Testbed Asset Administration Shell

Deutsche Messe Technology Academy GmbH

Mittelstand 4.0-Kompetenzzentrum Hannover

Labs Network Industrie 4.0 e.V.

Co-initaited by:

October 13th 2020

Testbed partners

At the beginning

Mittelstand-Digital

Mittelstand 4.0 Kompetenzzentrum Hannover

mit uns digital! Individuell. Unabhängig. Vor Ort.

Deutsche Messe Technology Academy

OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG

EIT FAKULTÄT FÜR ELEKTROTECHNIK UND INFORMATIONSTECHNIK

Nutzfahrzeuge

SENNHEISER

ECOROLL

WITTENSTEIN

micronex Electronic systems

adstec

seiotec digital change

soffico

SHS

eXIS Group HEKUMA

MANSYSTEM

VISION

Solutions Services

IT²

hilscher COMPETENCE IN COMMUNICATION

MITSUBISHI ELECTRIC Changes for the Better

PHOENIX CONTACT

HARTING

CEDALO ORCHESTRATING IOT AND THE DIGITAL INDUSTRY

Allisa

T · · SAP

BECKHOFF

SIEMENS Ingenuity for life

SCHMERSAL Safe solutions for your industry

Leuze electronic the sensor people

In cooperation with

PLATTFORM INDUSTRIE 4.0

STANDARDIZATION COUNCIL INDUSTRIE 4.0

VDMA

ZVEI: Die Elektroindustrie

bitkom

OPC FOUNDATION

eCl@ss CLASSIFICATION AND PRODUCT DESCRIPTION

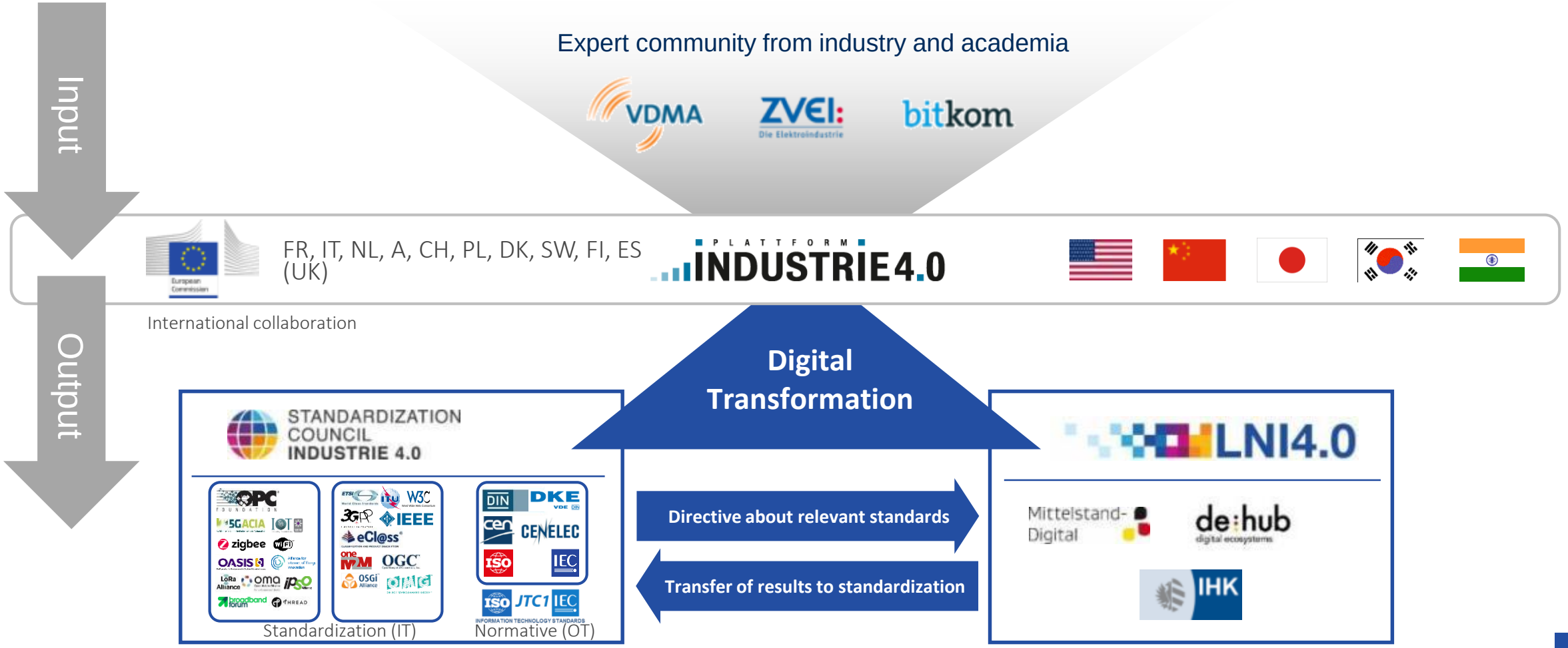
FESTO

BOSCH

Plattform Industrie 4.0 in Germany

Industrie 4.0 Stakeholders

Setup in Germany



LNI 4.0 testlabs (>45 MoU)

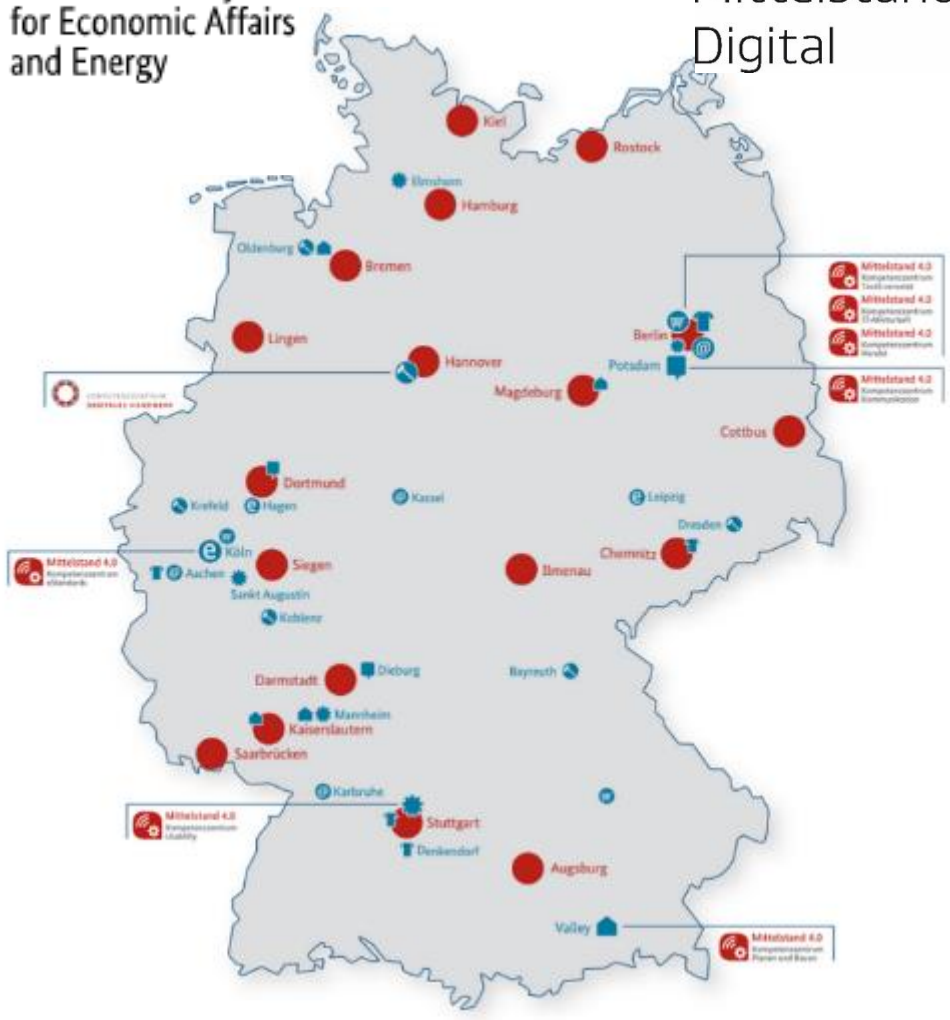
LNI4.0 LABS NETWORK INDUSTRIE 4.0

Use Case testing facilities (Labs)

