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Introduction to orchideo | easySSP

The way for Collaboration and Credibility in System Simulation

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WEBINAR PRESENTERS

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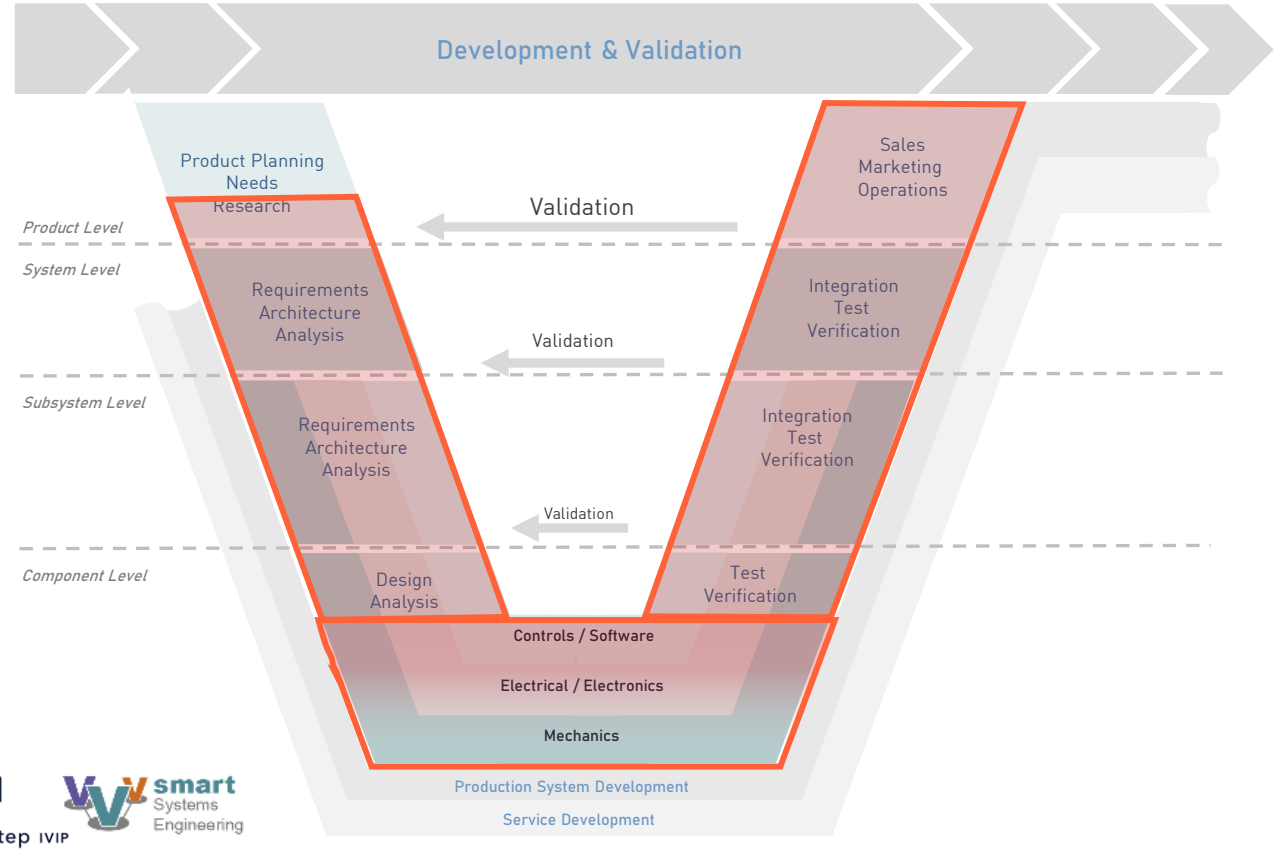
OVERVIEW

1. SSP & FMI in a Systems Engineering Context
   Where are they used, how do they fit with Systems Engineering
2. System Structure and Parameterization (SSP) Overview
   Overview and Basic Use Cases
3. SSP Traceability
   Supporting a Credible Simulation Process
4. easySSP Demo
   An Enabler for Collaborative System Design
5. Questions & Answers
   And some Resources to get started

USE OF MODELICA STANDARDS IN THE SYSTEMS ENGINEERING DESIGN-V



1. Modelica Language / Libraries, **Modelica**
2. Functional Mock-up Interface, **FMI**
   Layered Standards: **FMI**
3. System Structure and Parameterization **SSP**
   Layered Standard: SSP **Traceability**
4. FMI for embedded Systems **eFMI**
5. Distributed Cosimulation Protocol **DCP**

Collaborative Systems
Modeling and Simulation

A tool-independent modeling language: object-oriented, equation based, with a rich ecosystem of libraries, supported by simulation tools from most major vendors

A tool-independent API for exchange of transient simulation models: supported by > 230 simulation tools from major vendors, and open source. The de-facto standard for simulation interoperability and model exchange.

