ITEA Smart Systems Engineering workshop

Session II - Standardisation

ITEA Smart Systems Engineering workshop

7 April 2022 | online

Thomas Bär, Daimler Buses – EvoBus GmbH

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Dr. Thomas Bär

Manager „Digital Production Planning“

Daimler Buses – EvoBus GmbH

Email: thomas.baer@daimlertruck.com

Dr. Thomas Bär

Background experience

DAIMLER TRUCK

- *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*

Daimler Buses – EvoBus GmbH

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*

- *Standardization in digital planning and validation is available, but with limited functionality: https://www.automationml.org/, https://fmi-standard.org/ , https://www.mosim.eu/download.php*
- *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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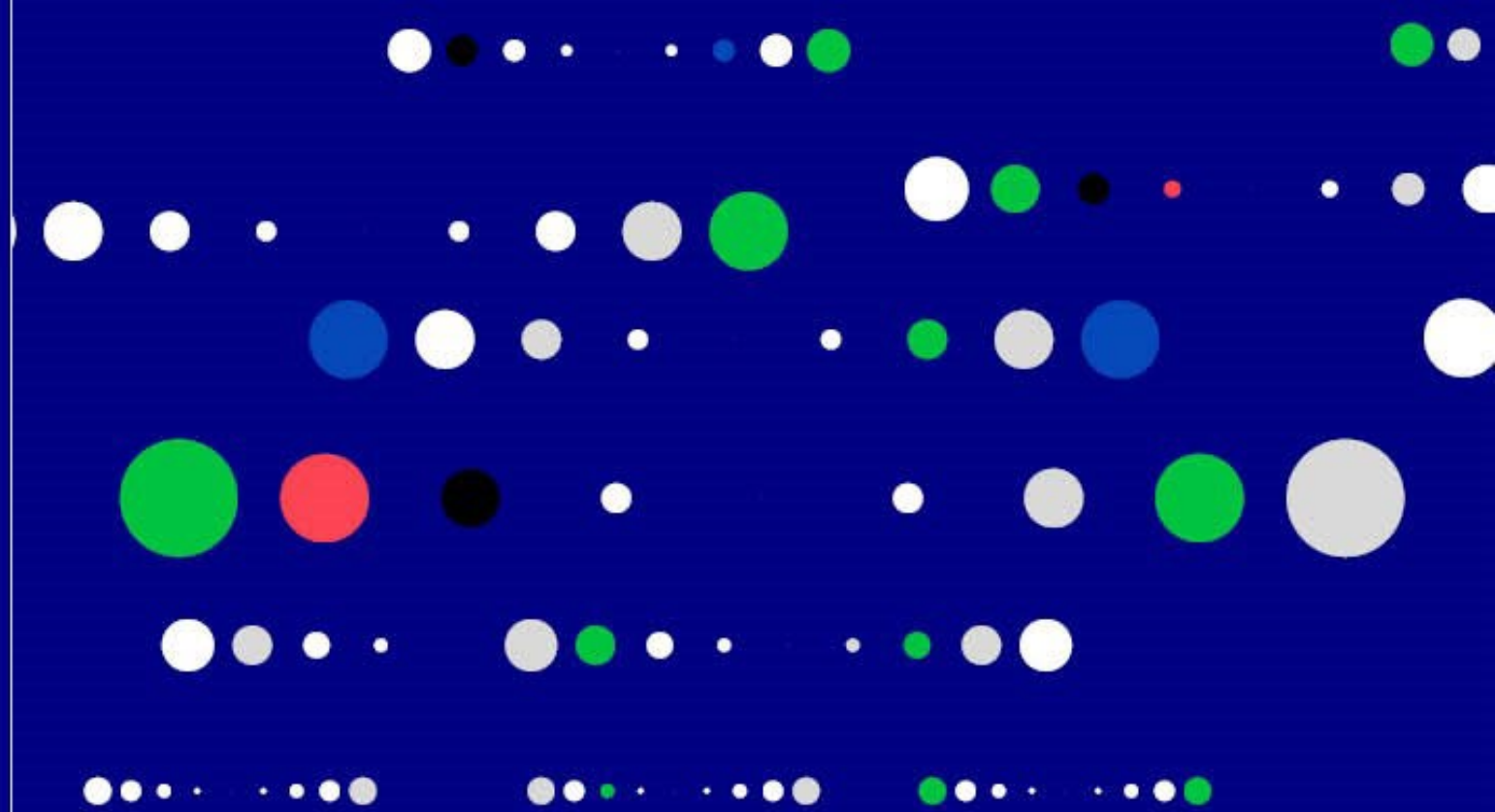

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Klaus Wolf, Fraunhofer SCAI

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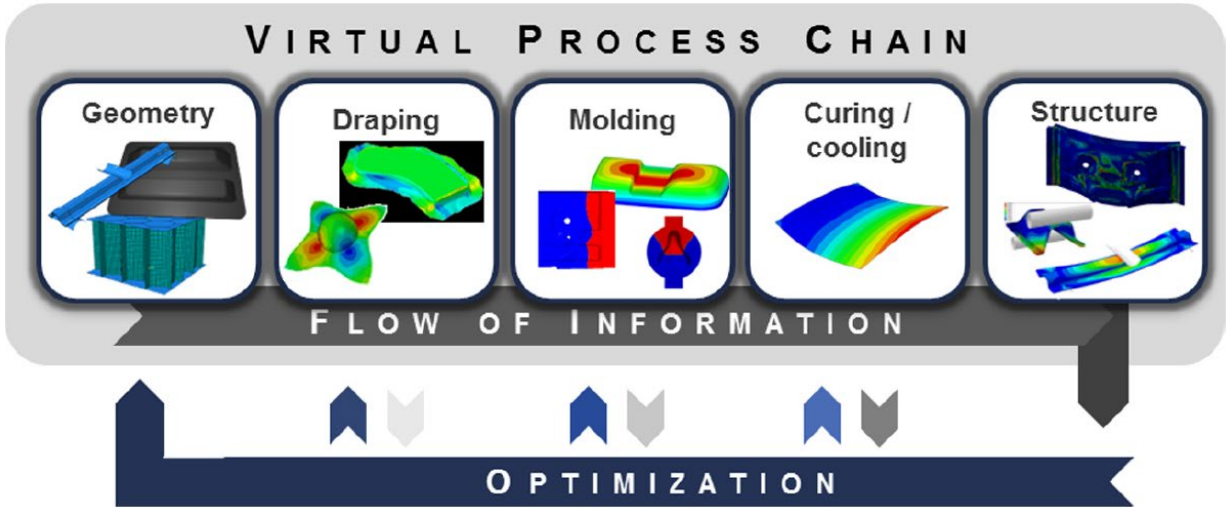
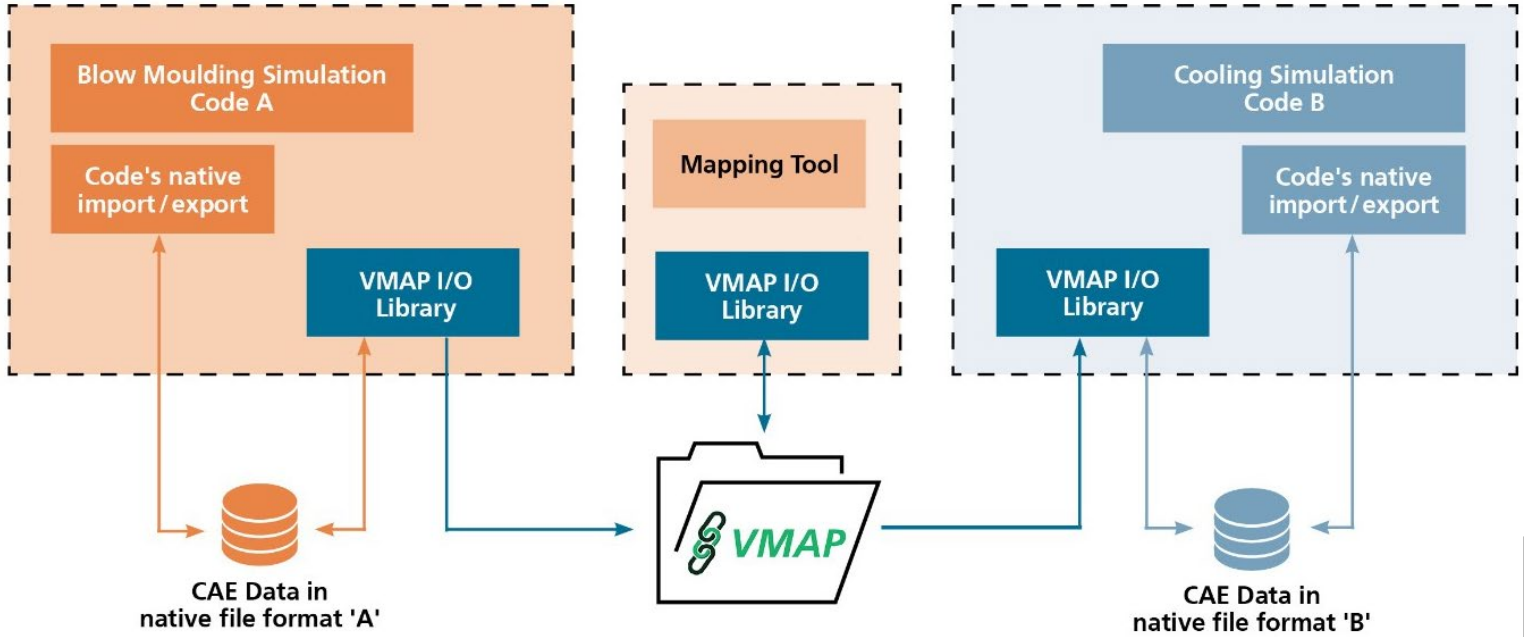
Session topic Standardization

