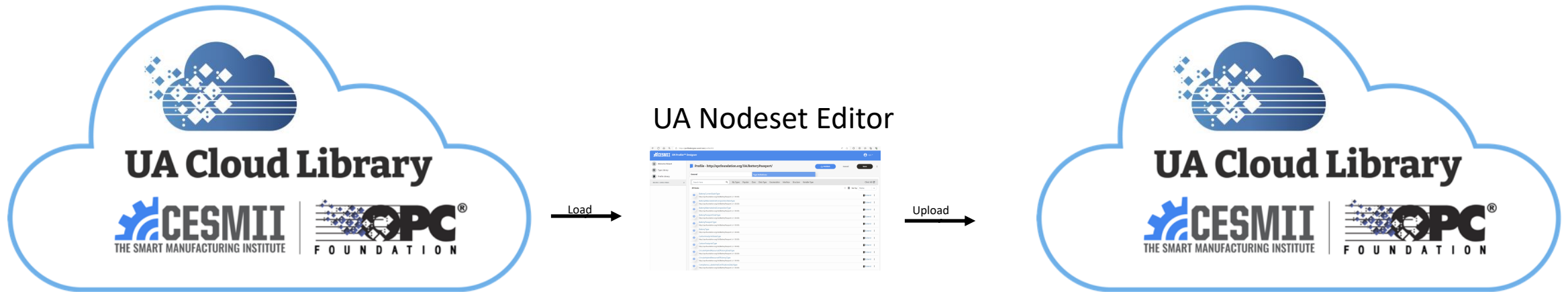


# Example: New Catena-X (Automotive) User Journey

1. All Catena-X SAMM templates are now available in OPC Foundation UA Cloud Library.

2. Catena-X template is loaded into new OPC Foundation online UA Nodeset Editor and values are entered.

3. Edited Catena-X nodeset file is uploaded to another UA Cloud Library instance and hosted online on behalf of the supplier.





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NEW WORK ITEM PROPOSAL (NP)

|                                           |                                               |
|-------------------------------------------|-----------------------------------------------|
| PROPOSER:<br><b>Secretariat</b>           | DATE OF PROPOSAL:<br><b>2025-02-21</b>        |
| DATE OF CIRCULATION:<br><b>2025-02-28</b> | CLOSING DATE FOR VOTING:<br><b>2025-05-23</b> |

|                                                                             |                                    |
|-----------------------------------------------------------------------------|------------------------------------|
| IEC TC 65 : INDUSTRIAL-PROCESS MEASUREMENT, CONTROL AND AUTOMATION          |                                    |
| SECRETARIAT:<br>France                                                      | SECRETARY:<br>Mr Didier GIARRATANO |
| NEED FOR IEC COORDINATION:<br>SC 3D,SC 41                                   | HORIZONTAL FUNCTION(S):            |
| ASPECTS CONCERNED:<br>Digital content,Information security and data privacy |                                    |