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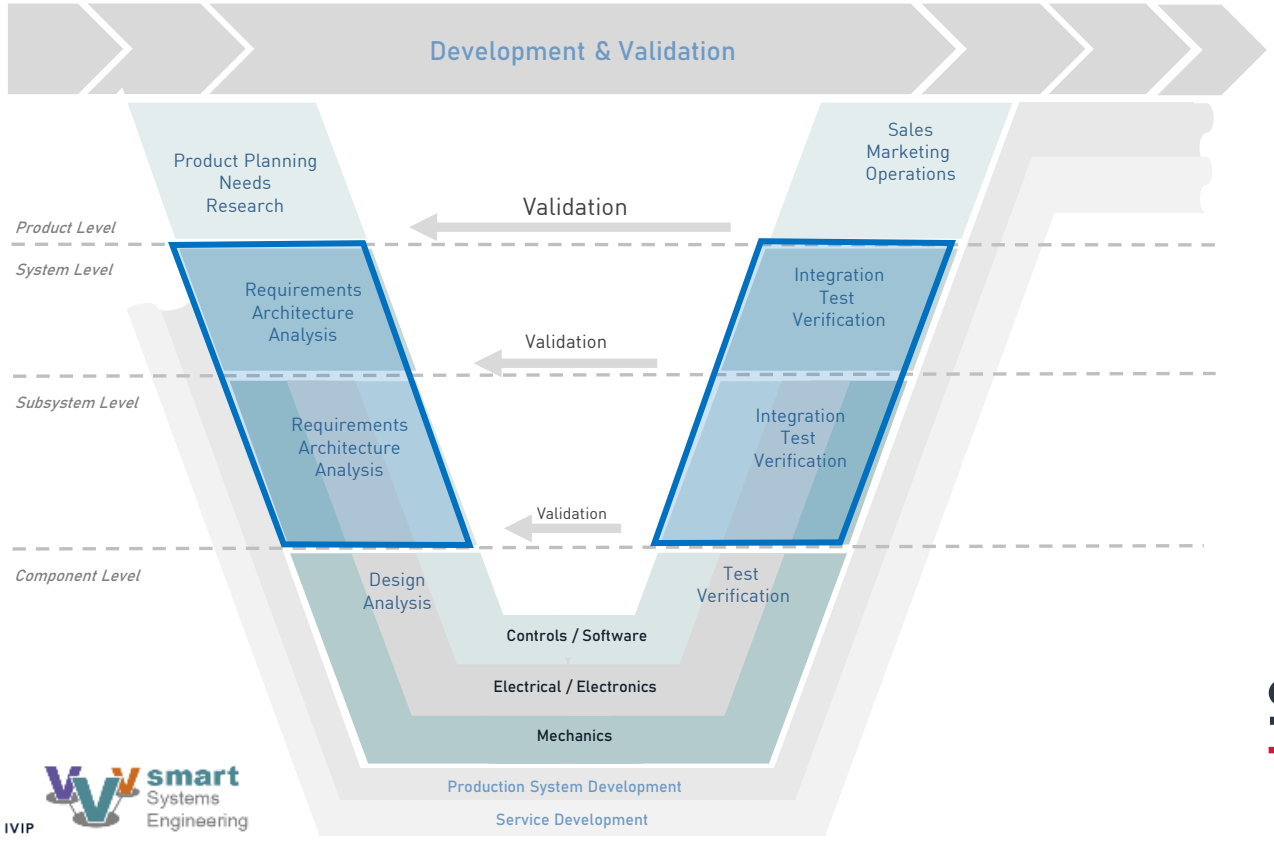

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Systems Architecture for Simulation, Integration & Verification
System Metadata
Credible Simulation Process

SSP System Structure & Parameterization

Container format for collaborative architecture design, simulation architecture definition, and system-level cosimulation

