

SET Level Mid-term Event Credible Simulation Process

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29.04.2021

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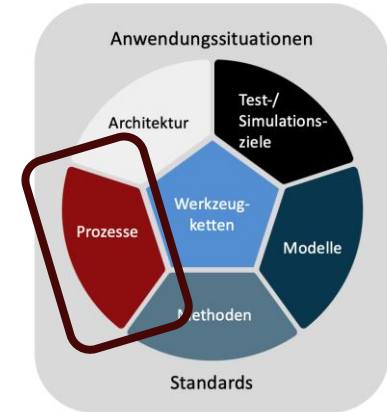
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SET Level – Processes

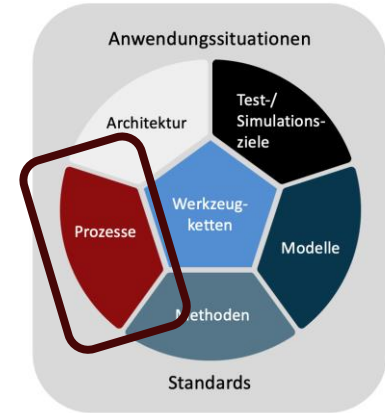
Agenda

- Challenges
- Overview Credible Simulation Process (CSP)
- Using CSP in SET Level Project
- Collaboration Process with Partners
- Consistency of Process and Data
- Metadata Support
- Tool Support
- Summary



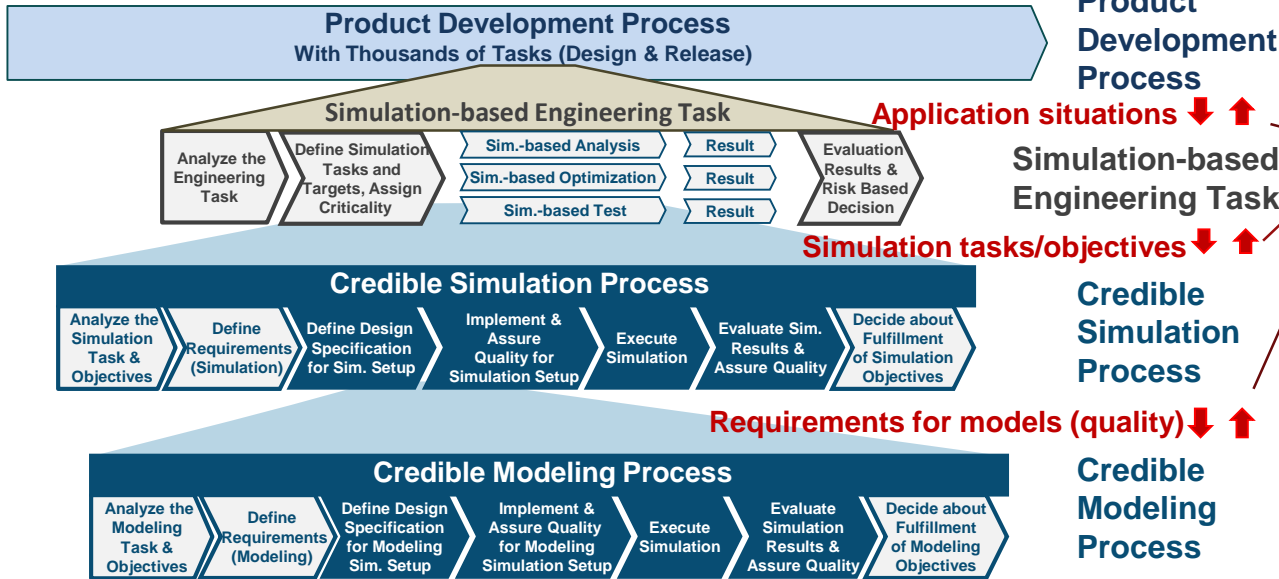
Challenges

- **Trends in the industry**
 - Digitalization and virtualization in product development and therefore virtualized validation and release are on the rise
 - This means that more decisions are made on the basis of simulation results
- **We therefore need simulation processes**
 - That can be integrated into company processes
 - That support collaborative development with partners
- **Efficient implementation and application will be the key to success**
 - Support through standardized data structures



Overview Credible Simulation Process (CSP)

Usage of Simulation for Development & Release



- Process hierarchy with clear information structuring
- Integration into “Big Picture SET Level”
- Sub-processes can be integrated into specific company processes