VMAP Standard for CAE Data Exchange



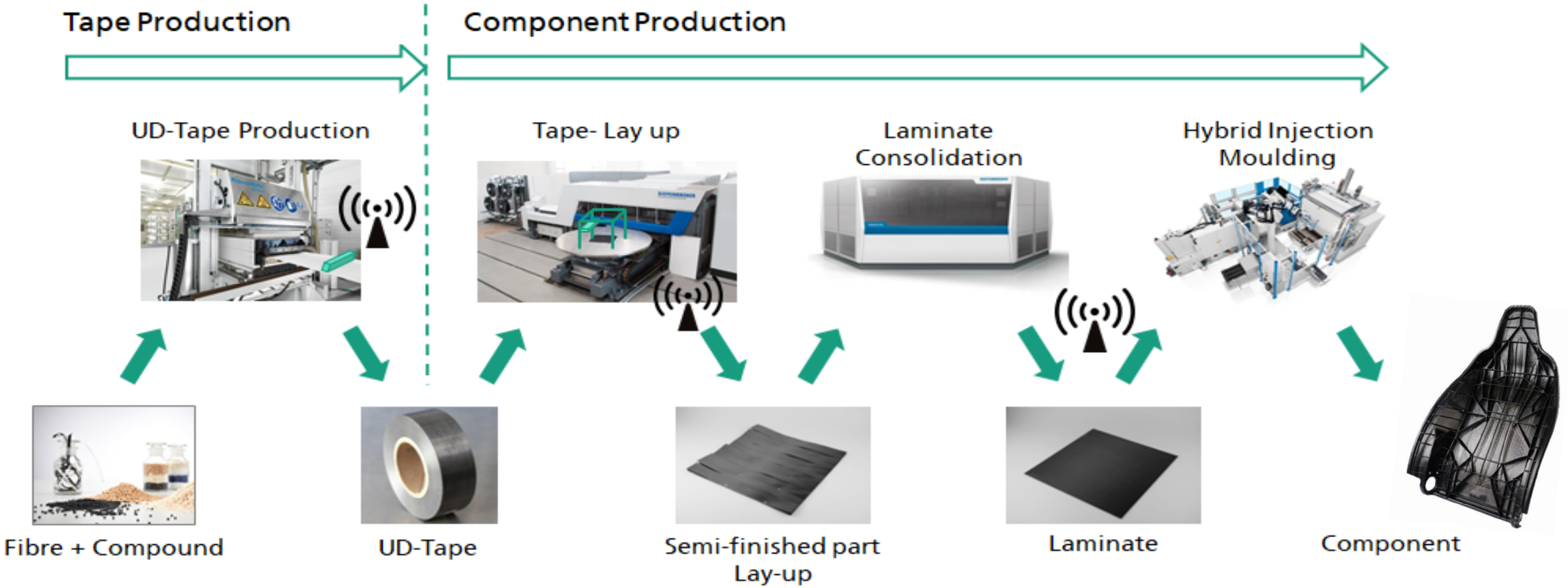
Demand from Industry:
We need better interoperability between CAE tools from different ISVs

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



Session topic Standardization

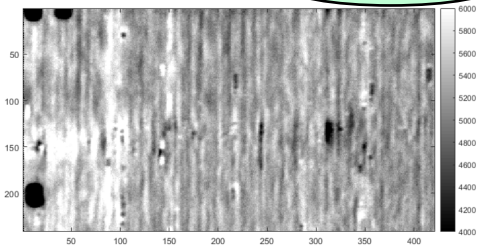
Hybrid Engineering Workflows – An example



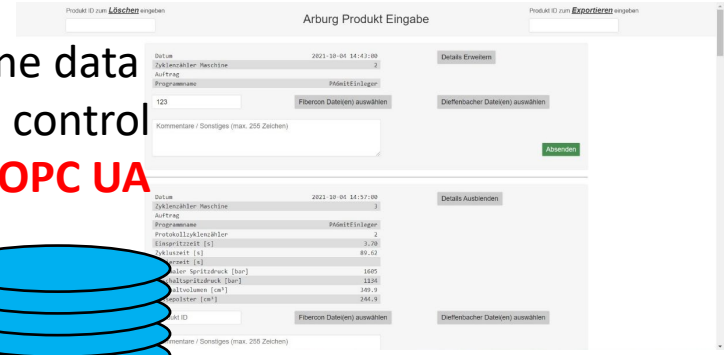
Session topic Standardization

Hybrid Engineering Workflows – Heterogeneous Data Sources

Monitoring,
Online Diagnostics
e.g. IEEE 1451



Machine data
and control
e.g. OPC UA



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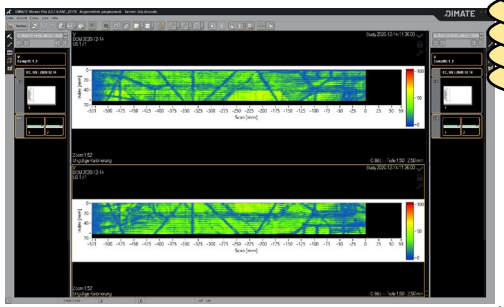
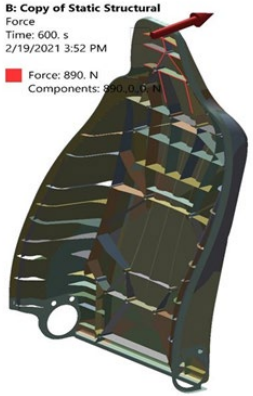
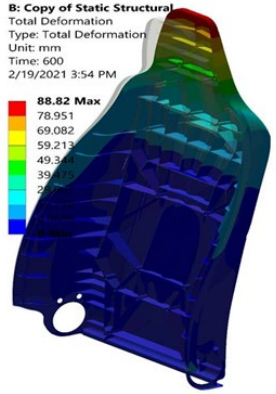