SSP Traceability

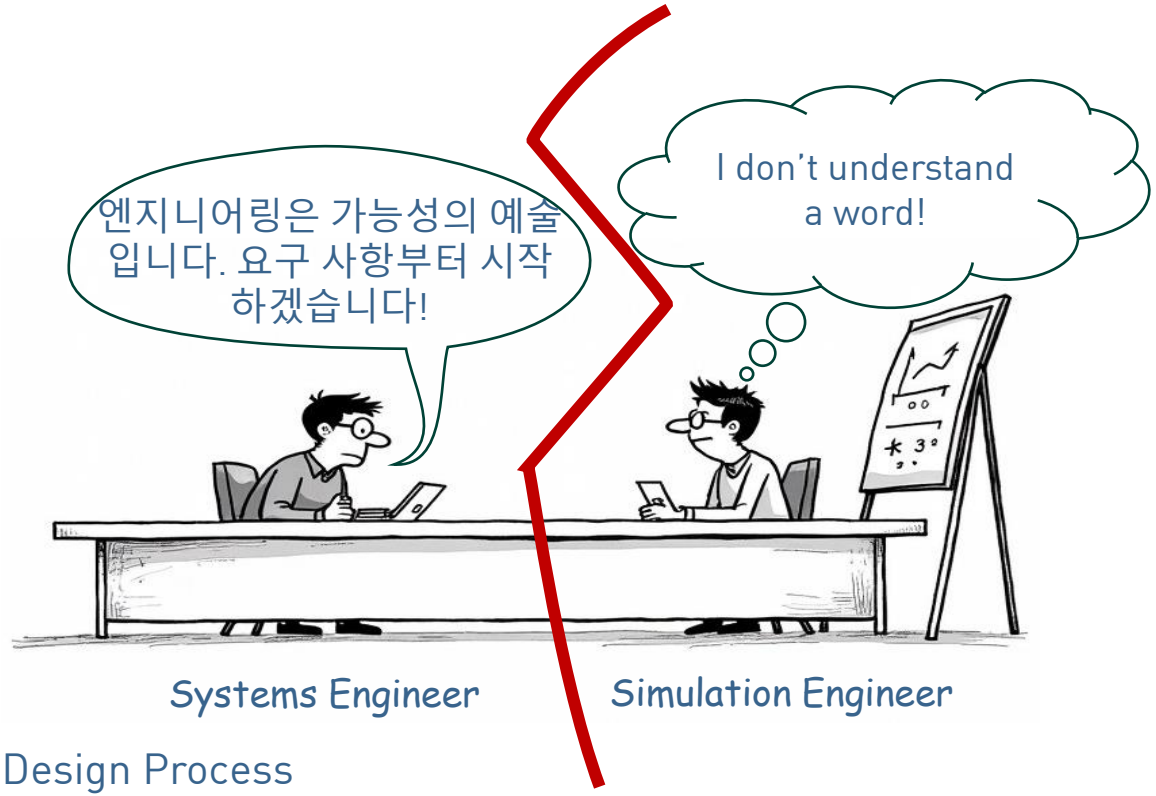
Simulation model and process Metadata to enable and document a credible simulation process

prostep ivip

smart Systems Engineering

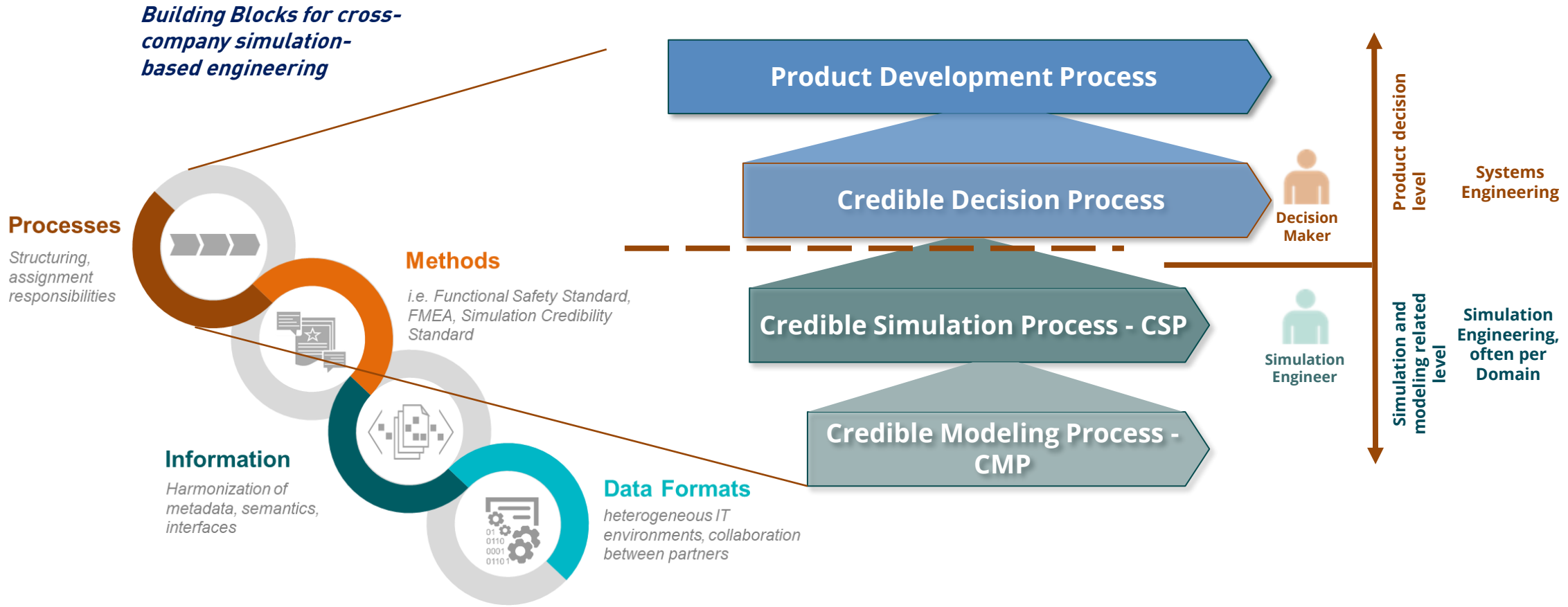
THE PROBLEM: SYSTEMS ENGINEERS AND SYSTEM SIMULATION ENGINEERS LIVE IN DIFFERENT WORLDS

