

Implementation of Model Based Systems Engineering (MBSE) Tools to Model CubeSats Systems

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Abstract

In the discipline of Systems Engineering there has been a major advancement in the industry to transition from the traditional systems engineering to a Model-Based Systems Engineering (MBSE). MBSE is a model-based approach that uses SysML to characterize and define systems in terms of models. MBSE aims to model: system requirements, architecture and design, ConOps diagrams, activity diagrams, different types of analyses, verification and validation, and other systems engineering related models. The use of MBSE software allow us to create these models in once central location to manage complexity and provide traceability across the different models.

To better demonstrate MBSE, a MBSE software called Cameo Systems Modeler by NoMagic was utilized to model a weather monitoring CubeSat. Cameo Systems Modeler was used to model the CubeSat domain architecture, the system architecture, use case diagrams, activity diagrams, requirements verification matrix, and more. The cohesive model provided traceability across the different models, from the requirements all the way to the architecture. Overall, the use of MBSE provided an innovative and efficient approach to modeling all the different pieces of the CubeSat. As the need for MBSE tools increase, their capabilities will also increase, paving a way to manage even more complex systems.

Keywords

Systems Engineering, Model-Based Systems Engineering, MBSE, CubeSats

Biographies

Waleed Waris is currently a graduate student working towards obtaining his Masters of Engineering (M.E.) in Systems Engineering at the A. James Clark School of Engineering at The University of Maryland. He earned his Bachelor of Science (B.S.) in Chemical Engineering from the University of Maryland, Baltimore County (UMBC). Waleed has had the opportunity to work with Peraton, a primary contractor providing communication and navigation systems engineering services to prominent National Aeronautics Space Administration (NASA) projects – including providing antenna ground station support to prominent satellite missions such as NISAR and PACE. This had motivated him to continue to work and research in the aerospace industry. His research interests include systems engineering, implementation of MBSE tools and SysML, modeling, simulation, requirements analysis, reliability, and aerospace engineering, specifically in the field of studying different Space Systems. He is a member of the International Council of Systems Engineering (INCOSE).