Non-Destructive Testing –
Local Details in
processed Materials
e.g. DICONDE

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



Extra Force application



Displacement at second load case

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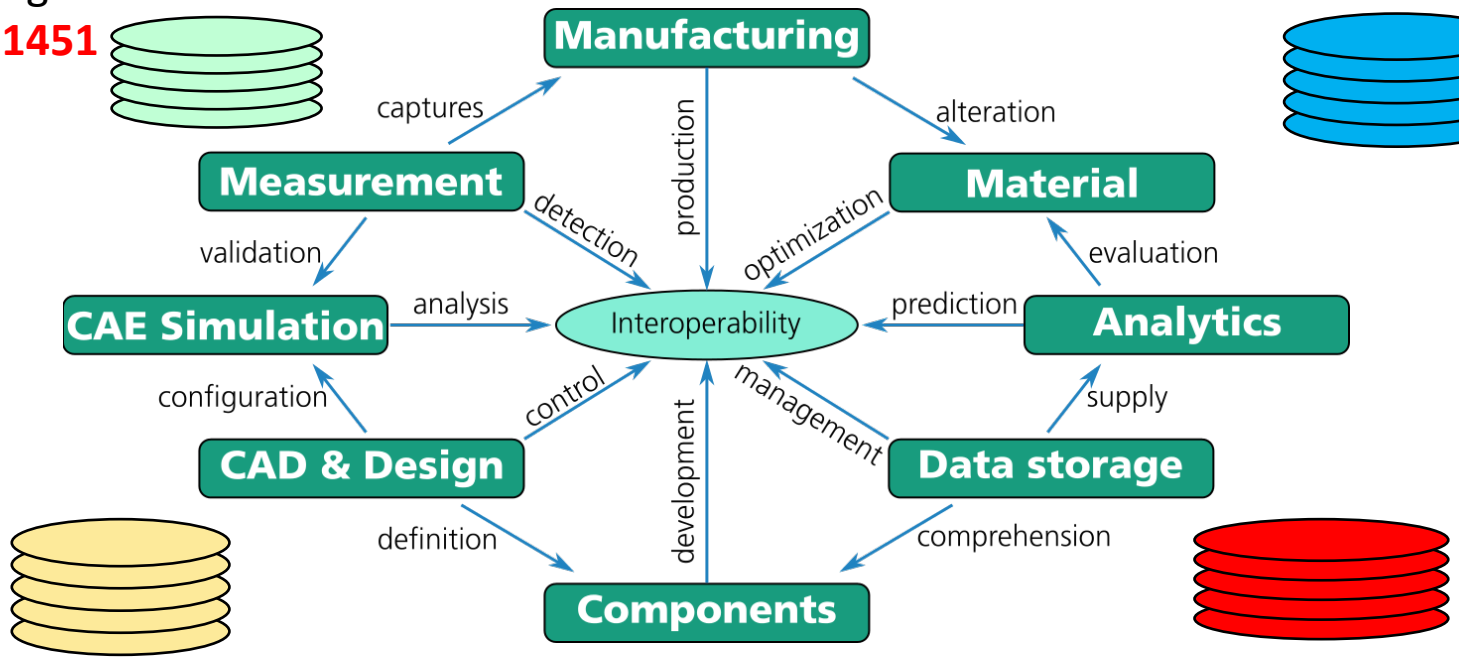
Session topic Standardization

Hybrid Engineering Workflows – Ontologies as Meta-Concept

Machine data
and control
e.g. OPC UA

Monitoring,
Online Diagnostics
e.g. IEEE 1451



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

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

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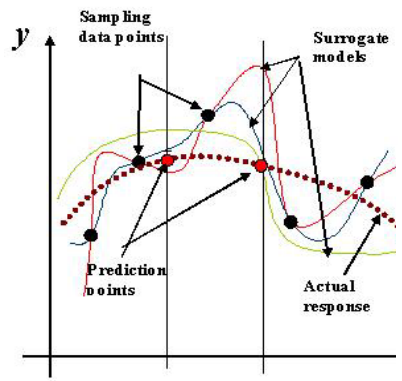
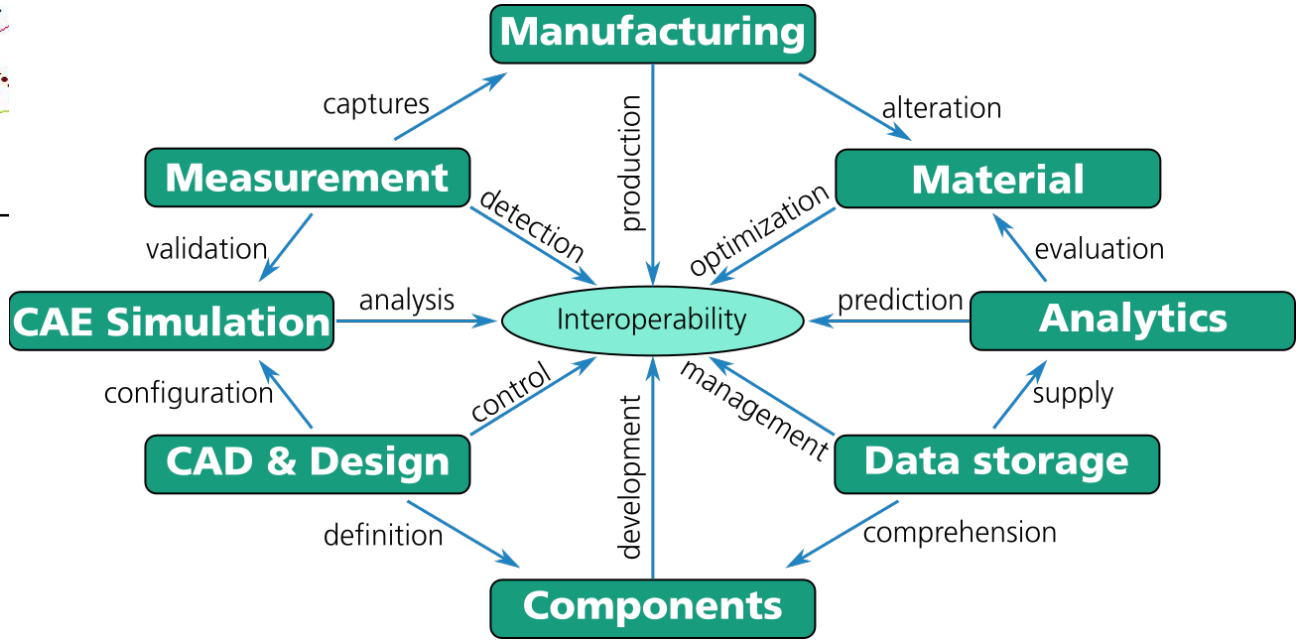
Session topic Standardization