- Tools:
  - Systems Engineering,
  - SysML
- Focus:
  - Process
  - Traceable decisions
  - Integration into Product Design Process
  - Documentation



- Tools:
  - Simulation
  - Scripting, Automation
- Focus:
  - Simulation correctness
  - Analysis

PROSTEP SMART SYSTEMS ENGINEERING (SMARTSE) SCOPE, BUILDING BLOCKS AND FOCUS OF WORK



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Standards

SSP System Structure & Parameterization

SSP Layered Standard Traceability

fmi Functional Mockup Interface

Collaboration & Credibility for Simulation Processes

based on Open Standards

Organisations

Modelica Association

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OpenSCALING

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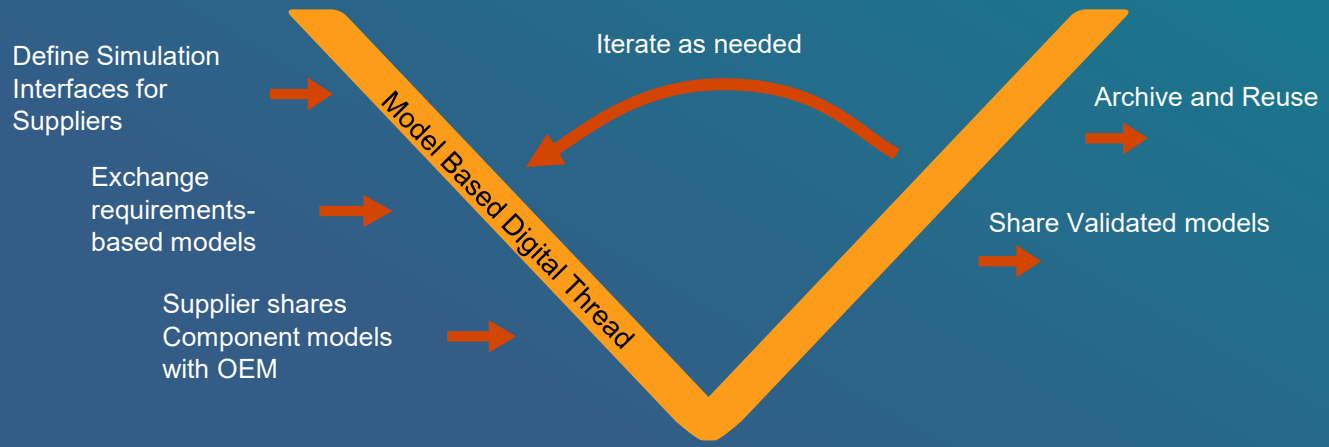
System Structure
& Parameterization

COLLABORATIVE USE CASES
SSP-based collaboration

Define Interfaces early in design for multiple parties contributing to a common system simulation model.