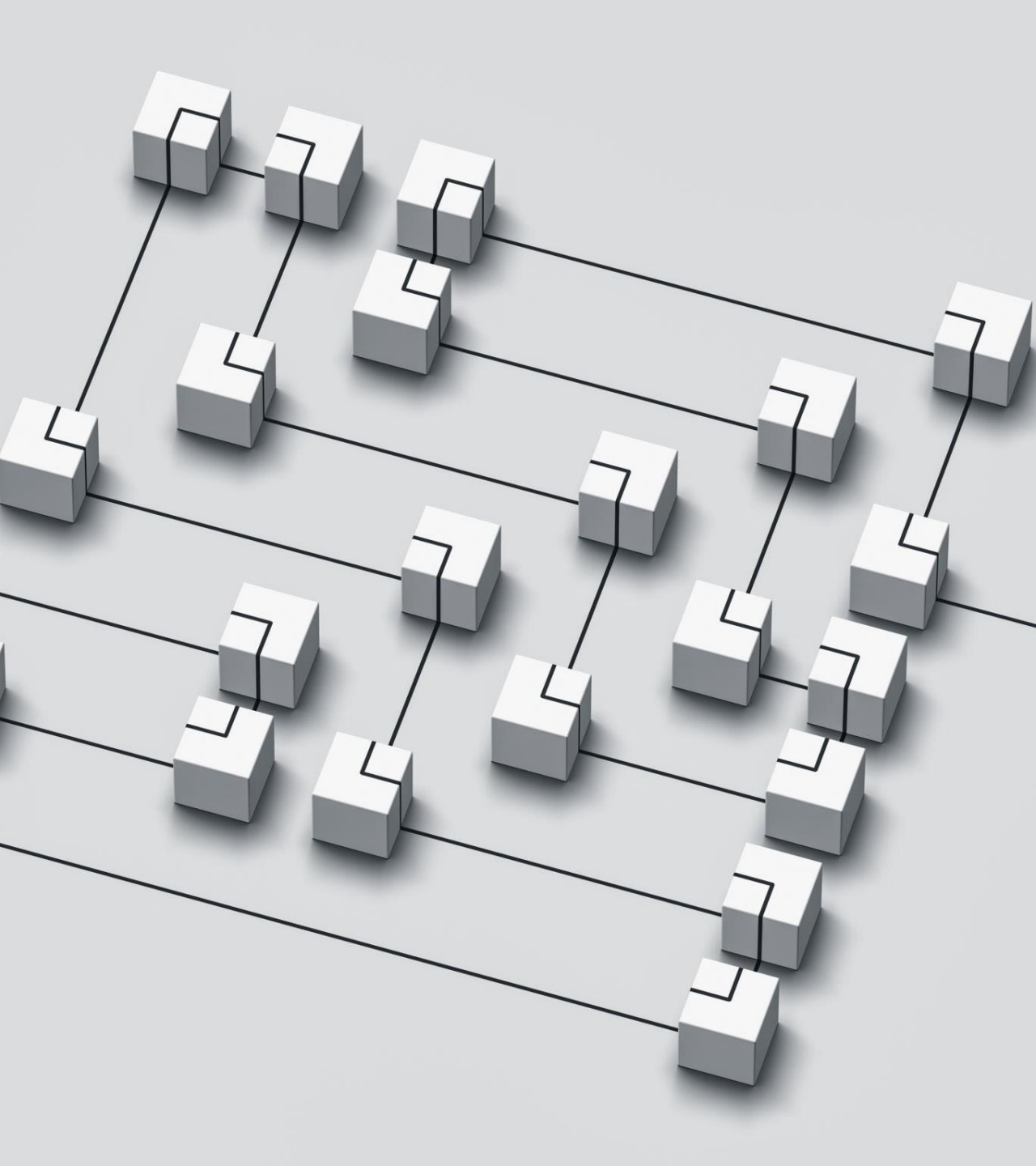
|                                                                 |
|-----------------------------------------------------------------|
| TITLE OF PROPOSAL:<br><b>Industrial Automation Product Data</b> |
|-----------------------------------------------------------------|

|                                              |                                                  |                                                           |
|----------------------------------------------|--------------------------------------------------|-----------------------------------------------------------|
| <input checked="" type="checkbox"/> STANDARD | <input type="checkbox"/> TECHNICAL SPECIFICATION | <input type="checkbox"/> PUBLICLY AVAILABLE SPECIFICATION |
| PROPOSED PROJECT NUMBER:                     |                                                  |                                                           |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SCOPE<br>(AS DEFINED IN ISO/IEC DIRECTIVES, PART 2, 14):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>The document contains Industrial Automation Product Data as information models and interfaces with defined semantics for digital use for industrial manufactured products, small and big assemblies and manufacturing systems.</p> <p>It supports the entire lifecycle and supply chain. Specifically, the data covers lifecycle stages from planning, designing, producing, using, maintaining, repairing, and disposing.</p> <p>Industrial Automation Product Data with standardized digital information supports industrial digital twins and circular economy, as well as carbon footprint aggregation with the relevant environmental impact factors.</p> <p>The following standards are leveraged as a baseline: IEC 63283-2 Smart manufacturing - Part 2: Use cases and IEC 63278-4 Asset Administration Shell for industrial applications - Part 4: Applications of Asset Administration Shell. In addition, the IEC 62264 Enterprise-control system integration series is used to define IEC CDD properties with their semantics.</p> <p>The Industrial Automation Product Data standard defines the semantic of properties in sufficient detail for the general usage e.g. for digital product passports and production systems. The standard specifies how the data are created, collected, used and maintained along the supply chain.</p> |