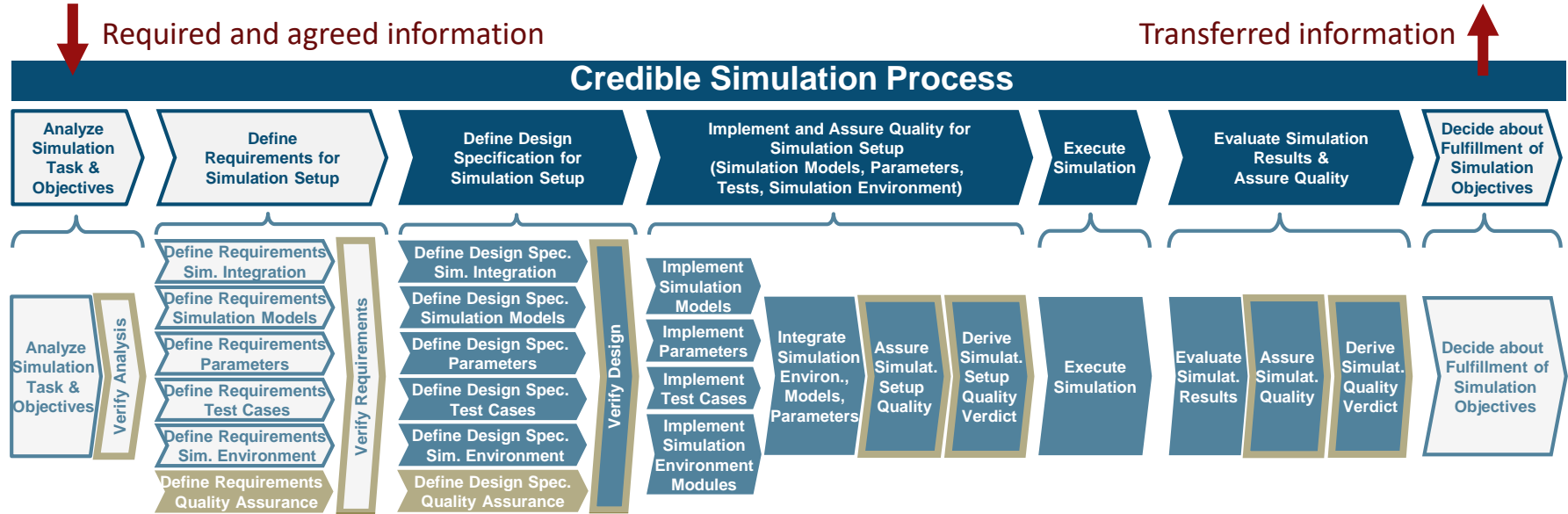
This information is needed for the proof and documentation of quality for a decision based on a simulation result

The CSP shown here is based on the preliminary work of the prostep SmartSE Project



Overview Credible Simulation Process (CSP)

Process Hierarchy, Information Structuring



Traceability and comprehensibility

- Clear information structuring
 - Which information is required and transferred
 - Documentation schema