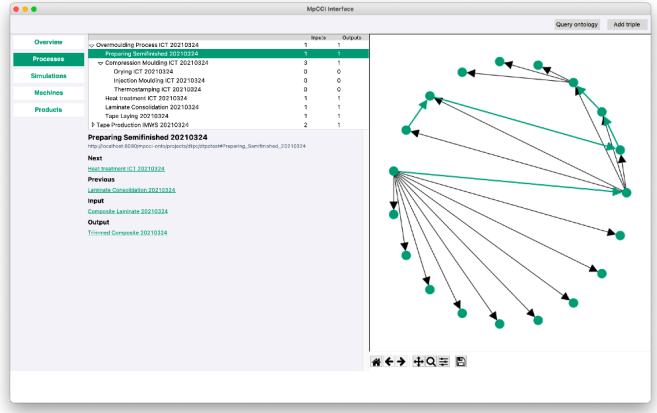
Hybrid Engineering Workflows – AI-based new Business Concepts



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

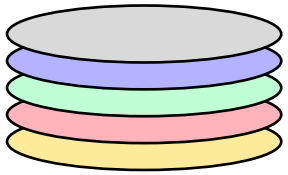
Surrogate Modelling

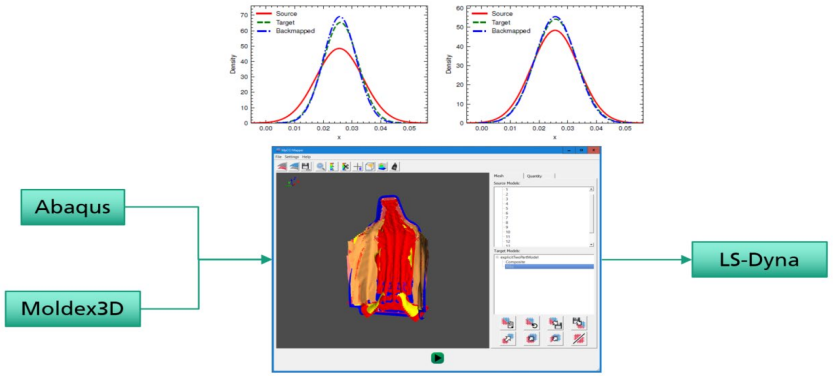




Semantic Search

Data & Model Stores





Data and Results Analytics

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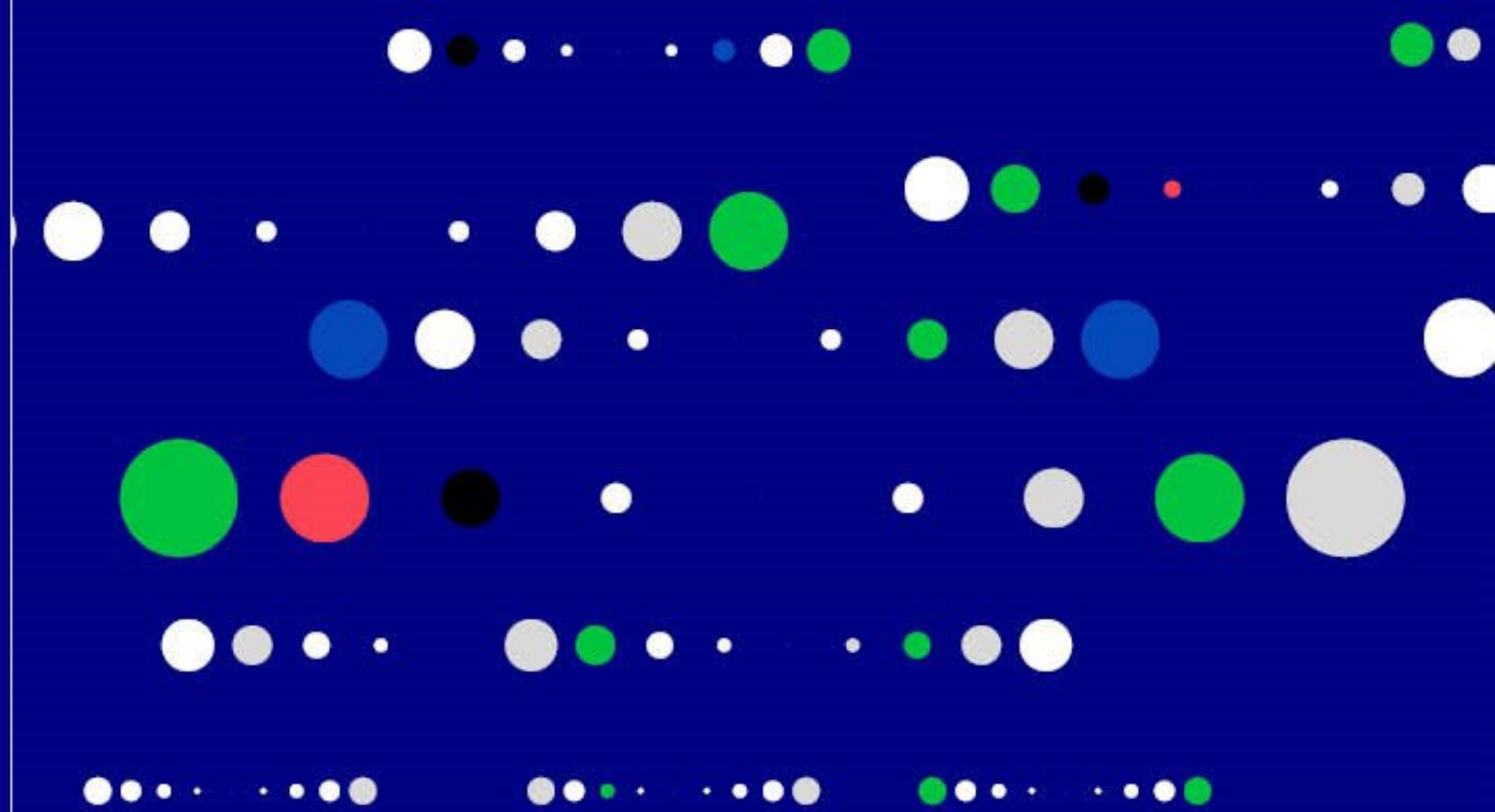

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Martin Barnasconi, NXP Semiconductors

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ITEA Smart Systems Engineering workshop

