prostep ivip e.V.
Smart Engineering Meets Smart Production
Dr. Alain Pfouga

MODEL-BASED ENGINEERING, AUTOMATION AND IOT IN SMART MANUFACTURING
Burlingame, December 6, 2017
CONTENT

- industrial drivers & challenges
- prostep ivip association
- Code of plm openness
- standardization strategy board
- smart systems engineering
- cyberphysical production
Industrial Drivers & Challenges
Product Data Digitalization and Usages
SHIFT TO CUSTOMERS DEMANDS

Mass-customization, platforms and modularization concepts are key to address both the product and customer needs.

FROM A PRODUCT FOCUS
Features centric, limited collaboration and rigid technologies. Means to explains the actual offering to achieve immediate sales!

TO A CUSTOMER FOCUS
Whole experience beyond engineering and sales. Means to provide the user with experiences it needs to gain the customer rapport!

Inside Airbus‘ Modular Plane Concept
The manufacturing ecosystem has an opportunity to use data to drive insights, take action on new business opportunities and create a safer world.

Intel CEO Brian Krzanich

Data is the New Oil in the Future of Automated Driving
INCREASED KOMPLEXITY AND DYNAMIK OF THE PRODUCT EMERGENCE PROCESS

90% of product innovations and new features are contributed by electronics & software, like

Telematics features, semi-autonomous and autonomous driving fully integrated Infotainment.

Software breakthroughs are becoming as critical as hardware innovation, and competition is increasingly coming from non-traditional players (e.g. Tesla or Google vs. traditional automotive OEMs)

Tesla is reportedly developing its own chip with AMD for self-driving cars
THE PRODUCT IN CONTEXT OF A SYSTEM OF SYSTEMS AND SIMULATION

Be aware that new kind of Partners might be in lead for the definition of content in key disciplines.
prostep ivip association

Overview, Objectives etc.
prostep ivip Association: Neutral & Non-Profit
A strong community since 1993

Leading Worldwide-acting Neutral & Non-Profit Network
- 180 Members from Industry, IT and Research
- Driven & Funded by its Members
- Know-how exchange in non-competitive areas
- Sharing risks and funds, instead of doing it alone
- Best practices, even beyond branches and continents

Digital Transformer in Product Creation & Production
- Defining Standards & Interfaces for Digital Processes
- Safeguarding industrial Benefits & Interoperability

Expert in IT-Standards & Industrial Implementation
- Be sure, that your results become standard and are supported by IT interoperable
Providing Results of Industrial Relevance
Fast and Flexible

Defining Standards & Industrialization for Digital Transformation:
- e.g. ISO 10303 (STEP), ISO 14306 (JT), LOTAR, OMG ReqIF
- Dozens of prostep ivip, VDA, VDMA Recommendations
- Tons of White Papers and Recommended Practices

Together with Partners to bring the relevant standard(s) to the market:
Focus: User-driven Application Groups
- 3D Measurement Data Management WF
- ALM-PLM Interoperability
- Code of PLM Openness
- JT Workflow Forum
- Manufacturing Information Model
- PDM for Vehicle Electric Systems
- Project Schedule Management
- ReqIF Workflow Forum
- Smart Systems Engineering
- Standardization Strategy Board
- Synced Factory Twins

Software Interoperability & Test Beds
- 3D MDM IF
- CAx IF
- ECAD IF
- ECAD/MCAD IF
- JT IF
- PDM IF
- ReqIF IF
- ReqIF Benchmark
- STEP Benchmark

International Standardization
- JT
- STEP AP 242
- Long-term Archiving & Retrieval
Projects

- Openness in PLM (CPO)
- Standard Strategy Board
- Smart Systems Engineering
- Cyberphysical Production
Smart Engineering, Industrie 4.0 & Society 5.0 Aims

- Seamless connectivity
- Future-readiness
- Reduction of Complexity
- Agility & Flexibility
- Cost-reduction

Openness is Enabler! Be Smart & Fast! CPO is the means!
30% of all costs are integration costs

The Code of PLM Openness (CPO) is the foundation for Daimler’s PDM strategy and serves as the basis for the externalization of business objects from all IT applications to a service-oriented middleware. This is a key driver for an IT system landscape with different development speeds and release cycles, whereby the implementation of the Digital Twin, the introduction of model-based Systems Engineering as well as the delivery of IT for Autonomous Driving will be enabled.

Dr. Siegmar Haasis,
CIO Research&Dev. Mercedes-Benz Cars

Volkswagen, like all other automotive OEM’s, has invested highly in its existing IT systems. The migration to new systems – especially for large monolithic systems – requires huge efforts and costs. Hence the extreme importance for Volkswagen for the assurance of interoperability, supportability, cost effective maintainability and scalability of the implemented systems.

