



**DLR**

**RATIO-SIM Position**

# Input to the Ratio-Sim Activity

Simulation and Software Technology

Andreas Gerndt and Philipp M. Fischer



Knowledge for Tomorrow



# Hypothesis and Current State

1. Not Yet Another Standard: We have developed enough relevant standards along the last years. They address all major points of systems engineering and v&v by simulation. But it should be considered that things evolved over the past years.
2. Complexity of Existing Standards is too High: We want to enable exchange and reuse of simulation components by agreements such as SMP, to increase resource efficiency and reduce costs. Contrary, these standards are very complex and difficult to apply, hence upfront investment/training is far too high.
3. We have to Answer the What: So far the standards tell us how to v&v the things, but there is a gap in telling what we have to v&v, even though we know exactly what we build by our system models. Different simulators on same question are still different!
4. No One Simulator for All: Our primes usually have their simulators and processes running. From our POV they need to be in full control of their implementation to adjust it to their individual business needs. Same do we as DLR to be able to commit our research on the whole lifecycle of a spacecraft and all processes including the simulators. One Simulator seems counterproductive to business efficiency
5. Non-Accessible Reference Simulator: It is still quite difficult for subcontractors to contribute to larger simulator frameworks or to get access to them, building an own implementation based on given standards



# The Goal from our Position

We **don't need** one common "**a has to be used standard**" **implementation** but conceptual agreement and simplified and efficient access

1. Configuration vs. Implementation: The ITT FSS <sup>1)</sup> study showed that simulators can be configured from a 10-23 system model. It also showed applicability of the SSRA to such configurations. Simulators should be driven from what is actually built. What is built is reflected in the system models and data bases. Simulator development has to start and be considered beginning from the system model.
2. Review Existing Standards: With OCDT, EGS-CC we evolved on the system models, this is not yet reflected into simulator relevant standards. SSRA and SMP should have a sorrow review to adjust to these new standards. Additionally complexity of these standards have to be reduced.
3. Give Answers to the What: We need to understand what needs to be simulated, we need definitions such as maturity levels for simulators. These levels are given by the built system (spacecraft) to be simulated and validated. Furthermore we need agreement what a model needs as inputs and configurations and for its outputs. We have to foster the understanding of simulators and which information can be reused from already from the system models. (Ontologies)
4. Provide Accessible Reference Implementations: A reference implementation for FES and SVF simulators including relevant models would be a great step forward. These simulators have to be easy to use and fit into their application environments. FES close to the system models in phases A/B. SVF close to AIT



# The Way to go to Achieve the Goal