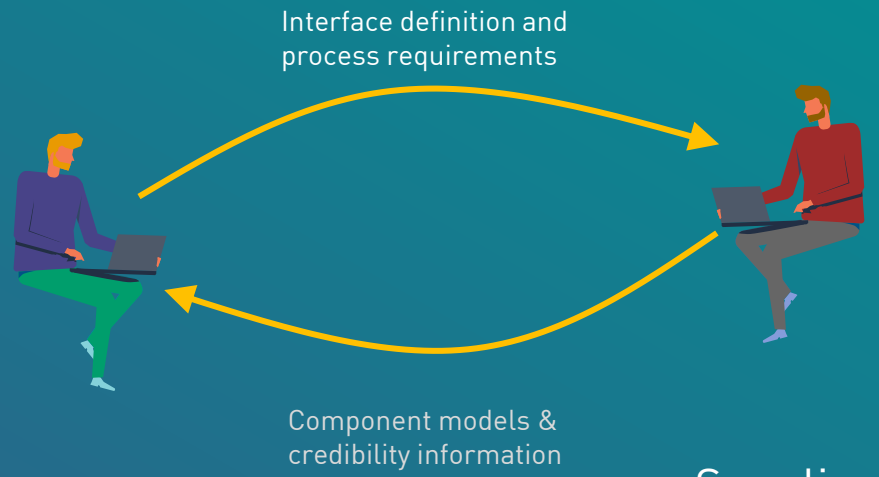
Define and communicate process requirements between departments and companies, especially about simulation credibility



Share simulation models and artifacts in a tool independent way, connecting models from a large variety of FMI-compatible tools.

Archive and reuse models across product generations

Share models & simulation results with regulators

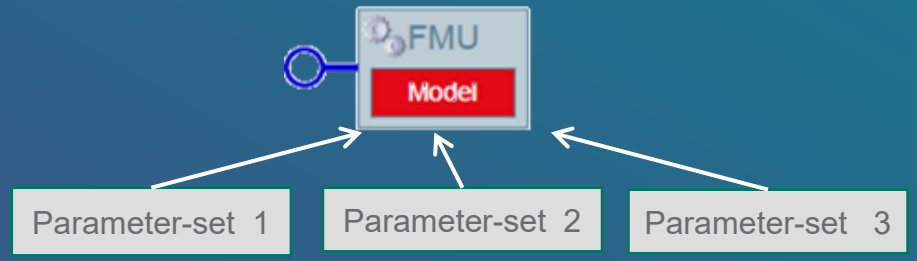


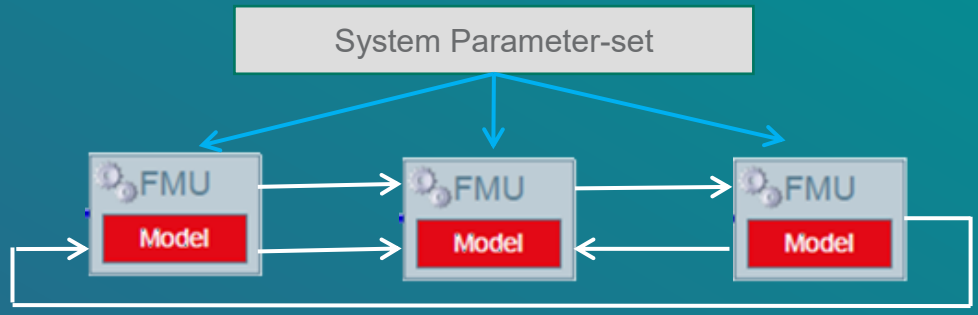
OEM or coordinating department

Supplier or internal collaborators

HIGH-LEVEL USE CASES
Parametrization

1. FMUs need tool independent parameterization
2. Applicable throughout the development cycle
3. One FMU can use several standardized parameter sets
4. System-level parameters set must be consistent across several FMUs





Native Simulation | Software / SIL | Hardware in the Loop (HiL) | ECU, Application