# Joint Working Group 29 in IEC TC65

|                                                                                                                   |                        |                        |                         |            |
|-------------------------------------------------------------------------------------------------------------------|------------------------|------------------------|-------------------------|------------|
| TARGET DATE(S)                                                                                                    | FOR FIRST CD:          | 2025-12-31             | FOR PUBLICATION:        | 2027-12-31 |
| ESTIMATED NUMBER OF MEETINGS:                                                                                     | FREQUENCY OF MEETINGS: | DATE OF FIRST MEETING: | PLACE OF FIRST MEETING: |            |
| 40                                                                                                                | 20 per year            | 2025-06-18             | web                     |            |
| RELEVANT DOCUMENTS TO BE CONSIDERED:                                                                              |                        |                        |                         |            |
| IEC 61360 Common data dictionary                                                                                  |                        |                        |                         |            |
| IEC 63278-1 Asset Administration Shell for industrial applications - Part 1: Asset Administration Shell structure |                        |                        |                         |            |
| IEC 62541-5 OPC Unified Architecture - Part 5: Information Model                                                  |                        |                        |                         |            |
| IEC 62541-6 OPC Unified Architecture - Part 6: Mapping                                                            |                        |                        |                         |            |
| IEC 62541-14 OPC Unified Architecture - Part 14: PubSub                                                           |                        |                        |                         |            |
| RELATION TO AND IMPACT ON EXISTING WORK:                                                                          |                        |                        |                         |            |
| Standards for the DPP developed in CEN/CLC/JTC 24.                                                                |                        |                        |                         |            |



# European Cloud Accelerator

An open technology development project

Develop comprehensive  
Data Sharing as a Service

Enable a cost-effective, lightweight  
solution that can reach enterprise  
scale

Establish and nurture a cross-  
discipline community



The ECA is a  
European  
solution with  
global reach



Open-source software under  
Eclipse & OPC Foundation  
governance

No requirement for hyperscaler  
technology (vendor neutral)

Address a global supply chain  
challenge

# References

| Topic                                                  | Link                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Press Releases                                         | <a href="https://opcfoundation.org/news/press-releases/catena-x-and-opc-foundation-join-forces-to-enable-seamless-industrial-data-exchange-for-the-digital-product-passport/">https://opcfoundation.org/news/press-releases/catena-x-and-opc-foundation-join-forces-to-enable-seamless-industrial-data-exchange-for-the-digital-product-passport/</a><br><a href="https://catena-x.net/news/catena-x-and-opc-foundation-join-forces-to-enable-seamless-industrial-data-exchange-for-the-digital-product-passport/">https://catena-x.net/news/catena-x-and-opc-foundation-join-forces-to-enable-seamless-industrial-data-exchange-for-the-digital-product-passport/</a> |
| Whitepaper                                             | <a href="https://catena-x.net/wp-content/uploads/2025/08/OPCF-Catena-X-Architecture-Whitepaper-v1.0.pdf">https://catena-x.net/wp-content/uploads/2025/08/OPCF-Catena-X-Architecture-Whitepaper-v1.0.pdf</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| OPC Foundation Cloud Initiative                        | <a href="https://opcfoundation.org/cloud/">https://opcfoundation.org/cloud/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| OPC Foundation Cloud Initiative Reference Architecture | <a href="https://opcfoundation.org/wp-content/uploads/2025/04/OPCF-Cloud-Reference-Architecture-HMI2025-ONLINE.pdf">https://opcfoundation.org/wp-content/uploads/2025/04/OPCF-Cloud-Reference-Architecture-HMI2025-ONLINE.pdf</a>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| European Cloud Accelerator Project                     | <a href="https://metaform.github.io/dcsa/documentation/overview/">https://metaform.github.io/dcsa/documentation/overview/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Catena/OPC Foundation Integration GitHub pages         | <a href="https://github.com/OPCFoundation/UA-CloudLibrary">https://github.com/OPCFoundation/UA-CloudLibrary</a><br><a href="https://github.com/OPCFoundation/AAS2Nodeset">https://github.com/OPCFoundation/AAS2Nodeset</a><br><a href="https://github.com/eclipse-edc">https://github.com/eclipse-edc</a>                                                                                                                                                                                                                                                                                                                                                              |