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

Author: Mr. Philipp M. Fischer
DLR (German Aerospace Center), Germany

Ms. Meenakshi Deshmukh
German Aerospace Center (DLR), Simulation and Software Technolog, Germany
Mr. Aaron Koch
Germany
Mr. Robert Mischke
DLR (German Aerospace Center), Germany
Mr. Antonio Martelo
German Aerospace Center (DLR), Bremen, Germany
Mr. Andreas Schreiber
DLR (German Aerospace Center), Germany
Dr. Andreas Gerndt
German Aerospace Center (DLR), Simulation and Software Technolog, Germany

ENABLING A CONCEPTUAL DATA MODEL AND WORKFLOW INTEGRATION ENVIRONMENT FOR CONCURRENT LAUNCH VEHICLE ANALYSIS

Abstract

Concurrent Engineering (CE) and Model Based Systems Engineering (MBSE) have increased the efficiency of spacecraft, and satellite design in particular. Early design of satellites in Concurrent Engineering Centers (CEC) has almost become business as usual. However, such progress has still to be achieved for the design of launchers. Applying the same approaches as used for satellites has not led to the same amount of improvement yet. To address this, DLR initiated the project Concurrent Launch Vehicle Analysis (CLAVA) to investigate the shortcomings and to improve the efficiency of conceptual launcher design and analysis. From an MBSE point of view, investigations show that concurrent modelling requires new Conceptual Data Models. In contrast to designing satellites, they are focused on a much more physical abstraction rather than a functional one. Regarding simulations, it became clear, that the conceptual design phase of launchers require far more computationally intense simulations in a sequential order. With this knowledge, it is possible to outline a new process for CE studies which allow for concurrent design phases and sequential simulation phases. For this, an adjusted architecture of tools is required as well. The data model used for satellite studies within DLR's Concurrent Engineering Facility (CEF) does not fit the requirements of launcher design and has been adapted. Additionally, DLR's aeronautics divisions have already made substantial progress in increasing the efficiency of their simulations. They employ automated simulation workflows using a parametric model for information exchange between simulations. This approach has been adopted and integrated. This paper outlines how this approach is combined with the CE and MBSE concepts used in satellite and addresses the specific requirements of launcher design. It provides details about the database used during CE sessions, and how its information is transferred into the parametric data model used to run the required simulations. The conceptual data model of this database has beend adapted to the physical representation of launchers; these changes will also be discussed. Furthermore, the general idea of the workflow and the design of the parametric model will be presented. The paper concludes by providing an outlook how DLR intends to continue on this work, and further refine the developed tools and processes into daily CE and CEF application.