Seamless parameterization from offline-models, HiL-applications, ECU-application

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A PROCESS PERSPECTIVE

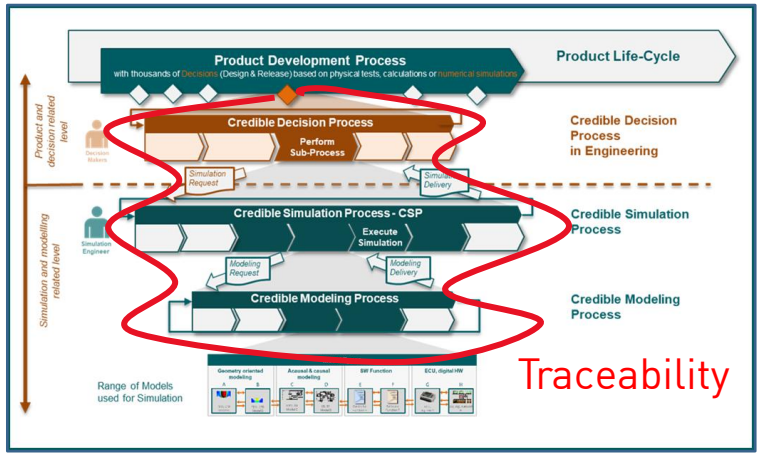
Traceability

SSP TRACEABILITY FOR COLLABORATIVE WORKFLOWS

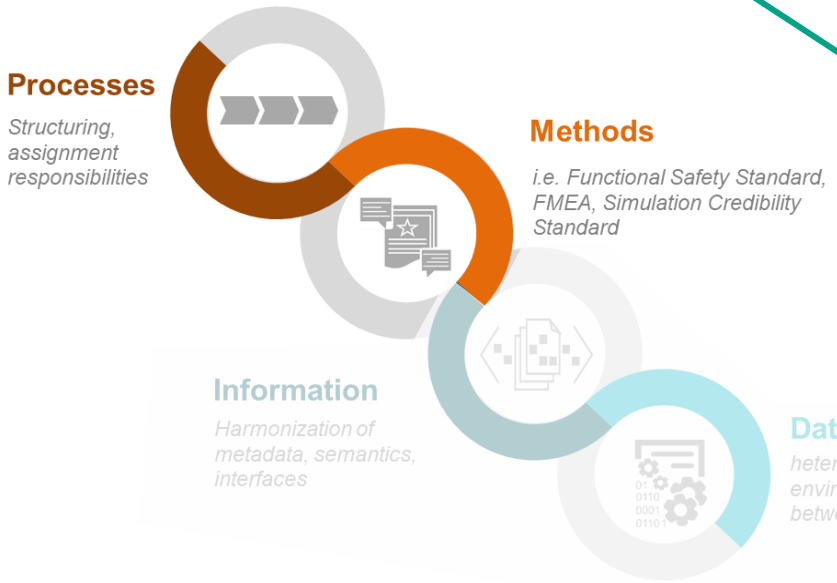
Credibility and Traceability of Simulation as an Enabler for Virtualization

Credibility has two main aspects

Process aspects: Clear Responsibilities and Traceability



Credible Simulation Process Framework

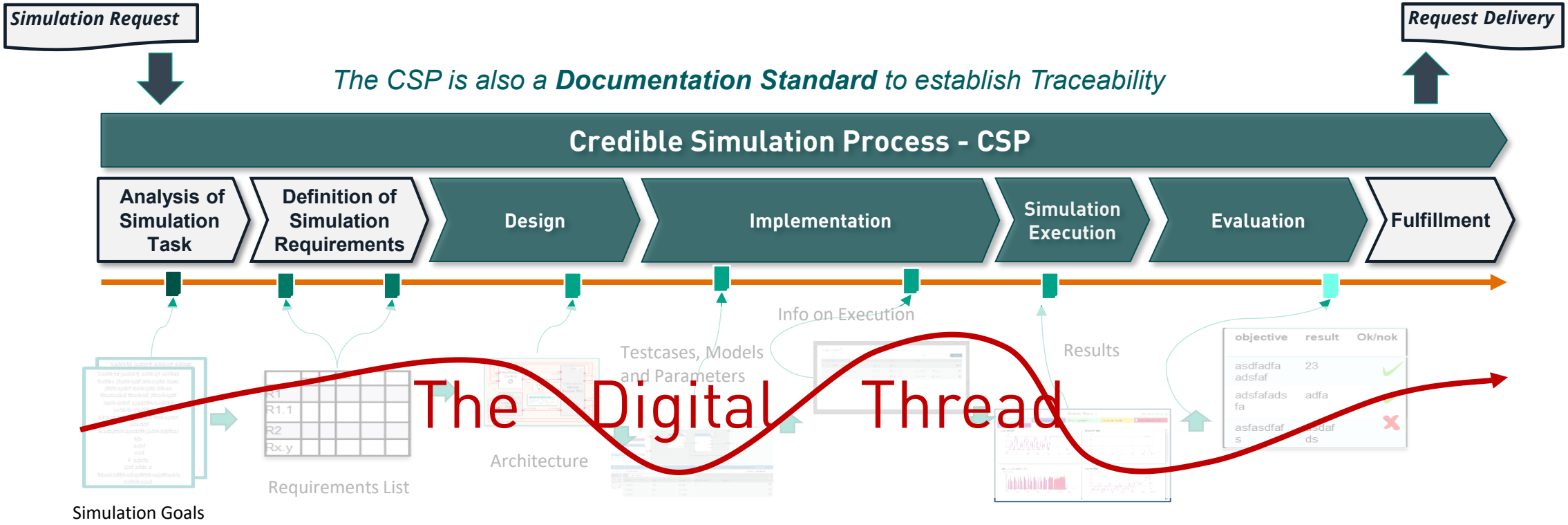


Credibility methods for evidence: focus on model credibility

i.e. simulation credibility methods & assessment

SSP TRACEABILITY FOR COLLABORATIVE WORKFLOWS

Credibility and Traceability of Simulation as an Enabler for Virtualization
The "DIGITAL THREAD"