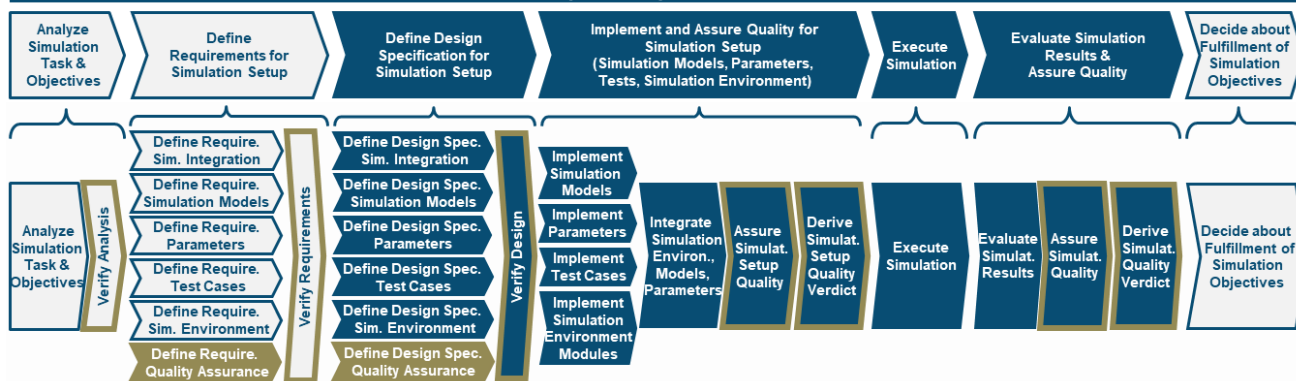
Framework for methods

- What does methods i.e. verification need as input, what is output

Using CSP in SET Level Project

Application of CSP in the Simulation Use Cases

Simulation Use Case 1 (SUC1) Credible Simulation Process



📄 README.md

Simulation Use Case 1 - Milestone 2

Documentation

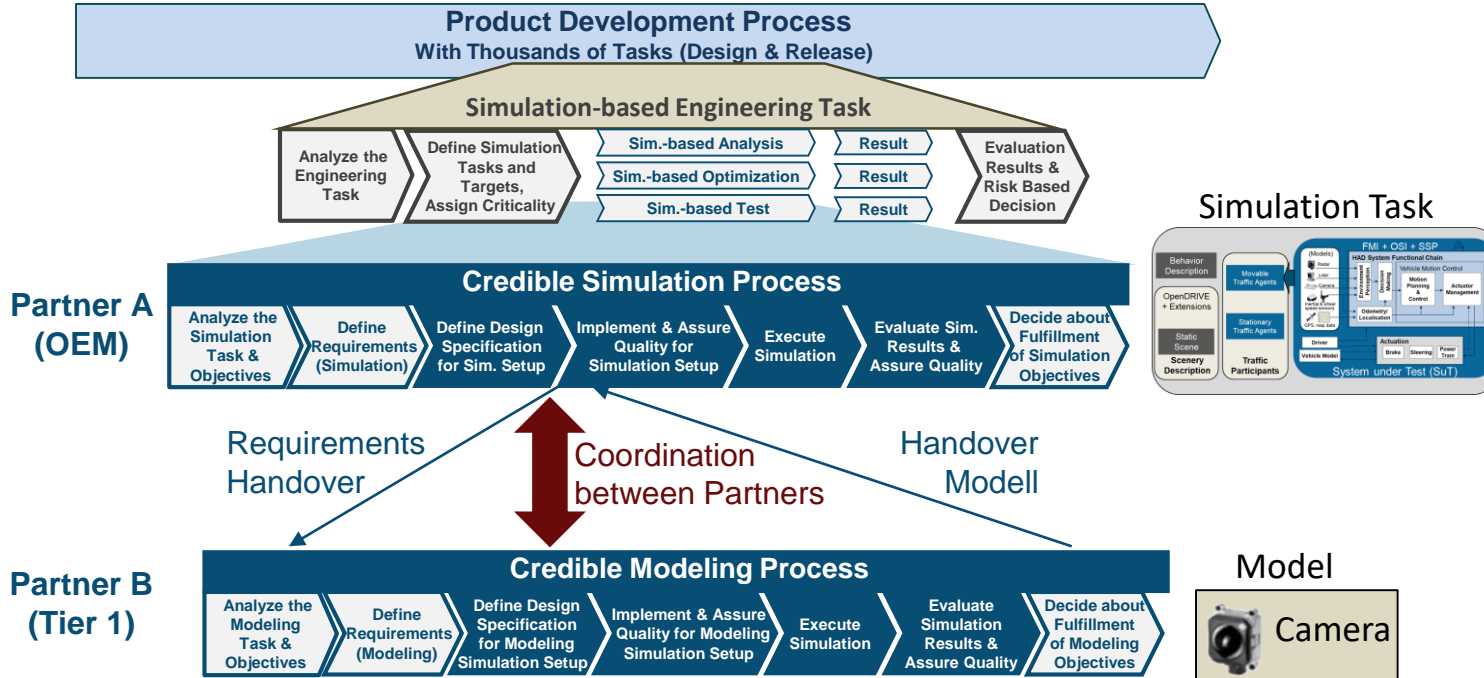
This folder contains the documentation of the work done for Milestone 2 here. The documentation is divided in 7 separate markdown files covering each phase and having distinct inputs and outputs:

- Phase 1: Analyze Simulation Task & Objectives**
- Phase 2: Define Requirements for Simulation Setup**
- Phase 3: Define Design Specification for Simulation Setup**
- Phase 4: Implement and Assure Quality for Simulation Setup**
- Phase 5: Execute Simulation**
- Phase 6: Evaluate Simulation Results & Assure Quality**
- Phase 7: Decide about Fulfillment of Simulation Objectives**

Positive feedback:

- Very good support for coordination and agreement for distributed development and heterogeneous teams

Collaboration Process with Partners



- Basic structure of processes agreed
- Currently PoC of Cooperation Process for Simulation in industry workshops