26 Industrie 4.0 Kompetenzzentren

Federal Ministry for Economic Affairs and Energy

Mittelstand-Digital

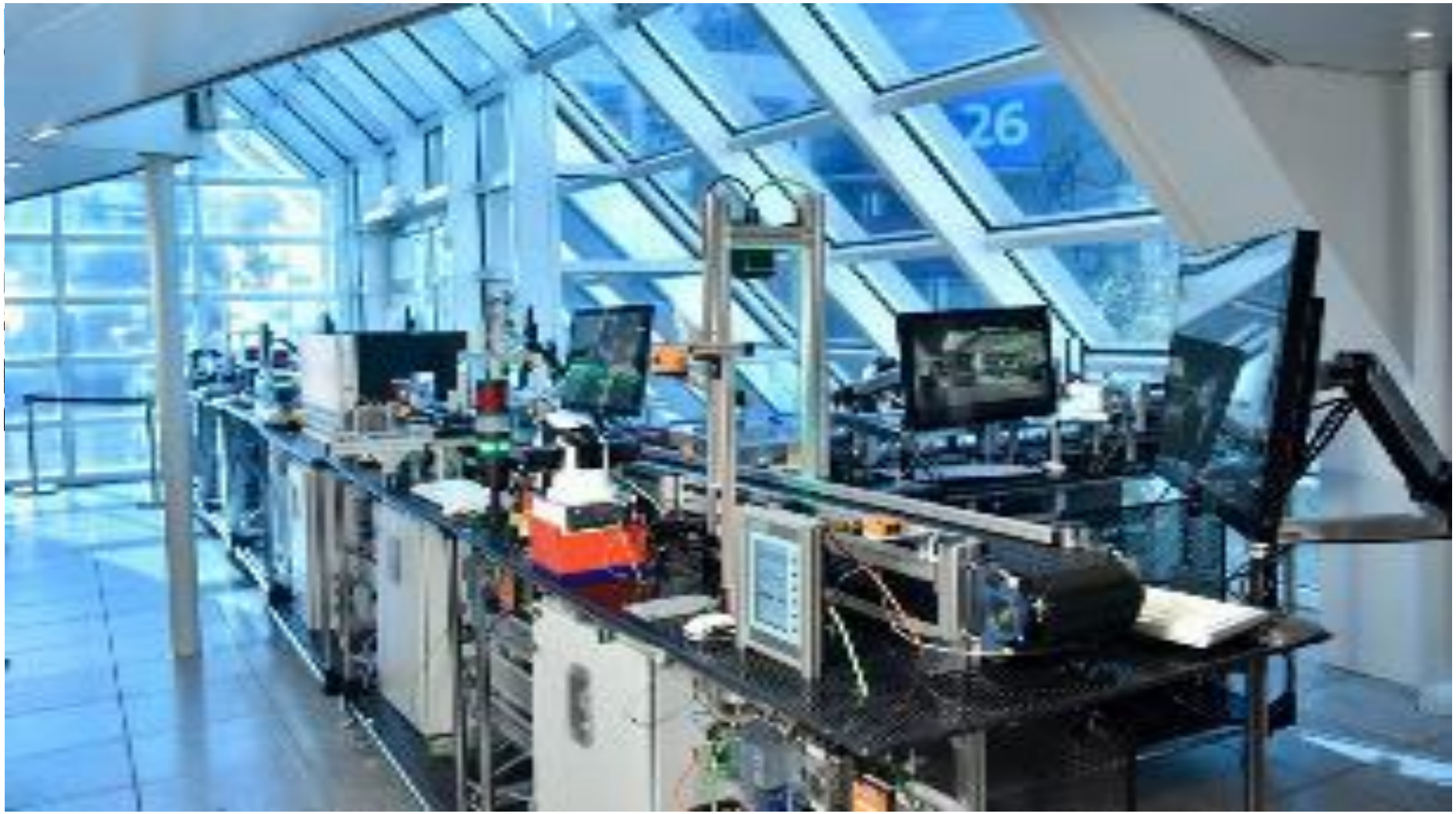


Deutsche Messe Technology Academy & Worldwide largest 5G Network on the fairground in Hannover

Networking the industry

Deutsche Messe Technology Academy

Campus for Digitisation - Volkswagen Commercial Vehicles



Deutsche Messe
smart venue

PROJECT DESCRIPTION

INITIAL SITUATION

- The Hanover exhibition center will be further developed into a unique, highly innovative multifunctional campus with a comprehensive 5G infrastructure
- The 5G network will be available in all halls, on the outdoor area and in tzh.e buildings of Deutsche Messe Technology Academy
- **One of the largest privat 5G networks worldwide is created**
- Enable new services at existing trade fairs and exhibitions
- Enrich existing trade fairs with the practical demonstration of new industry solutions
- Enable the further development and testing of new applications and solutions in a protected and controlled environment
- Represent a real laboratory (living lab) in which visionary applications can be born and tested before they need approval
- The LNI 4.0 testbed could be the central test facility for this living lab

FLÄCHENDECKENDES PRIVATES UND ÖFFENTLICHES 5G-NETZ

CURRENT PLANNING

- Start with a “non-stand-alone solution” in the transition from LTE → 5G from 2020 (real 5G probably in 2021)
  - Combination of public and private 5G network offers maximum spectrum
  - Ensuring local data storage on the exhibition site
- Additional equipment for initially 1-2 halls and in the Technology Academy with fully redundant network technology
  - Independent technical operator
  - Successive expansion of the infrastructure based on demand

Competence Centers: Supporting SME locally

Mittelstand-Digital: 26 Competence Centers

supporting SME locally with Information, Sensitation, Qualification and Expert knowledge

Mittelstand-Digital

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages

The Competence Centers Hannover

Mittelstand 4.0 Kompetenzzentrum Hannover

mit uns digital! Individuell. Unabhängig. Vor Ort.

Project partners:

Leibniz Universität Hannover

Produktionstechnisches Zentrum Hannover

IPH

Expert network:

IfBE

Forschungszentrum L3S Research Center

SOFI

herfurth.partner RECHT INTERNATIONAL

Technische Universität Braunschweig

Hochschule Hannover University of Applied Sciences and Arts – Fakultät I Elektro- und Informationstechnik

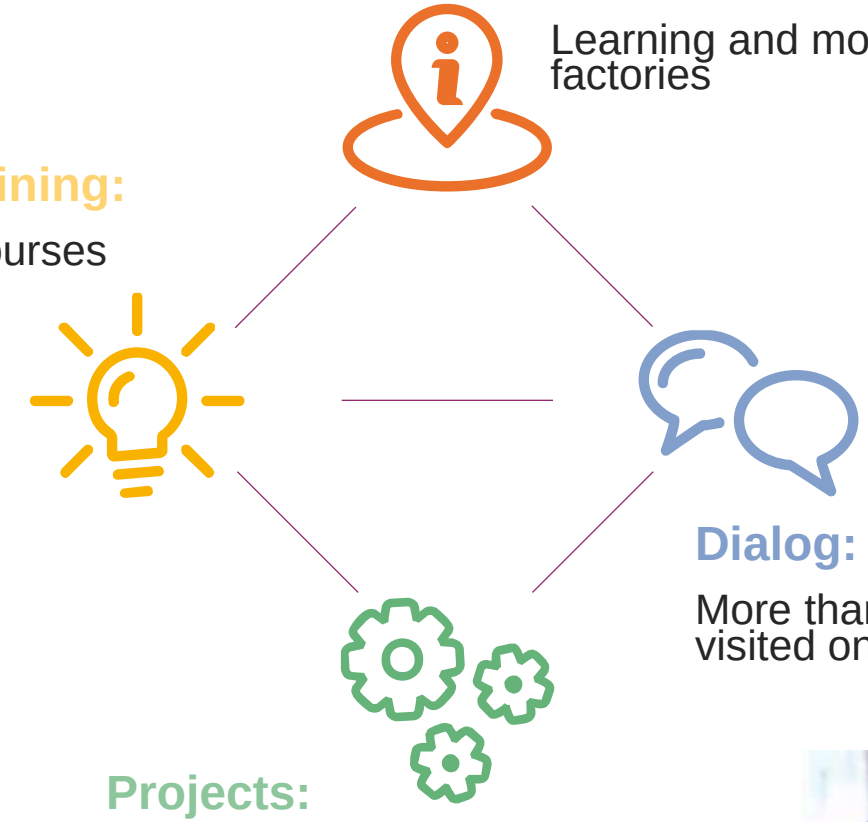
The Competence Center Hannover

Information:

Learning and mobile factories

Employee training:

more than 23 courses



Dialog:

More than 700 companies visited on site

Projects:

more than 40 digitization projects completed

New Testbed: Asset Administration Shell (AAS)*,**

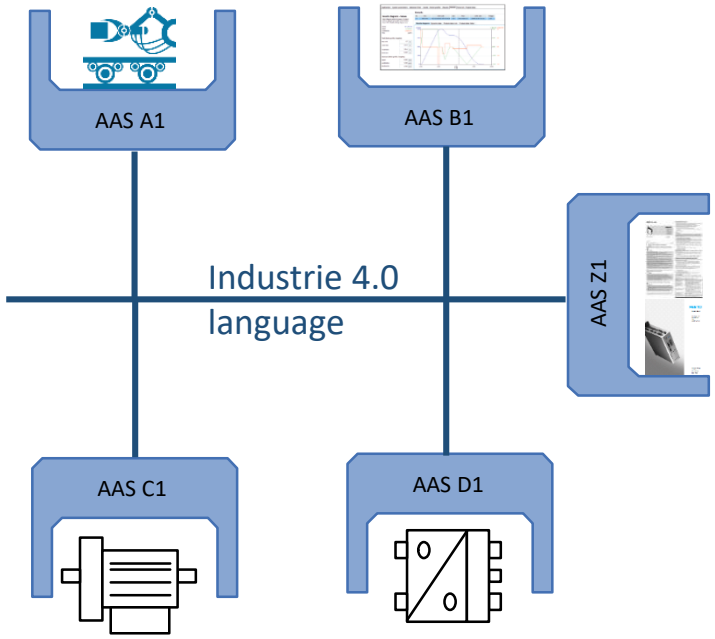
at DEUTSCHE MESSE Hannover exhibition area hall 36

*Interoperability
**5G connectivity as a major pre-requisite for interoperability

Testbed goal

Why (Influence and speed-up international standardization)

- Validation of the Asset Administration Shell (AAS)
- Support new IEC 63278-1, etc.
- Interoperability among all assets at as little cost as possible
- Assets are humans, products, production, facilities, supplies over the entire life cycle incl. contracting
- Digital twin
- Connectivity with 5G is available
- Build a demonstrator
- Education and up-skilling



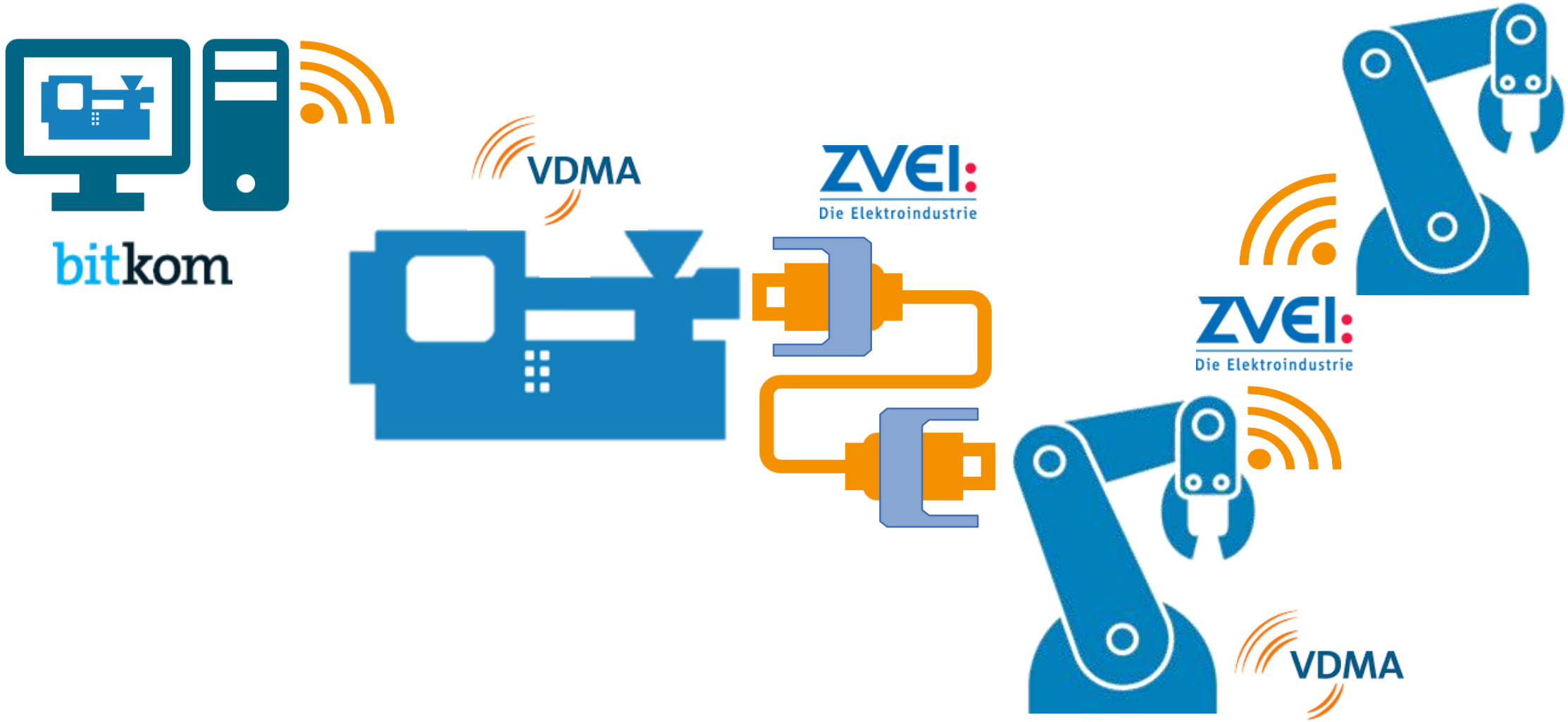
Testbed

Why (Influence and speed-up international standardization)