Traceability requires documentation structure adapted to the process (logically, not in terms of time) with clear interfaces

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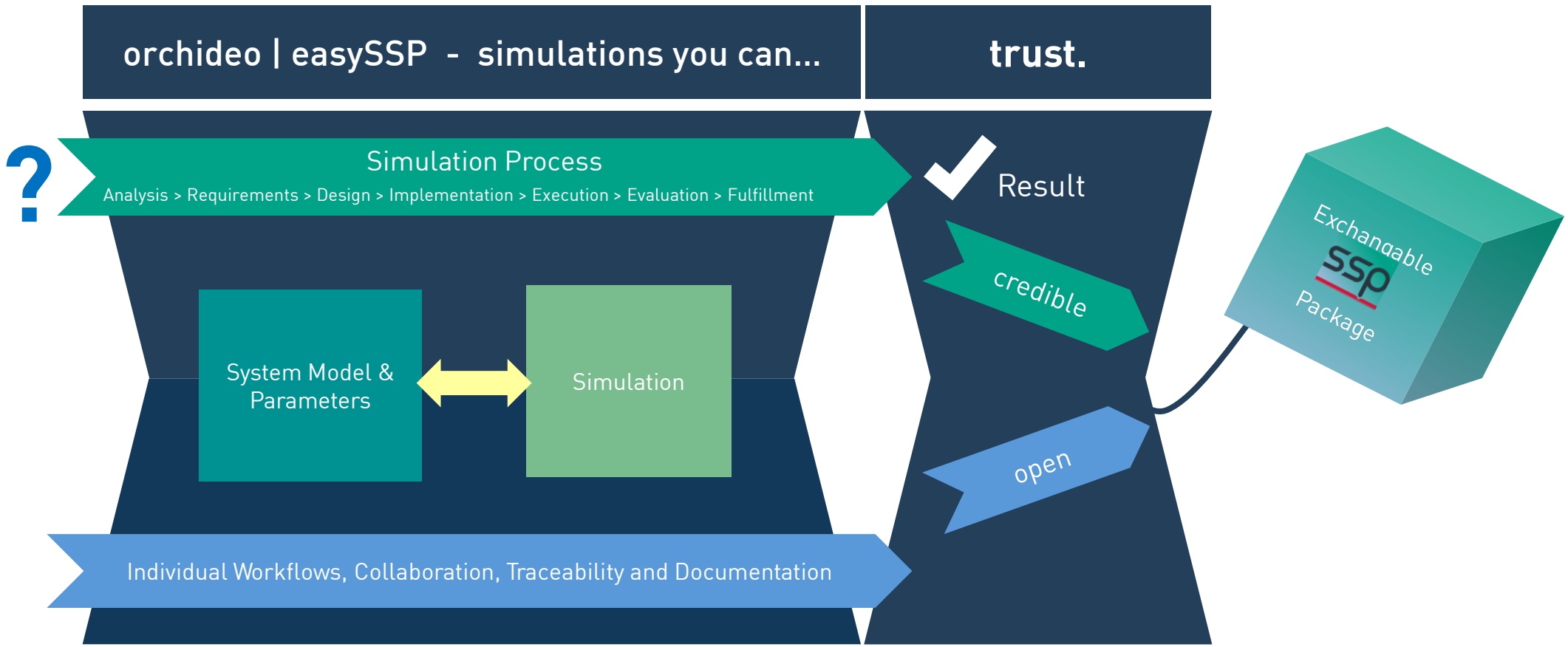
Your tool to support Collaborative and Credible Simulation - throughout the entire process