Contact details

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NXP Semiconductors
Technical Director
System Design & Verification Methodologies
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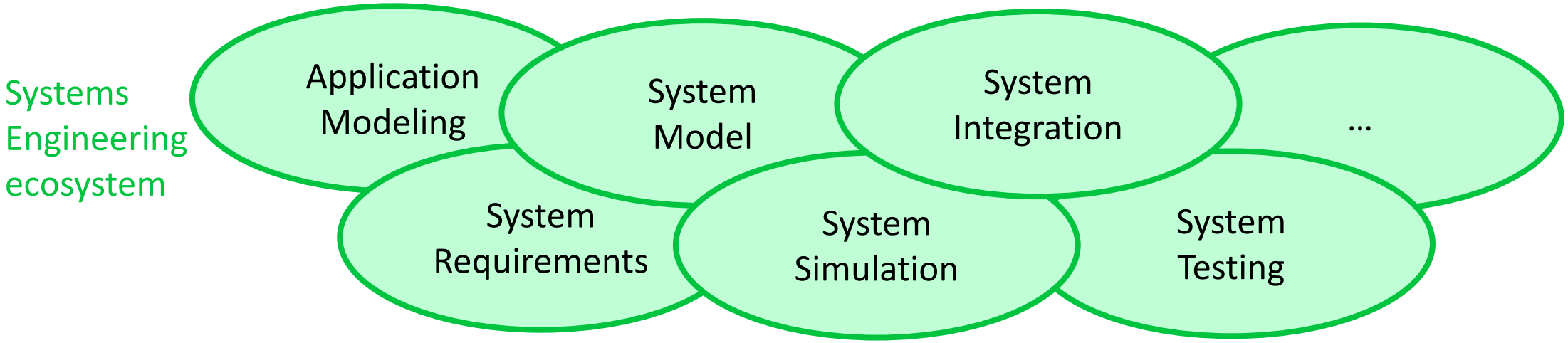
Background & Experience

Standardization
Key challenges

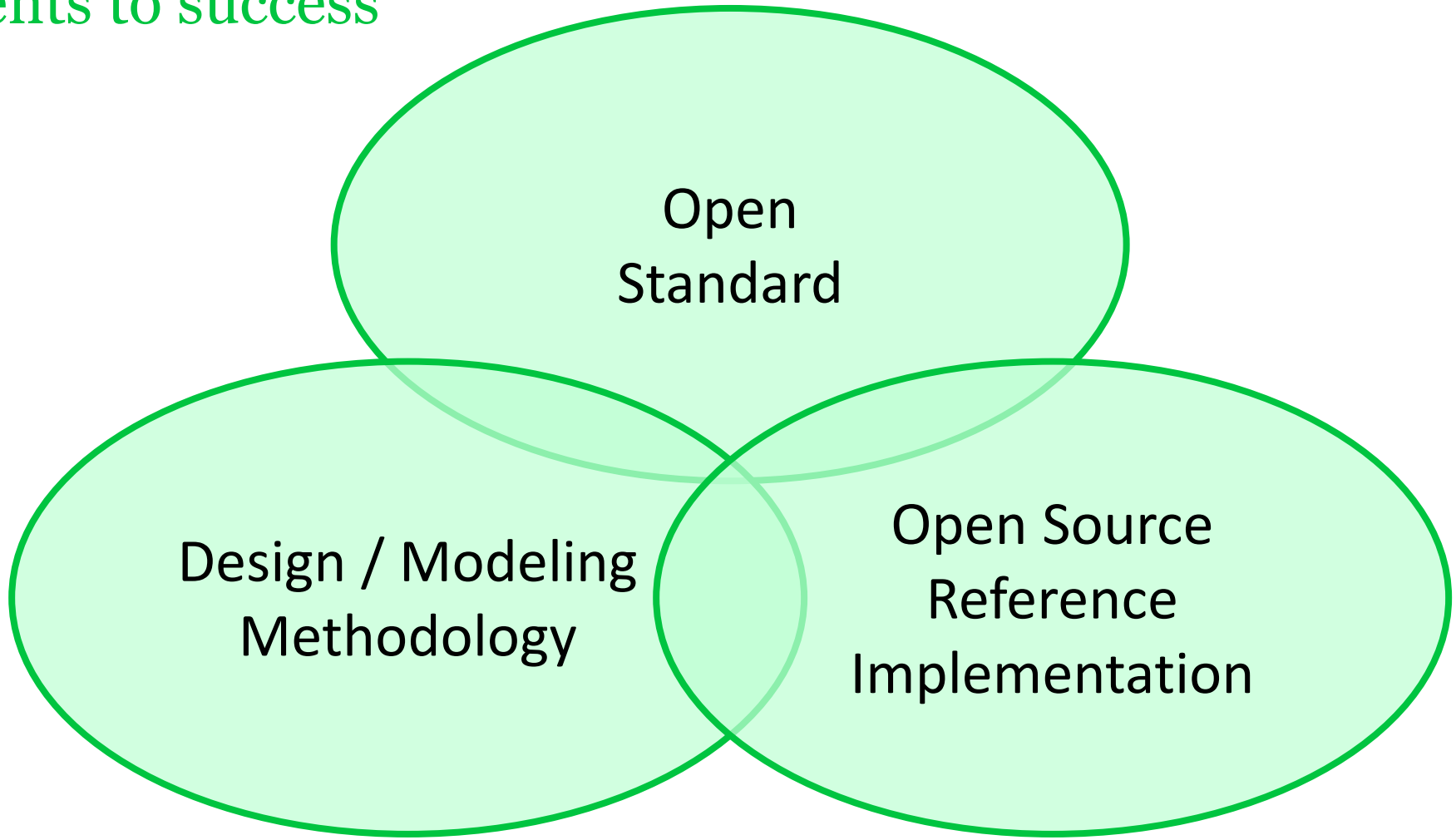
Use cases & Requirements → **What** to model → **How** to model → **How** to integrate all models



Standardization Objectives: Interoperability | Traceability | Communication | Quality | Safety & Security | Efficiency | …

