# New Modelling Methods in Simulation, Verification, and Validation

*Activity: TRP*

*Prime Contractor: Telespazio VEGA Deutschland GmbH*

*Sub Contractors: Airbus Defence and Space GmbH, ScopeSET Technology Deutschland GmbH*

*Presenter: Stephan Kranz (Telespazio VEGA) and Christian Hennig (Airbus DS)*

*ESA TO: Borja Garcia Gutierrez, Quirien Wijnands*

Abstract:


The main objective of the *New Modelling Methods in Simulation Verification and Validation* (NMM) study has been to define a methodology in order to capture and maintain the simulation-specific part of the system design. The study has been performed for ESTEC by a consortium led by Telespazio VEGA with Airbus DS and ScopeSET as sub-contractors.

The study started with an analysis of today's simulation engineering processes within a representative selection of simulation benches and engineering disciplines. In addition, the existing modelling approaches with respect to system, data, and simulation were examined, as well as their evolution through iterations. Based on the results of the analysis, a methodology has been defined with the focus on improving several points of the process used to maintain a consistent system simulation architecture throughout the whole system design cycle.

In essence, the methodology provides an overview on all artefacts, regardless of them being documents, design models, or executable models, their dependencies, and their current updated/outdated state. Based on updates of these artefacts, numerous activities may be triggered, such as starting a chain of model to model transformations for automatically integrating required changes. The established principles and the developed functionality provide the following benefits:

- Mitigation of simulator design errors by reducing inconsistencies between simulation artefacts
- Capability to make better informed decisions by providing an overview on the whole simulation artefact landscape and the updated/outdated status of artefacts
- Capability to make better informed decisions through explicitly tracking intangible artefacts such as assumptions
- Reduction of development effort and training demand by providing guidelines to integrate given changes on dependent artefacts
- Reduction of development effort and time by providing the ability to automatically update artefacts across artefact chains

For the implementation of the methodology a Simulation Artefact Dependency Management (SADM) toolkit has been specified and implemented on demonstrator level. The architecture of the SADM toolkit is client/server based. The SADM-Service is a REST based server application used to maintain the data required for the methodology. The SADM-Service can be used from a standalone application called SADM-Tool which allows the management of all the data. In addition the SADM-Service can directly be used from 3rd party domain specific engineering tools via tool specific plugins interacting with the SADM service via the REST interface.

The demonstrator implementation has been used to validate the methodology in different demonstration cases:

- Generic handling of system design and verification artefacts
- The setup and maintenance of a Training and Operational Simulator (TOS)
- Non-Tangible Artefact Handling and Update Procedure (SVF)
- Automated updates of artefacts used with Functional Engineering Simulator (FES)