***Play* of assets**

***Plug* of assets**

Association collaboration for AAS



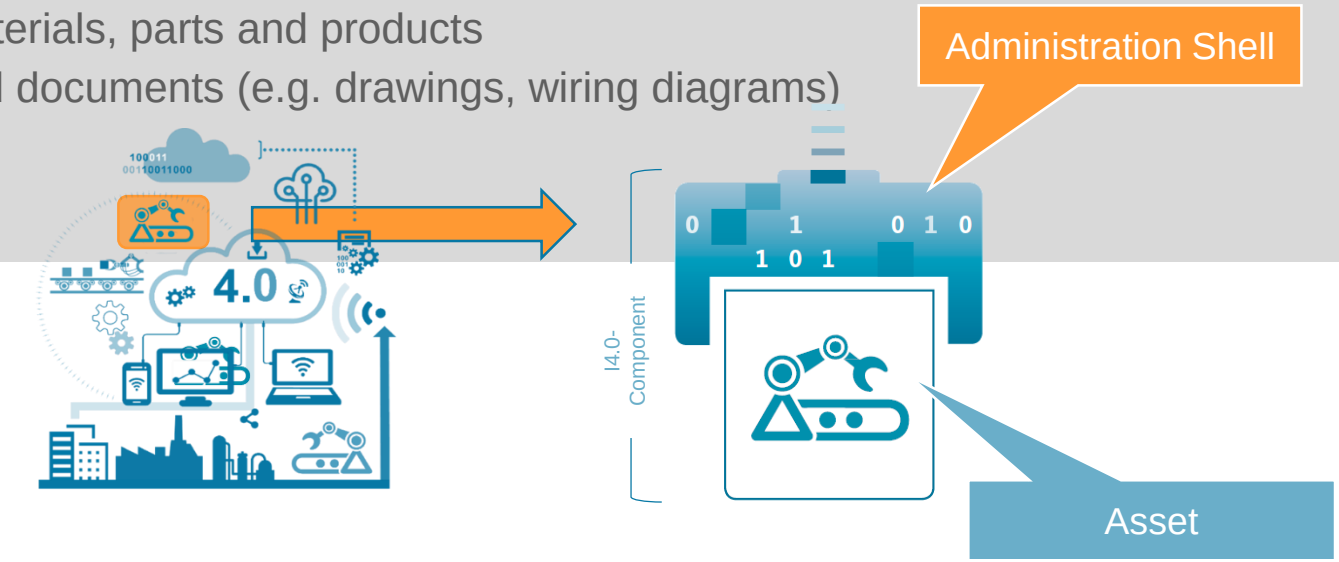
Asset Administration Shell

Asset

Integration of *assets and the humans* into the world of information

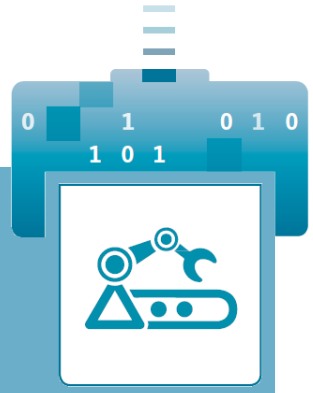
Asset = everything that requires a "connection" for an Industrie 4.0 solution
= is an item an organization has interest in

- People
- Machines and their components
- Supply materials, parts and products
- Exchanged documents (e.g. drawings, wiring diagrams)
- Contracts
- Orders,…



Asset Administration Shell

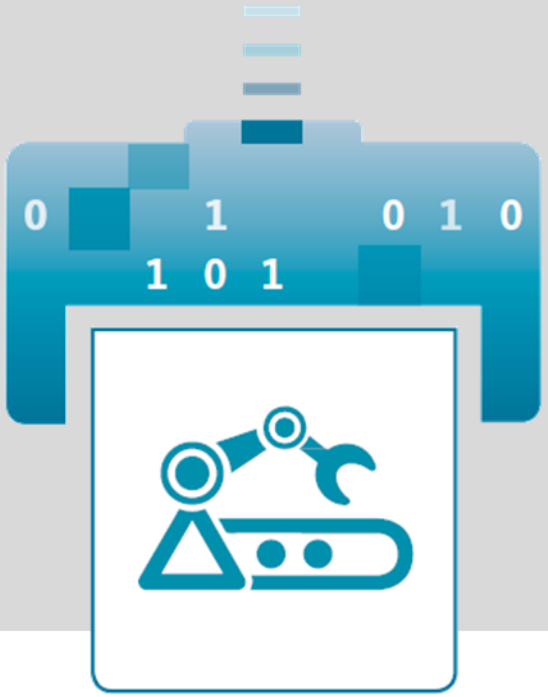
What is it



- The Administration Shell is the **implementation of the „Digital Twin“** for Industrie 4.0
- The Administration Shell establishes **cross-company interoperability**.
- The Administration Shell is available for **non-intelligent and intelligent products**.
- The Administration Shell covers the **complete life cycle** of products, devices, machines and facilities.
- The Administration Shell enables **integrated value chains**.
- The Administration Shell is the **digital basis for autonomous systems and AI**.

Asset Administration Shell

Digital Twin



Digital Twin

Definition: digital representation (= information that represents characteristics and behaviors of an entity), sufficient to meet the requirements of a set of use cases

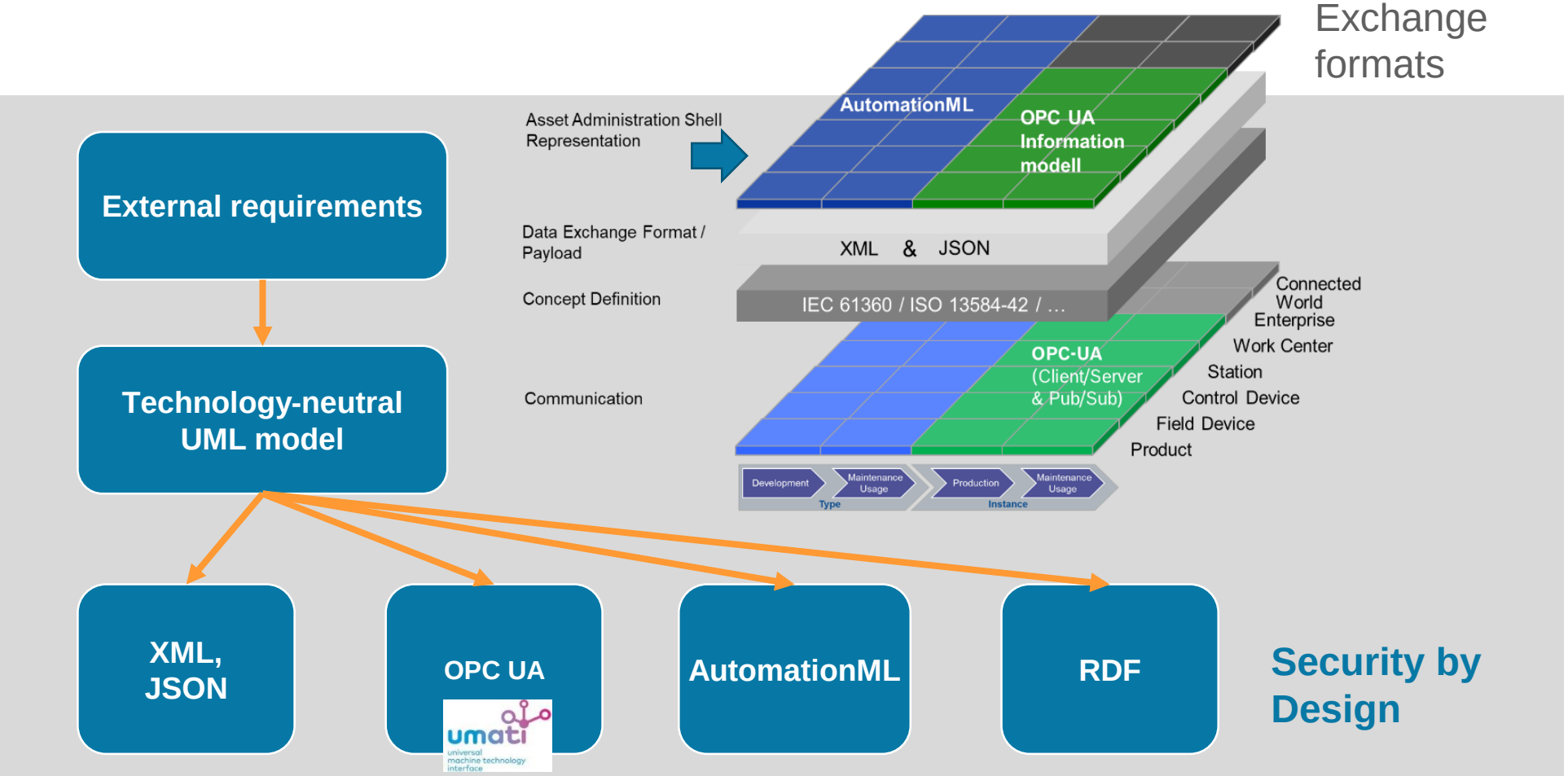
note: in this context, the entity in the definition of digital representation is typically an asset

The Administration Shell is the implementation of the „Digital Twin“ for Industrie 4.0