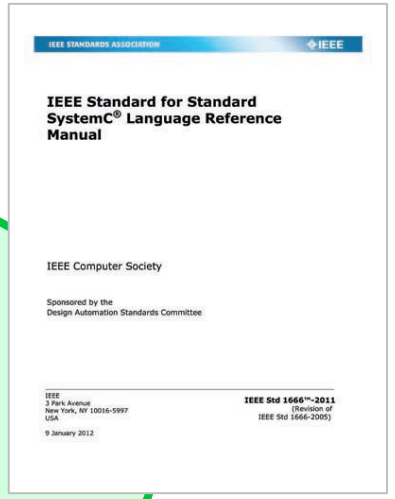
Standardization

Ingredients to success



Standardization

Ingredients to success

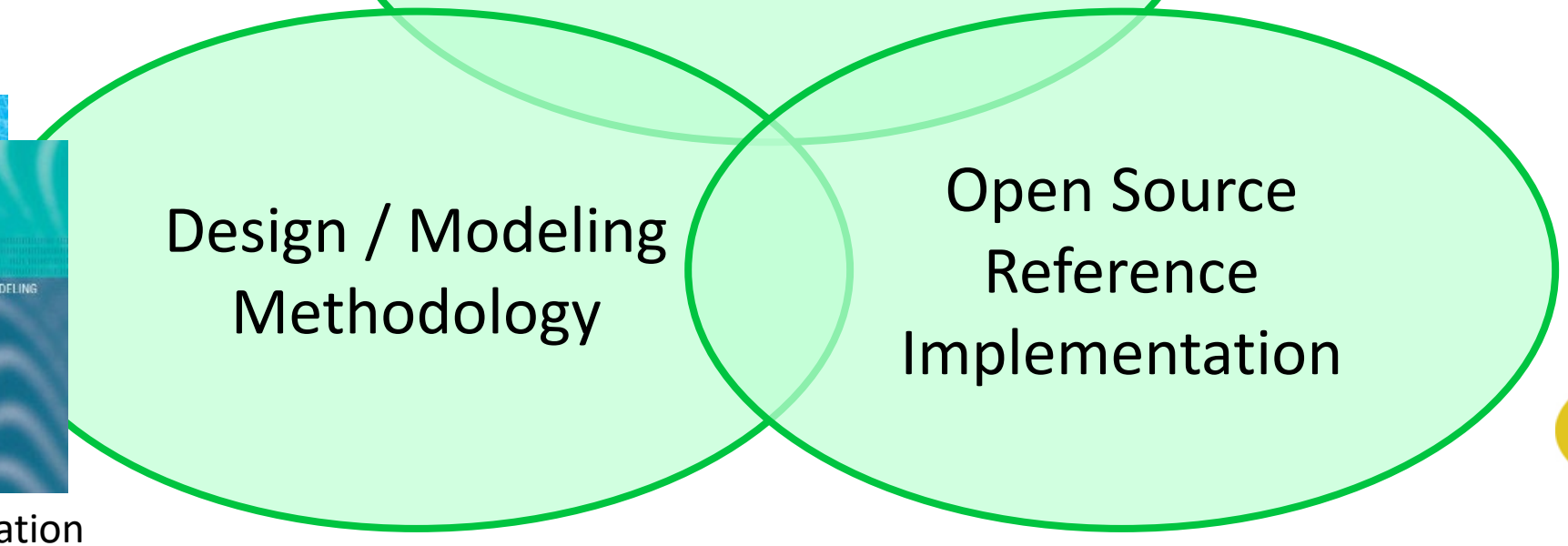


SystemC Standard Language Reference Manual
IEEE Std. 1666-2011

Example:

SYSTEMC™

Books & Education



GitHub

accellera SYSTEMS INITIATIVE

SystemC Community Portal systemc.org

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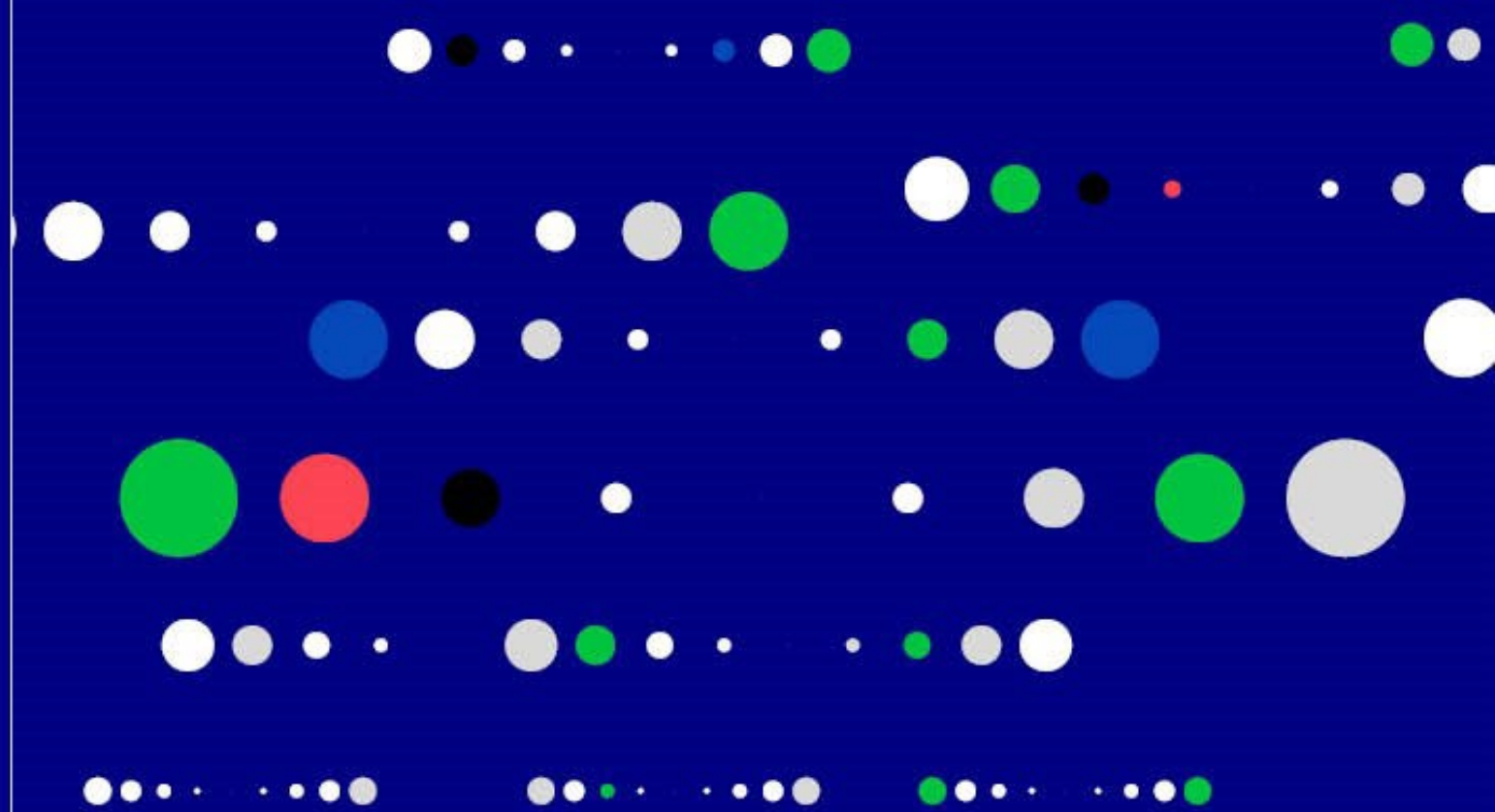

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Martin Benedikt, Virtual Vehicle Research GmbH

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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*

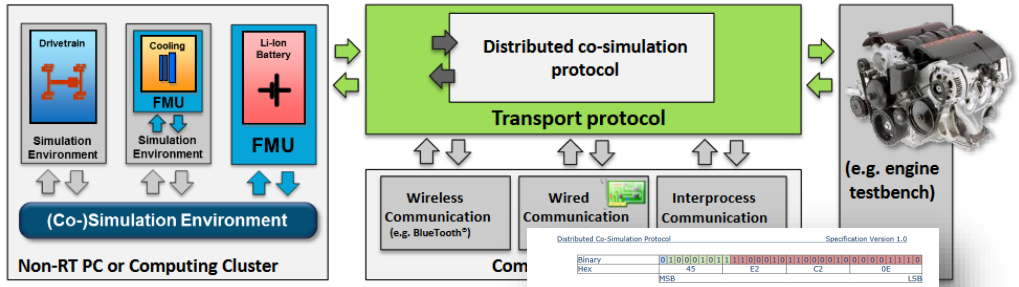
- ***Fields of activity,***
  - *2008: Invention of coupling-algorithms for co-simulation*
  - *2014: Team Leader "Co-Simulation & SW" (incl. SW Product Development)*
  - *2017: Thematic Area-Leader "Efficient Development"*