Matthias Keller,
Head of PDM
Code of PLM Openness (CPO)

Means for realizing Society 5.0
- Seamless Integration Plug & Play
- Reducing Complexity & Costs
- Increasing Agility & Flexibility

Standard Criteria Catalogue for
- Interoperability, Infrastructure, Extensibility, Interfaces, Standards, Architecture, Partnership

Patronage of BMWi (Ministry for Economic Affairs)
- Standardized as DIN SPEC 91372

Trust at the Market
- Accredited Certification Program

Open for Everybody: www.prostep.org/en/cpo
# 78 Committed CPO-Partners

## IT Customers
- Adient
- Airbus
- Altran
- BMW
- Bosch
- Continental
- Daimler
- Dräxlmaier
- EDAG
- Ford
- Fuji Heavy Industries
- Hino Motors
- Honda R&D
- Isuzu Motors
- Küster

## IT Vendors
- Mazda Motor
- Mitsubishi Motors
- Nissan Motor
- Porsche
- Schaeffler
- Siemens
- SMP Group
- Suzuki Motor
- thyssenkrupp
- Toyota Motors
- Volkswagen
- Volvo AB
- Yamaha
- Yazaki
- ZF Friedrichshafen
- Actano
- Aras
- Autodesk
- AVL List
- BETA CAE Systems
- BOS
- Cideon
- collaboration Factory
- CONTACT Software
- CONWEAVER
- Dassault Systèmes
- dSPACE
- ECS
- Elysiun
- ESI ITI
- Eurostep
- Gamma Technology
- HCL
- IBM
- IPG Automotive
- ISD
- Kronion
- MathWorks
- Mentor Graphics
- Modelon AB
- Müller-BBM
- NetAllied
- Noesis Solutions
- PROSTEP
- PTC
- Rocket Software
- SAP
- Siemens PLM
- TechniaTranscat
- Theorem

## IT Service Provider
- Atos
- CAFEM
- :em
- enso managers
- InMediasP
- iqs Software
- M.E.B.
- MetaRatio
- NTT Data
- Seeburger
- SSC-Services
- T-Systems
- xPLM
Standard Strategy Board: Vision/Mission statement

**Vision**

We foster **Collaborative Systems Engineering** based on engineering IT standards.

**Mission**

- We provide Systems Engineering recommendations for the usage of Engineering IT standards for the virtual prototype in all maturity stages.
- We use the **V-model** to locate the Engineering IT standards.
- We identify relevant standards (overlaps/pain points) and according standardization bodies.

We give recommendations to enable Collaborative Systems Engineering processes based on Engineering-IT standards.
Current Status of available Fact Sheets

Existing Fact Sheets
- OFTP
- JT
- FAV
- RDF/OWL
- OSLC
- SysML
- UML
- FDX
- XMI
- FMI
- Autosar
- ReqIF
- Automation ML
- VEC
- I++

Candidates
- MechML
- OPC/UA
- xMCF
- AxF
- ConfigML
- AP242*
- Rest
- UAF
- 3MF
- WebVR*
- IDX
- ASAM ods

*work in progress
Organizational fact sheets 2017/2018

- OMG:
  - ReqIF
  - SysML
  - UML
  - XMI

- ISO:
  - JT
  - AP242
  - PDF

- VDA:
  - OFTP
  - FDX

- W3C:
  - OSLC
  - WebVR
  - RDF/OWL
  - XML

- PSIVIP:
  - IDX
  - CPO*
  - JT IAP*
  - I++
  - VEC

- AUTOSAR:
  - AUTOSAR Adaptive Autosar

- OASIS:
  - OSLC

- IEC:
  - AutomationML

- Modelica:
  - FMI
  - SSP

- ASAM:
  - ASAM ODX

- VDMA:
  - tbd

- Incose:
  - tbd

- GENIVI:
  - tbd

- VDI:
  - VDI 2206

- DIN:
  - DIN Spec's

- GfSE:
  - tbd

* = relationship to prostep ivip exists already

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12/2017
Smart Systems Engineering: Collaborative behavior modeling
Best Practices, Standards and Application Assurance

Scope:
- Data & Information Exchange
  - Specification Environment
  - Boundary Models
  - Test
  - Core Model (Virtual Prototype)

Status:

Partners:
- AIRBUS
- ANSYS
- DAIMLER
- DASSAULT SYSTEMES
- DENSO
- dSPACE
- EM Engineering Methods AG
- ETAS
- Fraunhofer IPK
- Ford
- GT Gamma Technologies
- ITI
- ptc
- PROSTEP
- SCHAEFFLER
- Siemens
- Siemens PLM Software

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Theme: prostep ivip
Cyberphysical Production: From Vision to Reality

**Vision:**

- Enhanced data and information flow between engineering, production planning, production and industrial engineering.

**Participants:**

- ADIENT
- Autodesk
- AIRBUS
- AUDI
- DAIMLER
- AutomationML
- Volkswagen
- VDMA
- ZE

**Scope:**

- Enhanced data and information flow between engineering, production planning, production and industrial engineering.
Synced Factory Twins - Vision

Continuous actualization & enhancement of planning objects

Digital twin

Real planning object

Simulation & digital coverage of planning objects
Synced Factory Twins – Scenarios

1. "Assembly Monitoring": Real-time monitoring of assembly progress with detailed mounting information and testings.

2. "Component Monitoring": Identification of components and real-time tracking and tracing.

3. "Teileverbauprüfung": Check mounting of correct components.

→ Securely providing the right information in the right place at the right time.
The Digital Twin becoming reality

Scenario 1 „Assembly Monitoring“: Real-time monitoring of assembly progress with detailed mounting information and testings.
The Digital Twin becoming reality
The Digital Twin becoming reality
The Digital Twin becoming reality
Nowadays the focus is no longer solely on providing manufacturing information but also on feeding the information back into the process chain. ➔ **STANDARDS ARE KEY TO HANDLE SEAMLESS DATA FLOWS.**

Source: Audi, 2015/2017
Thank you for your attention!

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prostep ivip Symposium 2018 – Save the Date!

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18/19 April 2018
MOC, Munich, Germany

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Source: BMW, 2017