Asset Administration Shell

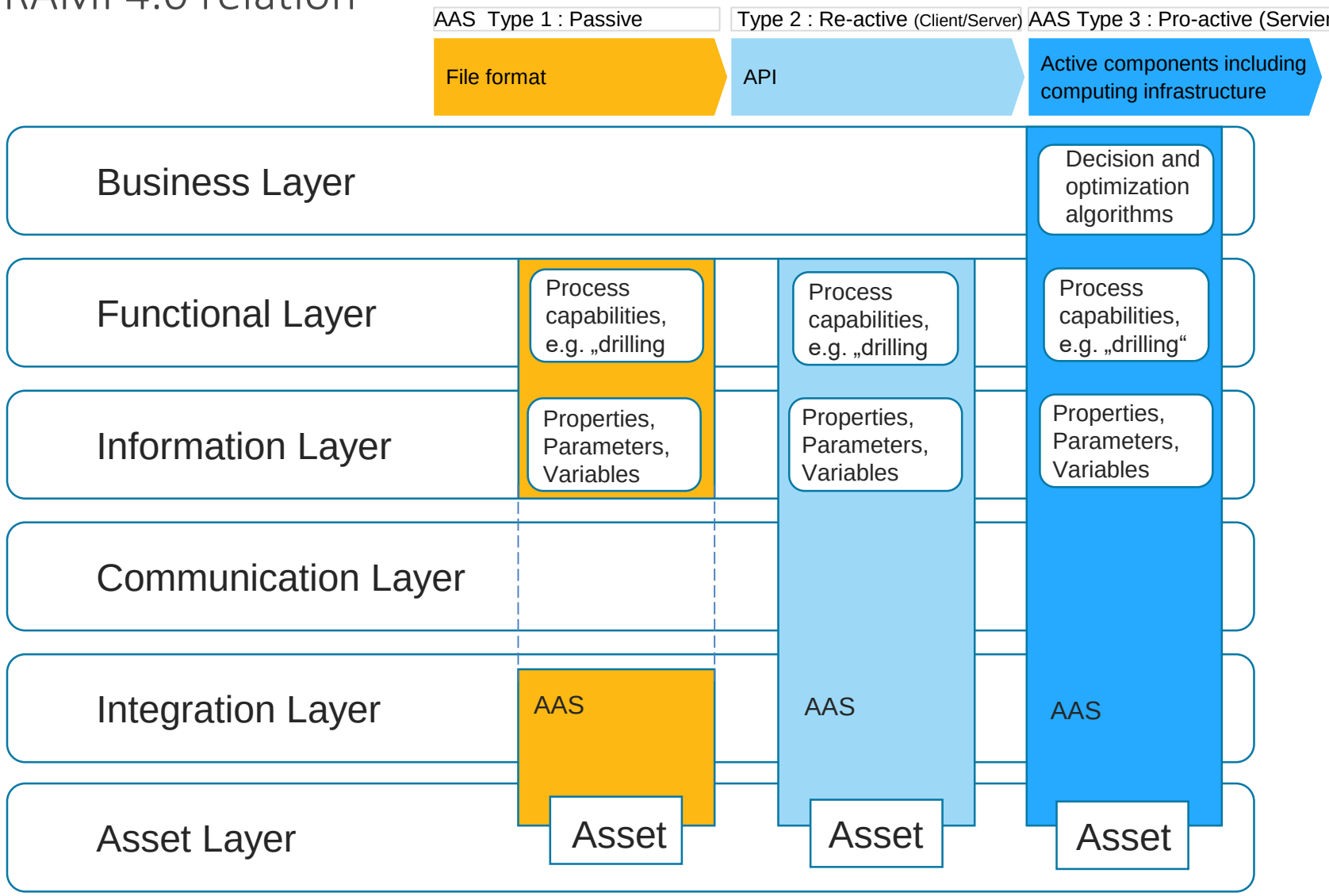
Life cycle & Implementation

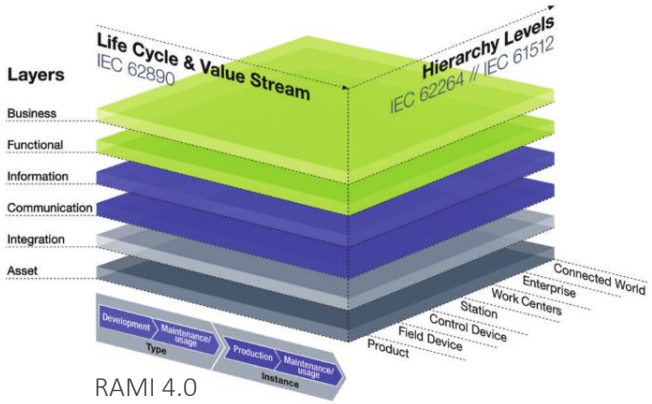
RAMI4.0 - Exchange formats



Asset Administration Shell

RAMI 4.0 relation

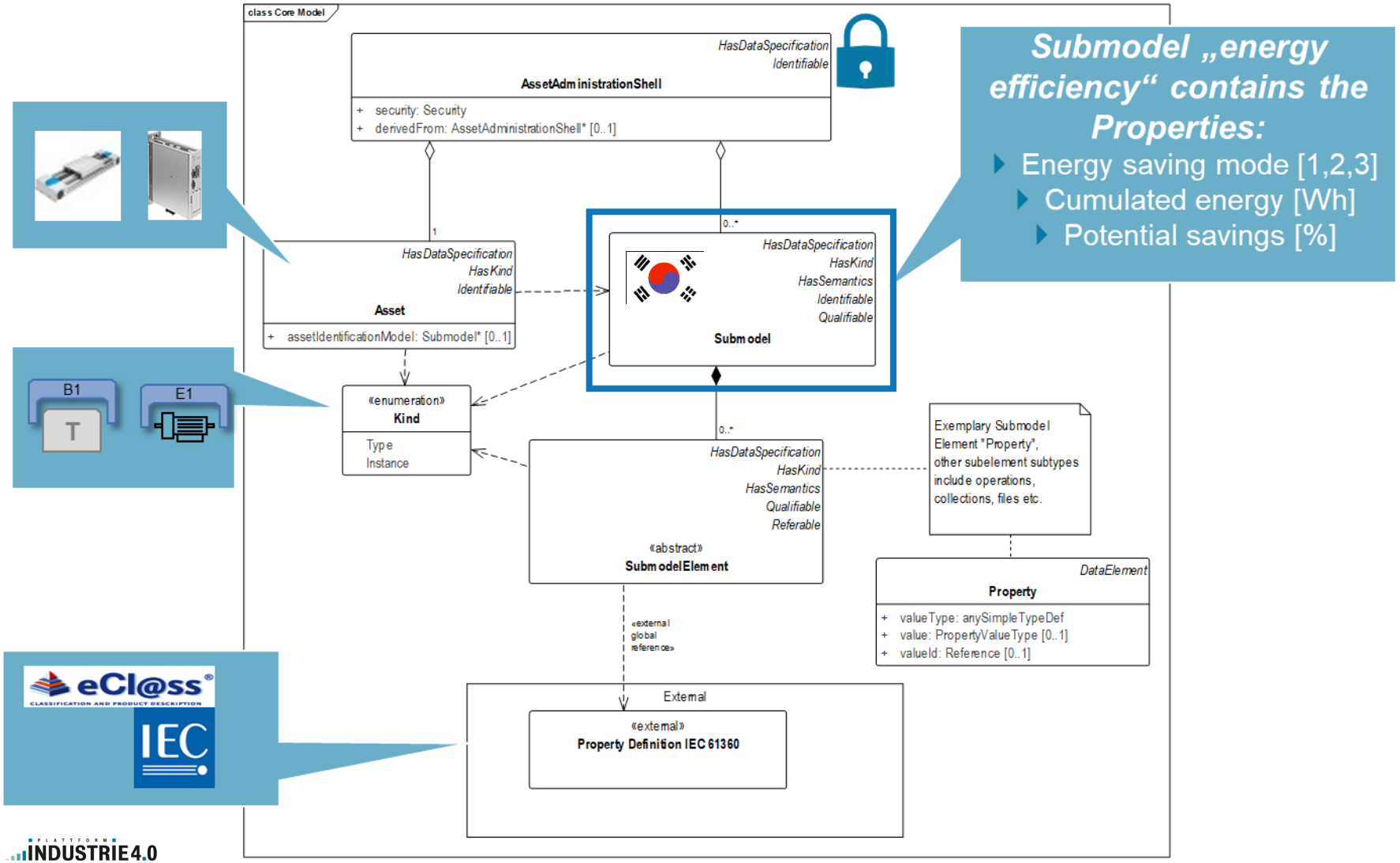




RAMI 4.0
IEC PAS 63088

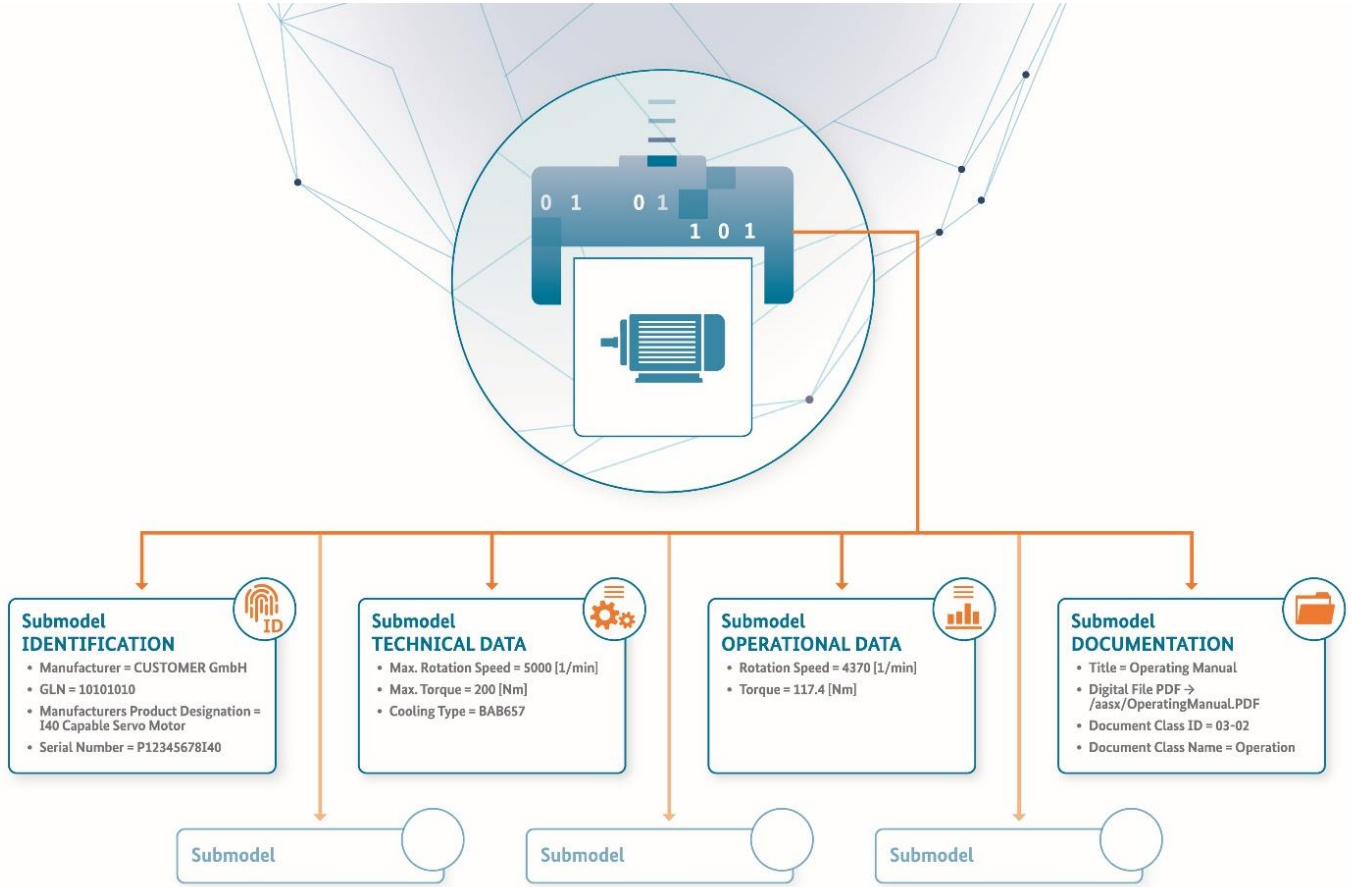
Asset Administration Shell

Meta information model



Asset Administration Shell

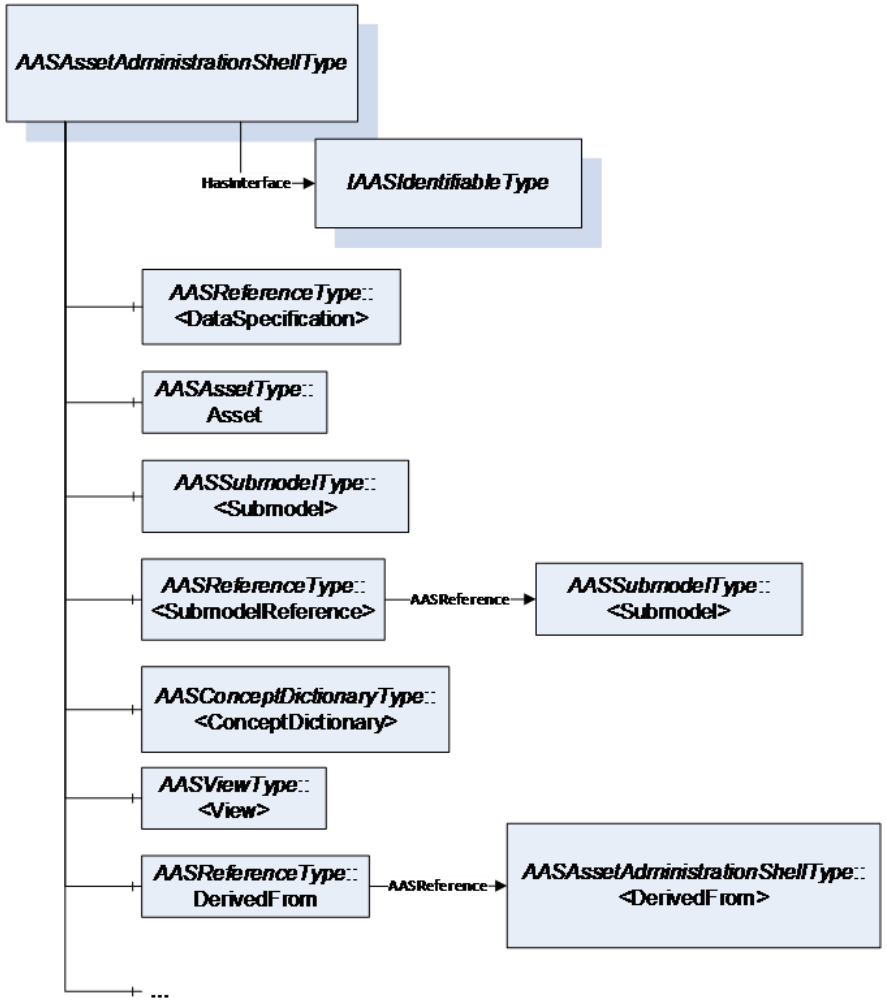
Sub-models

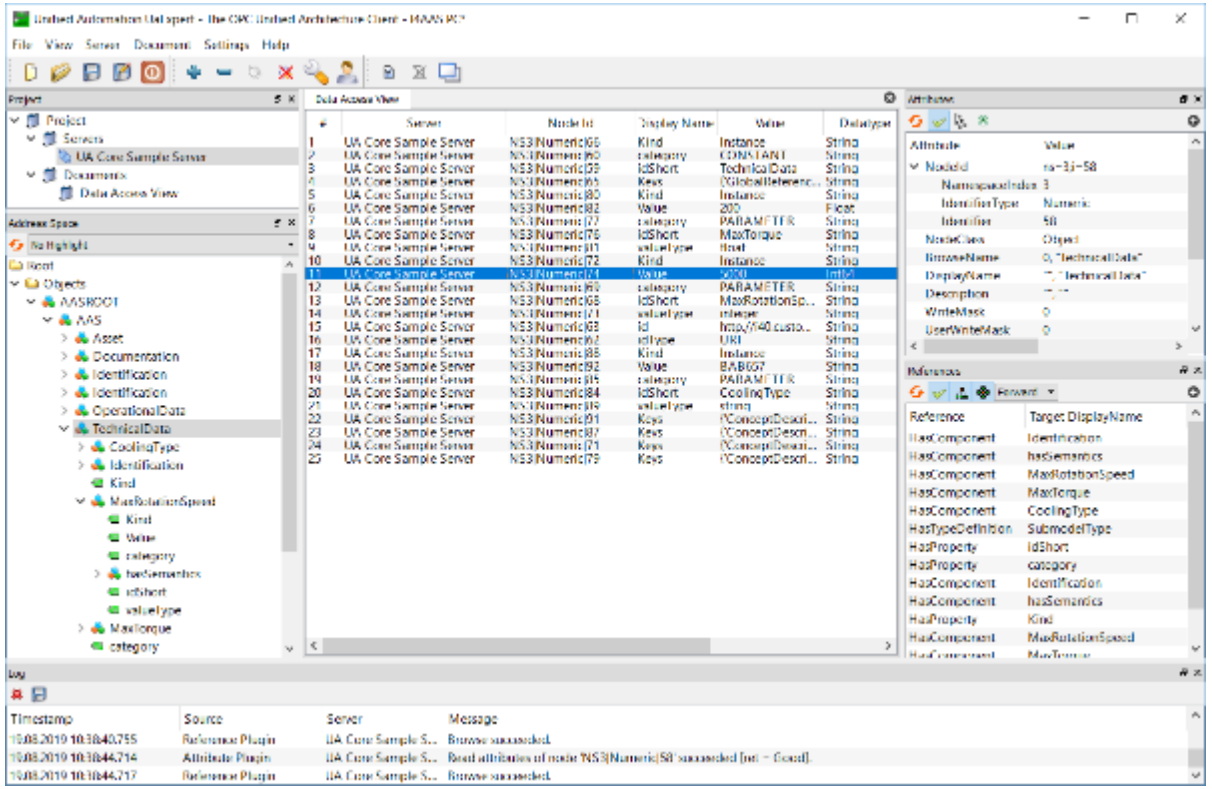


- **Product properties** in terms of IEC61360-1 or ecl@ss
- **Process variables** and parameters, telemetry data
- **Events** for observing properties
- **References** to external data sources or files
- **References** to other Administration Shells and their parts (submodels, properties), also from external partners in the value chain
- **Capabilities** of the asset, description of method calls
- **Sets** of properties, e.g. lists or arrays
- **Entities** for describing Composite I4.0 Components