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

Introduction

Recent projects …

ACOSAR
ADVANCED CO-SIMULATION OPEN SYSTEM ARCHITECTURE

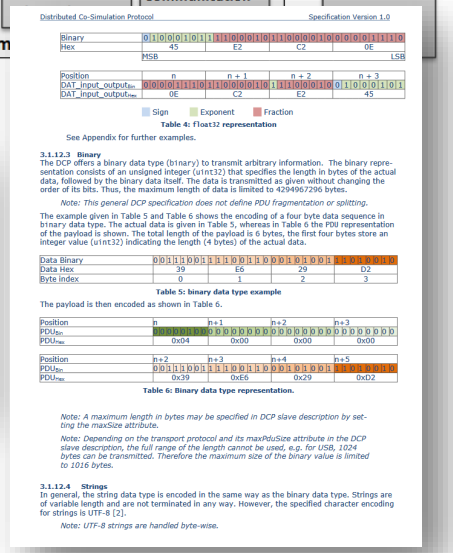


XSD

dcp Distributed Co-Simulation Protocol

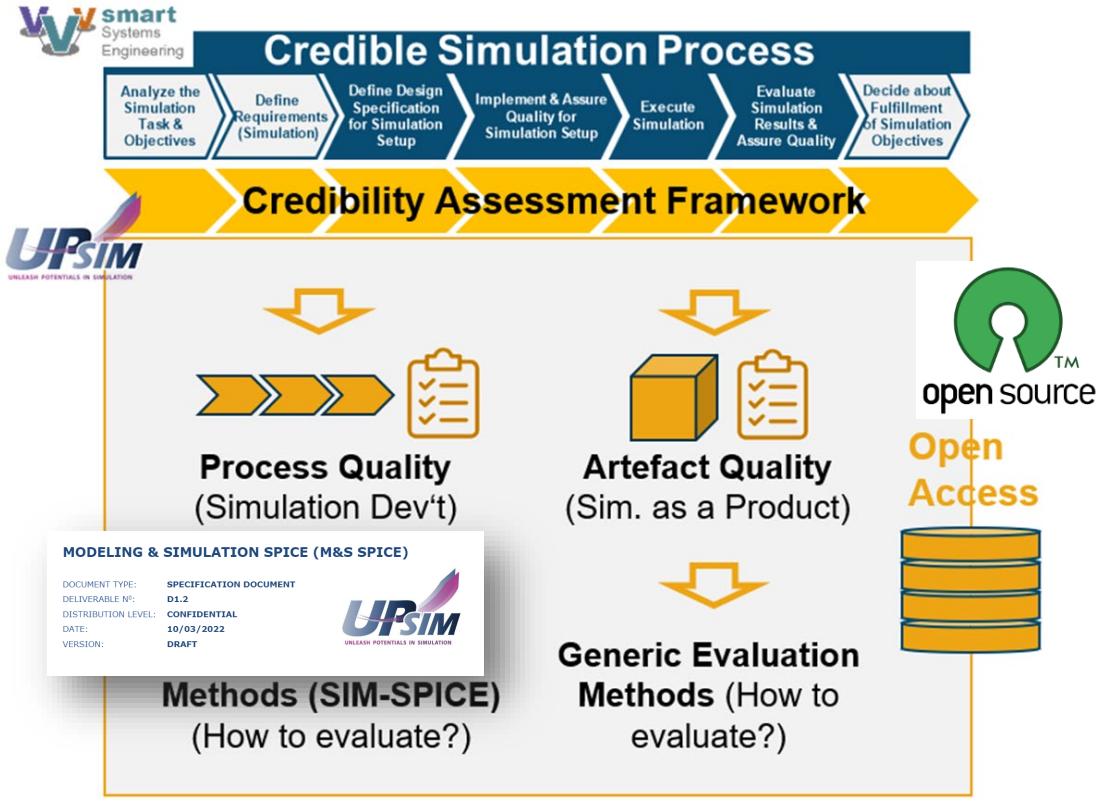
DISTRIBUTED CO-SIMULATION PROTOCOL (DCP)

DOCUMENT STATUS:	MODELICA ASSOCIATION STANDARD
DOCUMENT TYPE:	SPECIFICATION DOCUMENT
VERSION:	1.0.0
DATE:	MARCH 4, 2019



https://dcp-standard.org

UPSIM
UNLEASH POTENTIALS IN SIMULATION



www.upsim-project.eu

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Machine-X Digital Standards

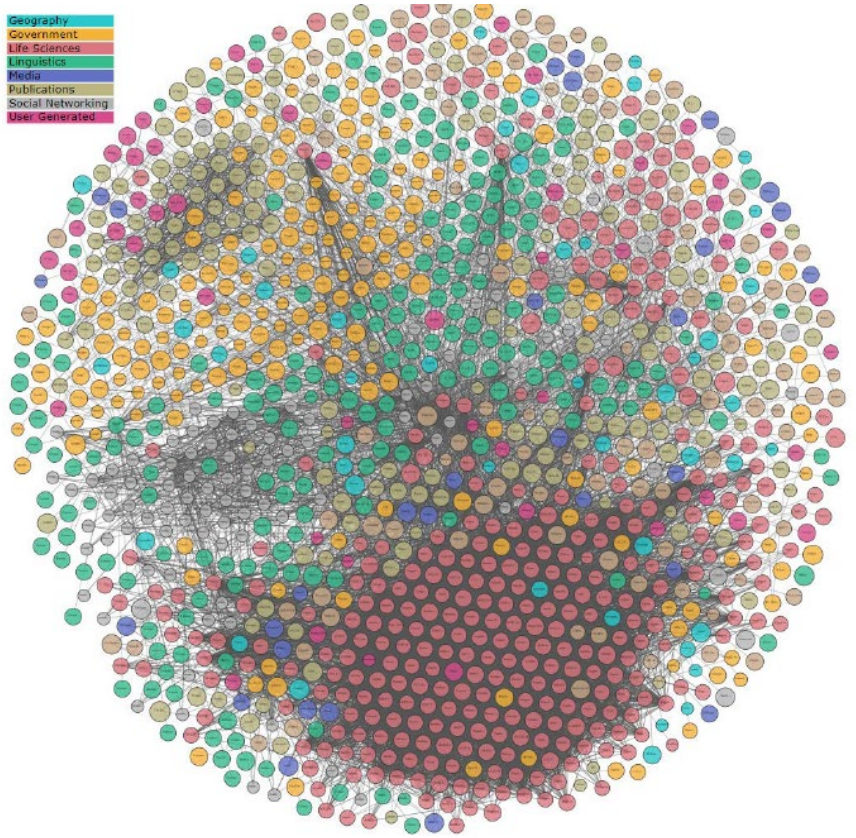
Status Quo and issues …

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

- *Complex Systems interact, evolve, communicate, adapte, 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.



