IAF SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Engineering - Methods, Processes and Tools (2) (4B)

Author: Mrs. Caroline Lange
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Caroline.Lange@dlr.de

Mr. Philipp Fischer
German Aerospace Center (DLR), Germany, Philipp.Fischer@dlr.de
Mr. Müller Sascha
German Aerospace Center (DLR), Germany, Sa.Mueller@dlr.de
Mr. Andrii Kovalov
German Aerospace Center (DLR), Germany, Andrii.Kovalov@dlr.de

A MODEL FOR EACH PHASE OR A MODEL FOR ALL PHASES? - AN ANALYSIS OF THE PRACTICABILITY OF PHASE-SPECIFIC SYSTEM MODELING AND ROUNDTRIP SYSTEM MODEL CONVERSION FOR SPACE MISSION DESIGN

Abstract

The first design of a spacecraft for a new mission is often conducted in Concurrent Engineering Facilities (CEF) such as the one in the DLR Institute of Space Systems in Bremen. Here, a study usually lasts between one and three weeks, with the aim of defining an initial conceptual design, assessing its feasibility and refinining requirements. The studies usually follow a well-defined process based on the typical concurrent engineering approaches. The process and engineers are supported by the data model of Virtual Satellite (VirSat), a DLR-internal software which provides a Conceptual Data Model CDM and which is used by the engineers to model the system under study. Based on this model the engineers directly share their information and get instant automated feedback regarding the KPIs of the system. The major drivers analyzed are the overall mass of the system as well as the power and data budget. Further, the engineers define the functional structure of the spacecraft including a selection of components to fulfill functional requirements. The current data model and process has proven to be very successful for early phases (Phase 0) of a space mission project, due to its simplicity and agility.

Recently, the Virtual Satellite has been enhanced by new system modeling concepts, which are increasing its usefulness to later phases, e.g. phases A and B of a typical space system lifecycle. Its applicability has been demonstrated in the preliminary design phase of the satellite platform S2TEP within DLR. While the overall system modeling software concepts are similar, the two versions of the VirSat have been used independently of each other so far. However, when dealing with satellite platforms, an additional functionality has gained interest in the team: the possibly to reuse higher detail system models in a early phase study thereby enriching the study with design information and concentrating only on gaps and incompatibilities between the existing design and the new study's requirements. In a recent CE study, this approach has been tested and will be reported in this paper. In addition, we will report about another feature, i.e. introducing the newly applied changes to the higher level model (remerging the two models), thereby creating a round-trip model conversion capability. This paper will discuss the functionalities of the two VirSat versions, the realization and practicability of the model conversions by discussing different case studies and the analysis of the realized features for future projects.