Asset Administration Shell

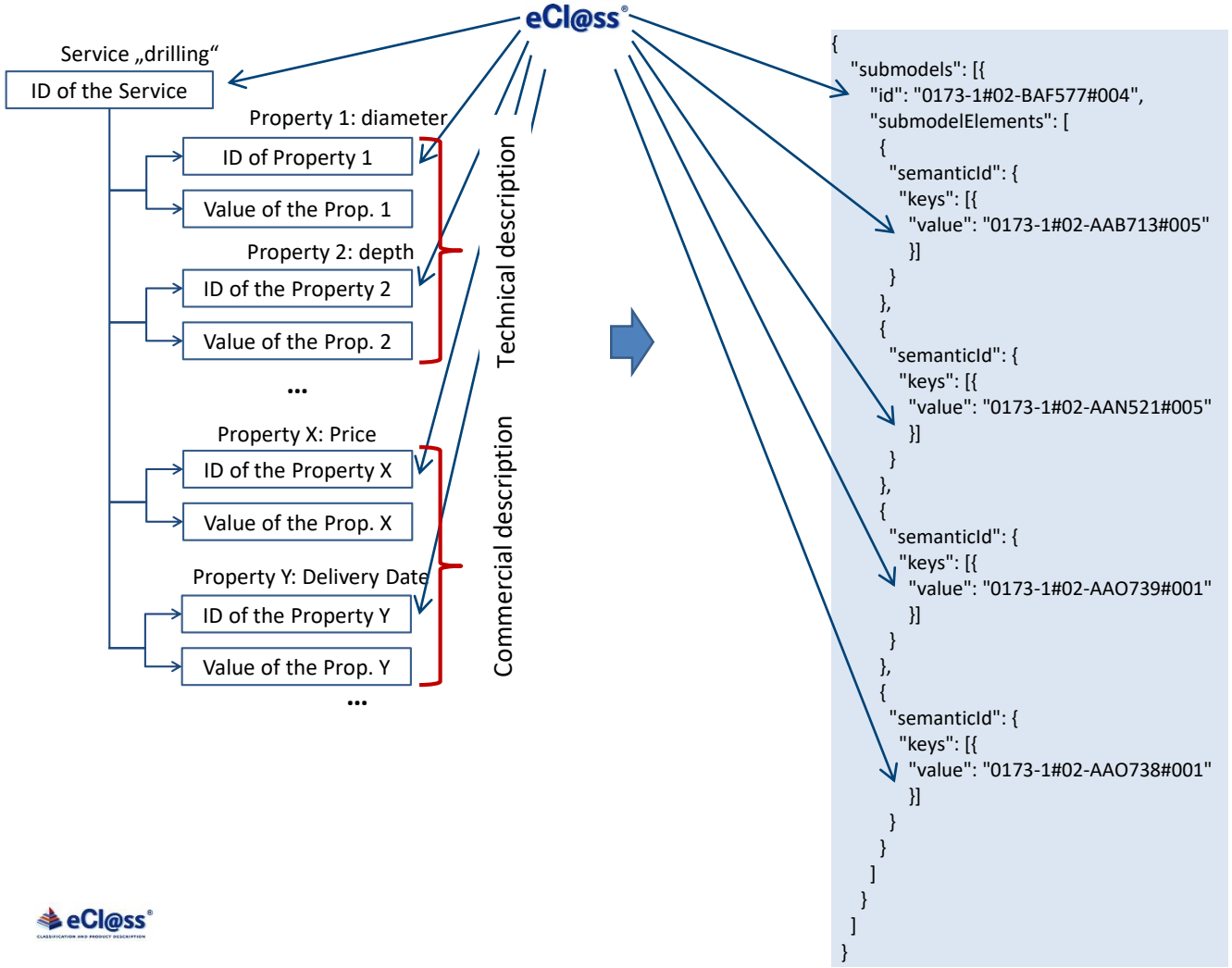
VDMA OPC UA companion specifications





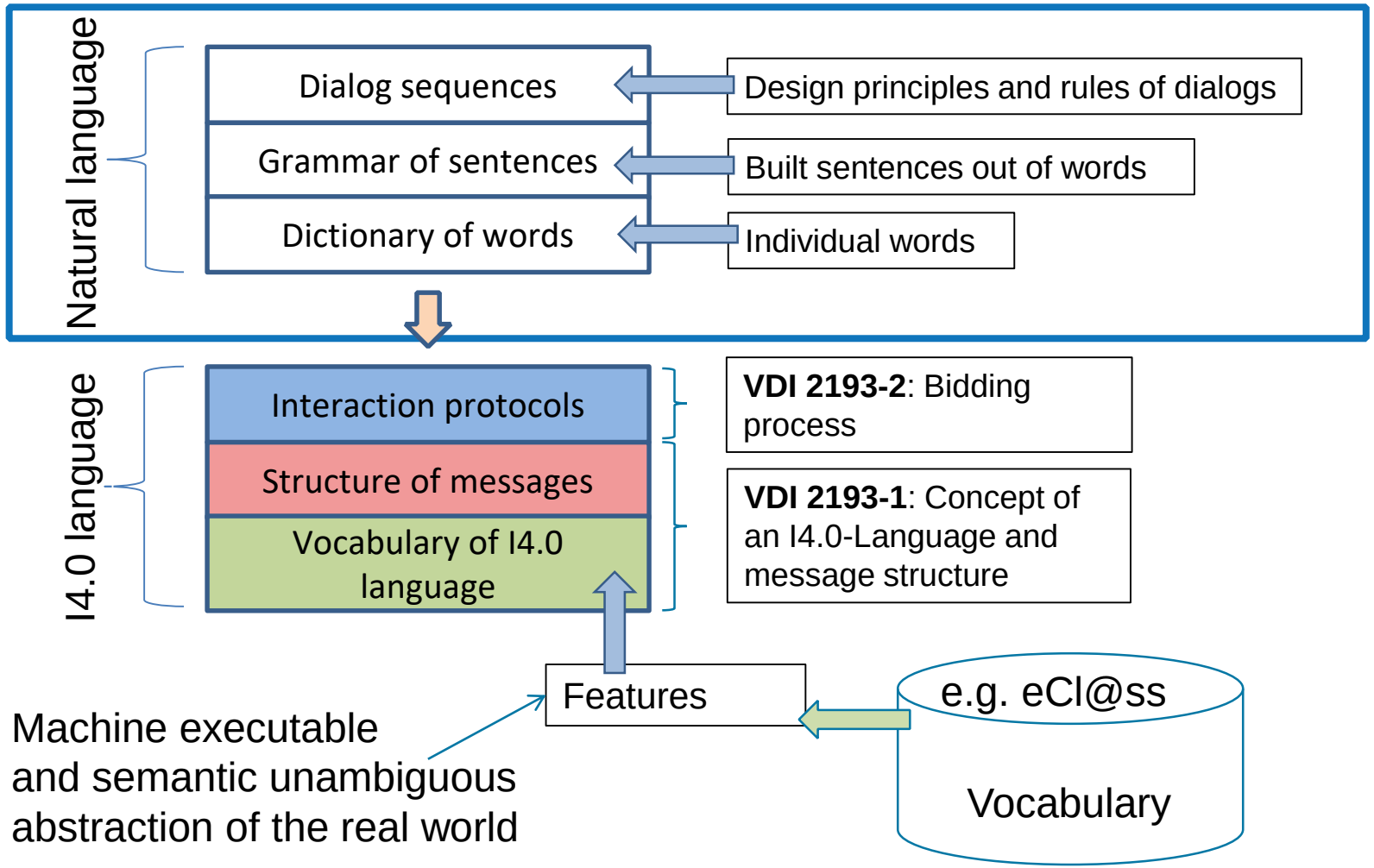
Asset Administration Shell

eCl@ss relation



Asset Administration Shell

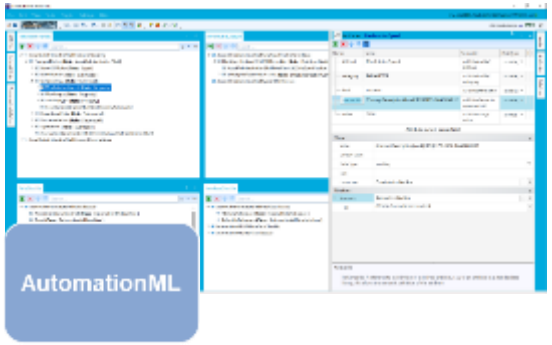
Relation to Industrie 4.0 language (VDI 2193)

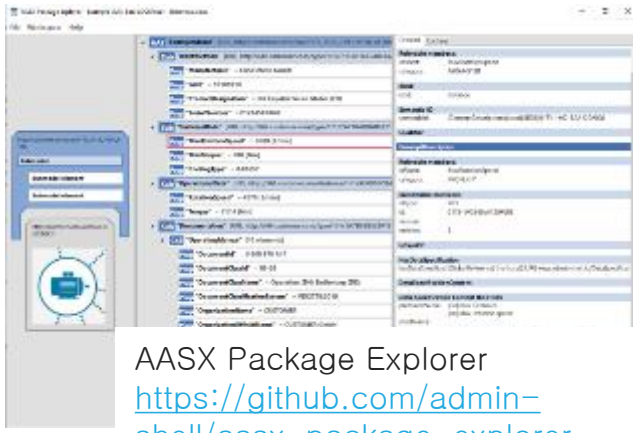


Asset Administration Shell

Implementations along the life cycle exist (many are open-source)

Engineering

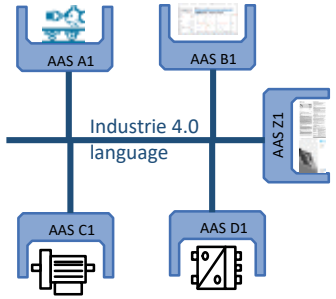


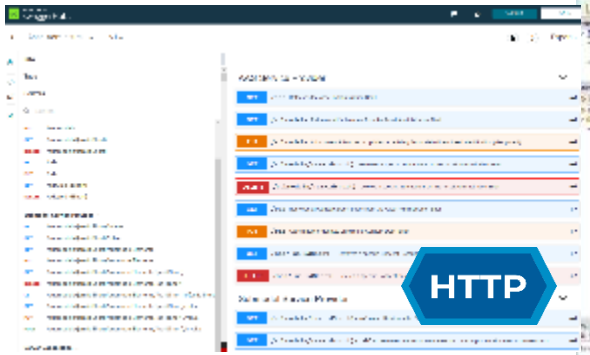


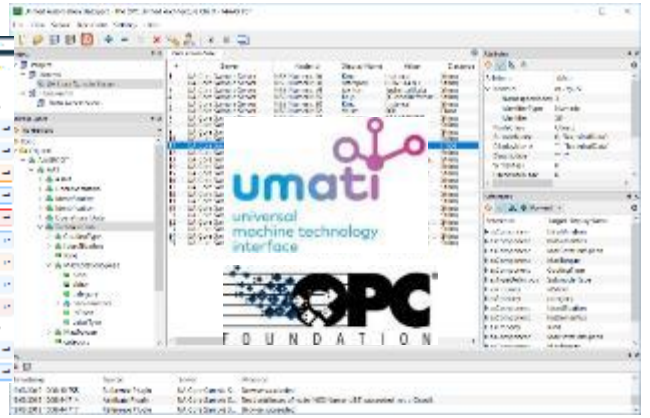
AASX Package Explorer
https://github.com/admin-shell/aasx-package-explorer

API

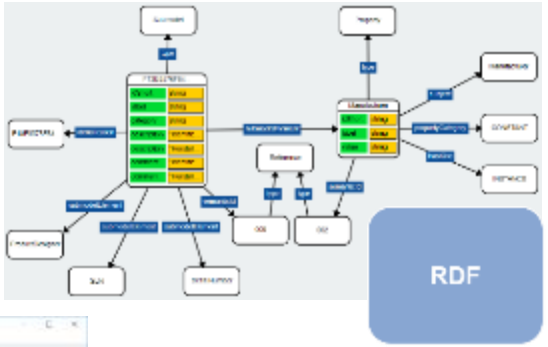
Operations







Analyze



Development | Maintenance / Usage | Production | Maintenance / Usage

Type | Instance

Asset Administration Shell

Standardization

- *IEC PAS 63088* Reference Architecture Model Industry 4.0 (RAMI 4.0)
- ISO/IEC JWG21 Smart Manufacturing Architecture Reference Model
- *IEC TC 65 WG 23 & WG24* Asset Administration Shell for Industrial Applications
- *IEC 62832* Smart Manufacturing Framework and System Architecture (“Digital Factory”)
- ISO/IEC JTC 1 AG 11 (Digital Twin)
- *IEEE P2806* System architecture of digital representation for physical objects in factory environments
- Digital Twin Manufacturing Framework *ISO/AWI 23247* within *ISO TC 184 SC4 WG15 (STEP)*

Thank you