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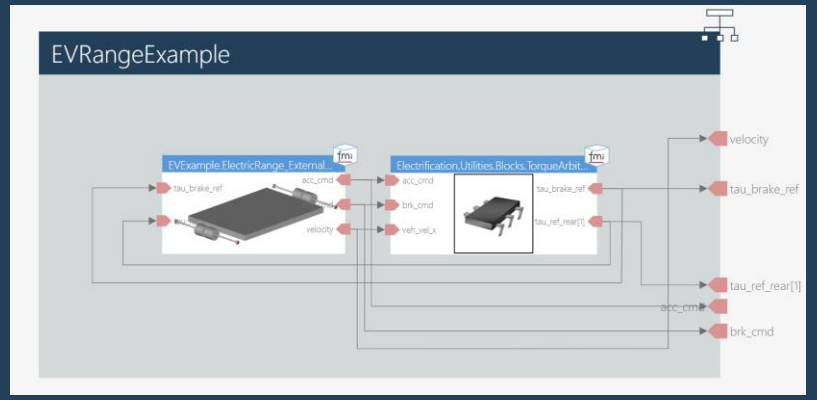
Background Reading Material

SSP IN A NUTSHELL

Collaboration is key - Design, exchange and simulate System Structures and their Parametrization

SSP by Modelica Association

- **is a standardized data format**
- **describes hierarchical system architecture**
  - including components and their connectivity (e.g. FMI- or Modelica based)
  - including different parameterizations and variants
  - including data buses and binary data streams such as video and other complex sensor data
- **is used to model, parameterize, and exchange complex simulateable systems**



Screenshot easySSP

SSP by Modelica Association

- **enables:**
  - contract based system- and component design by an interface first approach
  - collaboration and enforces interface compatibility for system structure- and component modelling
  - sharing simulation models and artifacts in a tool independent way, e.g. connecting models from a large variety of FMI-compatible tools
- **helps** reducing integration efforts, speeds up your processes & safes time and money

SSP TRACEABILITY IN A NUTSHELL

Credibility is goal - by providing standardized Documentation and Meta Data along the entire Process

SSP Traceability, a layered Standard on SSP by Modelica Association

- **builds a Chain of Trust for Confident Simulation-Based Decision Making**

  strengthens product decisions with verifiable simulations by establishing a digital thread of simulation-based evidence linking simulation processes to product requirements and KPIs

- **enables open, Flexible & Scalable Credible Simulations**

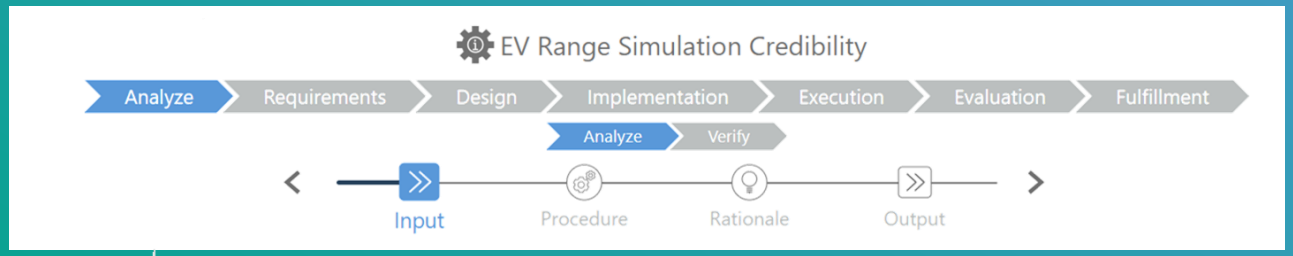
  enables credible simulations by documenting the relevant simulation process aspects in a traceable, consistent and standardized format that you can tailor and scale to your credibility needs

- **provides Flexible and Standardized Metadata Exchange**

  the built in Simulation Resource Meta Data (SRMD) format ensures a well structured, flexible and efficient way to collect and share simulation metadata across the development lifecycle

- **facilitates Model Reuse and Continuous Improvement**

  the well documented SSP Traceability simulation resources facilitate the reliable reuse of existing simulations and models and the continuous improvement of simulation best practices, processes and resulting artefacts



FURTHER RESOURCES AND LINKS

easySSP Website: www.easy-ssp.com

EasySSP python packages are available on PyPi and open source on GitHub

PyPi: https://pypi.org/search/?q=easySSP

GitHub: https://github.com/search?q=org%3Aexxcellent+easyssp&type=repositories

Demo video: https://www.youtube.com/watch?v=WfdKhjZi-IU

Installation via pip, e.g.: `pip install easyssp-import-export-client`

FURTHER RESOURCES AND LINKS

easySSP in the INCOSE SE LAB:

https://www.incose.org/inet/discover-community-initiatives/incose-se-laboratory/exxcellent-solutions---orchideo-easyssp

Links to SSP and SSP-Traceability Standard, homepage and standards

Standard homepage: https://ssp-standard.org/

SSP Standard online specification: https://ssp-standard.org/docs/2.0/

SSP Traceability online draft specification: https://modelica.github.io/ssp-ls-traceability/master/

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for simulations you can trust

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