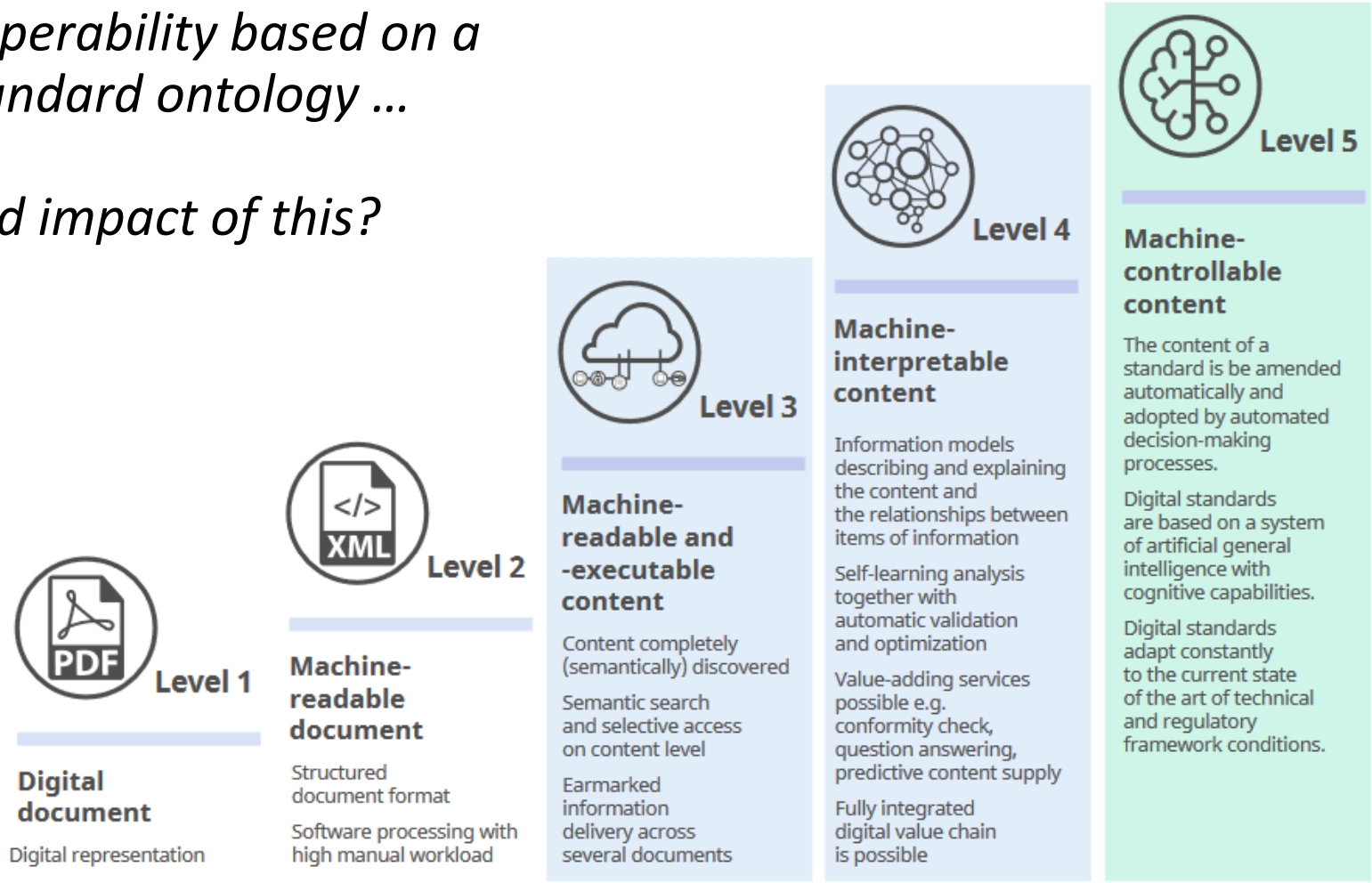
Source: Czarny D.; „Standards of the Future: How Digitalization Will Change the Rules"; Automotive Software Strategies, March, Munich 2020

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?*
- *…*



Source (DKE 2020):
https://www.dke.de/resource/blob/2076816/facc9bde1806e2194a3d26a60c79bf77/idis-whitepaper-en---download-data.pdf

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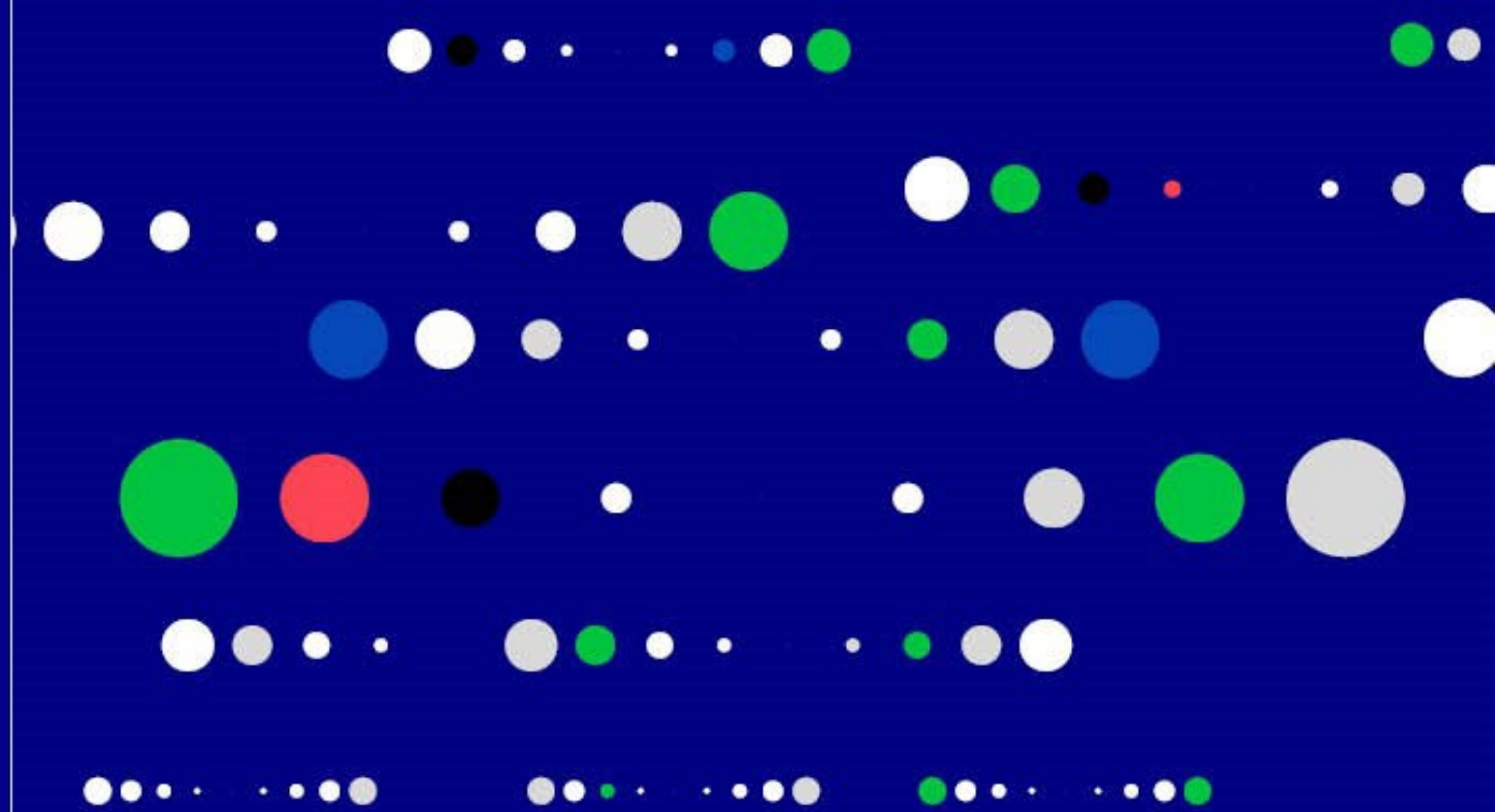

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