eCl@ss and SME: use cases, testbeds and standardization

Labs Network Industrie 4.0 e.V.
Challenges for SMEs

2017 average investment in Industrie 4.0: 5% of annual revenue

- Investment required: 59%
- Skills shortage: 57%
- Lack of standards: 57%

Sources: bitkom; Industry 4.0: Status Quo and Outlook 2017
Plattform Industrie 4.0 in Germany

2030 VISION FOR INDUSTRIE 4.0
Shaping Digital Ecosystems Globally

Autonomy
Self-determination and free scope for action guarantee competitiveness in digital business models.
- Technology development
- Security
- Digital infrastructure

Interoperability
Cooperation and open ecosystems permit plurality and flexibility.
- Regulatory framework
- Standards and integration
- Decentralized systems and artificial intelligence

Sustainability
Modern industrial value creation ensures high standard of living.
- Decent work and education
- Climate change mitigation and the circular economy
- Social participation
Plattform Industrie 4.0 in Germany

The digital transformation needs a broad-based foundation

- 400 participants
- Relevant stakeholders in Germany

WG1: Reference architectures, standards and norms
WG2: Technology and application scenarios
WG3: Security of networked systems
WG4: Legal framework
WG5: Work, education and training
WG6: Digital business models in Industrie 4.0
LNI4.0 founders, Nov. 2015

Our network feels connected to the entire German industry

In cooperation with:
Industrie 4.0 Stakeholders

- Expert community from industry and academia

Digital Transformation

 Directive about relevant standards
 Transfer of results to standardization
Standardization orchestration

1. Initiating

2. Check and decide

3. Standardization (International)

4. Validation

Industrie 4.0 Standards is an initiative of

Top down
Bottom up

Top down
Bottom up
LNI 4.0 testlabs cooperation (>45 MoU)

25 SME 4.0 competence centers are most important smart factories partners

All cover e.g. interoperability, AI, AR, edge / cloud computing and work 4.0
Reference Architecture Model 4.0
Asset Administration Shell

RAMI 4.0

Industrie 4.0-component

Asset shell
e.g. Machine

Industrie 4.0 communication
Asset Administration Shell 3 Types

**Type 1: Passive**
- **File format**: Enables exchange of asset information between software applications.

**Type 2: Active (Client / Server)**
- **API**: Enables access to asset information by software applications.

**Type 3: Interacting (Servient)**
- **Active components including computing infrastructure**: Enables secure plug and unplug of software components of different vendors.
- **Applications based on standardized interaction principles**: Enables design of highly flexible and autonomous systems.

Applications primarily supporting design and engineering workflows:
- Opportunity to extend engineering tools and applications by import/export capabilities based on Asset Administration Shell.
- Sometimes these extensions can be provided by solution partner.
- Benefit for user of engineering tools and applications: improvement of consistency of engineering and configuration information.

Application primarily supporting system integration activities:
- Currently no “low-hanging fruits”: concepts still in elaboration, especially computing infrastructure and Industrie 4.0 language.
- Benefit for system integrator: simplification of system configuration and reconfiguration.
>100 Use Cases with >200 SME
SEMANTICS FOR PRODUCTION

FACILITY CONTROL SYSTEMS

- Reliability data of individual machine components and condition of the foundation structures can be collected automatically, evaluated easily, and used for maintenance.

- Semantically (AAS) managed components.
STANDARDIZATION TESTBED

OPC UA VDMA COMPANION SPECIFICATIONS

- Testbed host HS Weingarten-Ravensburg
- Based on SME requirements
- Companion Specs validation
- https://investitionsrechner-i40.vdma.org/login
DATA-DRIVEN VALUE CREATION

VALIDATION WITH ADMINISTRATION SHELL

- Marketplace, market prognosis providers and machine operators are networked via the Industrial Data Space Connector and Clouds (Data Intelligence Hub and MindSphere)
- Application of administration shell and reference architecture model
PRODUCTION ASSISTANCE SYSTEMS

SKILLED WORKERS WITH DISABILITIES

▪ People with mental impairment can perform skilled work thanks to assistance systems

▪ Networking, information provision and visualization of assembly operations from ERP/MES in control cabinet construction
Agile testing!