Collaboration Process with Partners

Agreement & Development

General

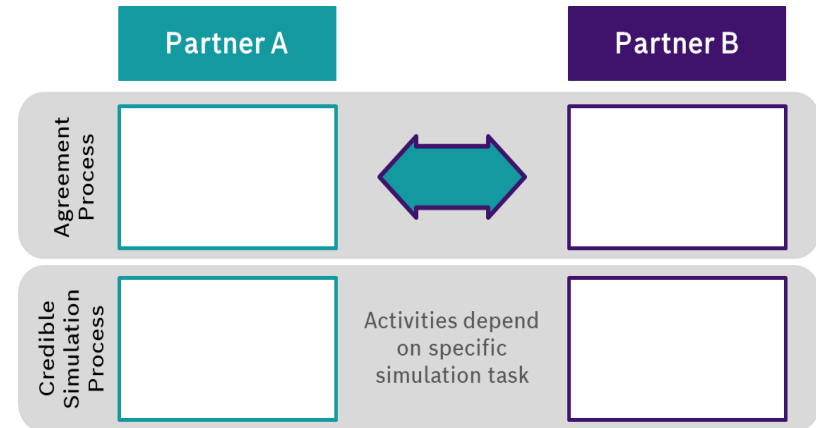
- A cooperation process is always composed of an agreement process and the actual development process
- In the case of simulation aspects, this agreement process is usually covered by the higher-level product development agreement
 - Often, however, the simulation-specific aspects are not fully clarified in the agreement process

Focus of the agreement process

- Clarification and definition of the technical and contractual boundary conditions for a simulation and modeling project between partners

Focus of the simulation and modeling process

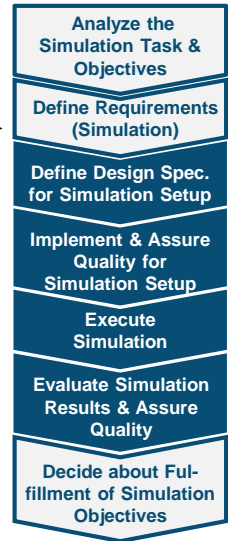
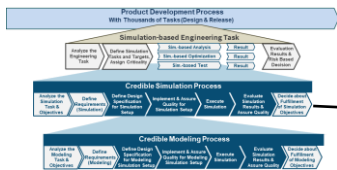
- (Joint) specification, design, implementation of the simulation task



Consistency of Process and Data

Traceability and Proof of Quality of Simulation Tasks

Process Chain

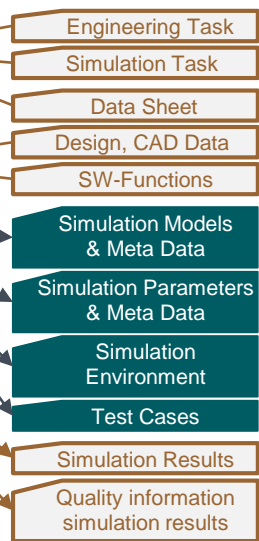


Consistent process framework

Information Chain



Linked Information



Development Data

Product Data

Simulation Task Data

Simulation Result Data

Mapping, Consistency of Information

XML Glue Particle Schema
Simulation Task Meta Data (STMD)
For connecting (Gluing) relevant information/data elements

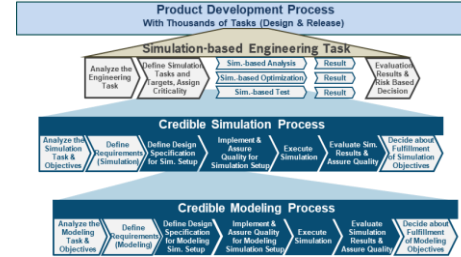
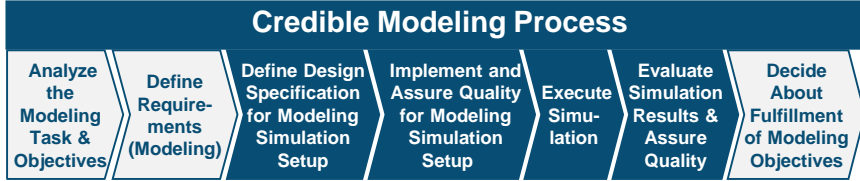
Glue Particle Approach

- Consistency of process structure and data structure
- Prerequisite for tool supported traceability

Metadata Support

Credible Modeling Process & Model Documentation

← Traceability



↑ semantic unique
Meta Data increasing

Documentation, sources for model developers

Documentation, sources for model users

Reduction of information ↓

Brief information, description Model

i.e. MIC, SMMD



i.e. SRMD



↑ Traceability

Documentation and Traceability

- Basis is the information created in the CSP, CMP. The documentations and records should be derived from it (Single Source of Information)

