ITEA Smart Systems Engineering workshop

Session II - Standardisation
ITEA Smart Systems Engineering workshop

7 April 2022 | online
Thomas Bär, Daimler Buses – EvoBus GmbH
Dr. Thomas Bär
Manager „Digital Production Planning“
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Dr. Thomas Bär
Background experience

- More than 20 years of experience in digitalization projects in research & development and production planning in automotive industry (cars, trucks and buses)
- Current Position “Manager Digital Production Planning” responsible for Daimler Buses
- My ITEA projects:
  - AIToC (12/2020 – 02/2024): Artificial Intelligence supported Tool Chain in Manufacturing Engineering - Running
  - MOSIM (09/2018 – 11/2021): End-to-end Digital Integration based on Modular Simulation of Natural Human Motion – Recently completed
  - ENTOC (09/2016 – 08/2019): Engineering Tool Chain for Efficient and Iterative Development of Smart Factories - Completed
  - AVANTI (11/2013 – 06/2016): Test methodology for virtual commissioning based on behaviour simulation of production systems - Completed
Session Topic Standardization

Key challenges

- **Current Vision is the Digitalized Bus Manufactory:**
  For every customer order a digital twin in 3D is available, planned digitally and validated digitally.
  → **Usage of AI is required to reach this vision**


- For usage of AI semantics are important, but no standardization can be found, which covers all industry needs in manufacturing

- My personal experience: Standardization is always a long journey and you need partners in your project with links to standardization bodies
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Contact details

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Thank you for your attention
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Klaus Wolf, Fraunhofer SCAI
Session topic Standardization

VMAP Standard for CAE Data Exchange

Demand from Industry:
We need better interoperability between CAE tools from different ISVs

VMAP Standard:
Unique and open interface standard to store CAE data and results
Session topic Standardization

Hybrid Engineering Workflows – An example

Tape Production

UD-Tape Production

Fibre + Compound

UD-Tape

Component Production

Tape- Lay up

Semi-finished part Lay-up

Laminate

Laminate Consolidation

Component

Hybrid Injection Moulding
Session topic Standardization
Hybrid Engineering Workflows – Heterogeneous Data Sources

- Non-Destructive Testing – Local Details in processed Materials
  e.g. DICONDE

- Machine data and control
  e.g. OPC UA

- Monitoring, Online Diagnostics
  e.g. IEEE 1451

- Virtual Models and Simulation
  e.g. VMAP, FMI, CGNS
Session topic Standardization
Hybrid Engineering Workflows – Ontologies as Meta-Concept

Monitoring, Online Diagnostics e.g. IEEE 1451

Non-Destructive Testing – Local Details in processed Materials e.g. DICONDE

Virtual Models and Simulation e.g. VMAP, FMI, CGNS

Machine data and control e.g. OPC UA

Manufacturing

Measurement

Material

Analytics

Data storage

CAE Simulation

CAD & Design

Components

Interoperability

captures detection production alteration

validation analysis production optimization prediction evaluation

configuration control management supply

definition development comprehension

Machine data and control e.g. OPC UA

Virtual Models and Simulation e.g. VMAP, FMI, CGNS

Non-Destructive Testing – Local Details in processed Materials e.g. DICONDE

Monitoring, Online Diagnostics e.g. IEEE 1451
Session topic Standardization
Hybrid Engineering Workflows – AI-based new Business Concepts

Semantic Search

Surrogate Modelling

https://en.wikipedia.org/wiki/Talk%3ASurrogate_model

Data & Model Stores

CAE Simulation

Measurement

Material

Analytics

Interoperability

Components

CAD & Design

Manufacturing

Data storage

Data & Results Analytics

Abaqus

Moldex3D

LS-Dyna
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Contact details

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Contact details

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Background & Experience
Standardization

Key challenges

Use cases & Requirements → What to model → How to model → How to integrate all models

Systems Engineering ecosystem

Application Modeling → System Model → System Integration → System Testing

System Requirements → System Simulation

Interoperability | Traceability | Communication | Quality | Safety & Security | Efficiency | ...

Multi Domain Multi Disciplinary Multi Language Multi Standard ...

Standardization Objectives

ITEA4
Standardization

Ingredients to success

- Open Standard
- Design / Modeling Methodology
- Open Source Reference Implementation
Standardization
Ingredients to success

Example:

- Open Standard
- Design / Modeling Methodology
- Open Source Reference Implementation

SystemC Community Portal systemc.org
ITEA is the Eureka Cluster on software innovation

Σ eureka

https://www.eurekanetwork.org

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7 April 2022 | online
Martin Benedikt, Virtual Vehicle Research GmbH
Introduction

Background experience

- **Since 13 years with the Virtual Vehicle Research Center,**
  - strategic focus on virtual-enriched system development & operation
  - Automated Driving, Green Systems, Human-Machine Integration, etc.
  - Automotive & Rail; 300 FTE’s, 25 M€ turnover, 50% nat. & 50% EU

- **Fields of activity,**
  - 2008: Invention of coupling-algorithms for co-simulation
  - 2014: Team Leader “Co-Simulation & SW” (incl. SW Product Development)
  - 2017: Thematic Area-Leader “Efficient Development”

- **ITEA projects**
  - ACOSAR … Advanced Co-simulation Open System Architecture → MAP DCP Std.
  - UPSIM … Unleash Potentials in Simulation → looking for standardization ...
Introduction

Recent projects ...

https://dcp-standard.org

www.upsim-project.eu
Machine-X Digital Standards
Status Quo and issues ...

- The 4th Industrial Revolution is based on Software, Connectivity, AI, etc.

- Complex Systems interact, evolve, communicate, adapt, update, non-linear, etc.

- Standards are defined by interested stakeholders (volunteers or industry) or official body (e.g. quality assurance) → mediator-driven (manual) consolidation
  - Projects and/or working-groups (ACOSAR 3+1Years)
  - Meetings (ACOSAR ~100 WG meetings)
  - Formal Processes to be followed (ACOSAR 6 Months)
  - Market Uptake afterwards (tbd. ~ 5 Years)
→ resulting in informal documents / ref. impl.

Machine-X Digital Standards
Solution paths ...

... imagine semantic interoperability based on a flexible communication standard ontology ...

- Related applications and impact of this?
- Needed infrastructure?
- Needed organisation?
- ...

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Thank you for your attention