Tool Support: Traceability, Search, Reuse

- According to the XML Glue Particle Schema for the Credible Modeling Process, a consistent XML schema for Simulation Resource Meta Data (SRMD) was created for this purpose
- Details for prototype Tooling → Tracy

Tool Support TRACY

Credible Simulation Process



SET Level



```
OsiPedestrian_Metadata.srmd 3.92 KB
Edit Web IDE Replace Delete
1 <?xml version="1.0" encoding="UTF-8"?>
2 <srmd:SimulationResourceMetaData xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3   xsi:schemaLocation="http://apps.pmsf.net/STMD/SimulationResourceMetaData SRMD.xsd"
4   xmlns:srmd="http://apps.pmsf.net/STMD/SimulationResourceMetaData"
5   version="0.5" name="Sensor Model XXX Meta-Data">
6   <srmd:Classification type="de.s14to5.srmd.model-meta-data">
7     <!-- Sensor related information -->
8     <srmd:ClassificationEntry keyword="model.type">Pedestrian Model</srmd:ClassificationEntry>
9     <srmd:ClassificationEntry keyword="sensor.manufacturer"></srmd:ClassificationEntry>
10    <srmd:ClassificationEntry keyword="sensor.family"></srmd:ClassificationEntry>
11    <srmd:ClassificationEntry keyword="sensor.name"></srmd:ClassificationEntry>
12    <srmd:ClassificationEntry keyword="sensor.version"></srmd:ClassificationEntry>
13    <srmd:ClassificationEntry keyword="sensor.manufacturer.partnumber"></srmd:ClassificationEntry>
14    <srmd:ClassificationEntry keyword="sensor.type"></srmd:ClassificationEntry>
15    <srmd:ClassificationEntry keyword="sensor.technology"></srmd:ClassificationEntry>
16    <srmd:ClassificationEntry keyword="sensor.technology.variant"></srmd:ClassificationEntry>
17    <!-- Model related information -->
18    <srmd:ClassificationEntry keyword="model.manufacturer">BMW AG</srmd:ClassificationEntry>
19    <srmd:ClassificationEntry keyword="model.family"></srmd:ClassificationEntry>
```

Jane P. Miller PR-CRIT-MS2

REQUEST WORK

DELETE

Derive Simulation Setup Quality Verdict

- Execution Phase
- Evaluation Phase
- Fulfillment Phase

Graph

Milestones

Add new Milestone

Outputs

Add new entry with

| Title | Qualifier |
|---------------|-----------|
| OsiPedestrian | model |

Rationale:

Source Repository: GitLab SET-Level START SELECTION UPDATE RESOURCE

Name: OsiPedestrian_Metadata.srmd

Download link: Download

Show link: Show in Source System

| Attribute | Value | Type |
|-----------------------------|---|-----------|
| commitMessage | Update OsiPedestrian_Metadata.srmd | text |
| model.type | Pedestrian Model | srmd-text |
| model.implementation.format | OSMP 1.0 and FMI 2.0 | srmd-text |
| model.name | OsiPedestrian | srmd-text |
| model.verification.report | Link to sensor model verification report, if any exists | srmd-text |

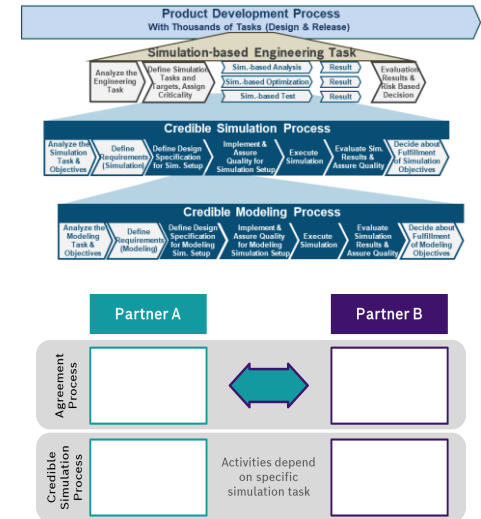
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1 2 3 4 5 5 EDIT

SET Level – Processes

Summary

- We need the use of simulation for the development and release of automated driving functions
- With the Credible Simulation Process, we have a process framework
 - That supports the necessary traceability of simulation tasks
 - That can be integrated into company processes
 - That supports collaborative development with partners



Status

- Credible Simulation Process 1.0 will publicly available begin of May 2021
- Credible Modeling Process 1.0 will be publicly available end of May 2021
- According XML data structures for tool support is already publicly available ([Link](#))