Relating MBSE to Spacecraft Development: A NASA Pathfinder
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The NASA Engineering and Safety Center (NESC) has sponsored a Pathfinder Study to investigate how Model Based Systems Engineering (MBSE) and Model Based Engineering (MBE) techniques can be applied by NASA spacecraft development projects. The objectives of this Pathfinder Study included analyzing both the products of the modeling activity, as well as the process and toolchain through which the spacecraft design activities are executed. Several aspects of MBSE methodology and process were explored.

Adoption and consistent use of the MBSE methodology within an existing development environment can be difficult. The Pathfinder Team evaluated the possibility that an "MBSE Template" could be developed as both a teaching tool as well as a baseline from which future NASA projects could leverage. Elements of this template include spacecraft system component libraries, data dictionaries and ontology specifications, as well as software services that do work on the models themselves.

The Pathfinder Study also evaluated the toolchain aspects of development. Two chains were considered: 1. The Development toolchain, through which SysML model development was performed and controlled, and 2. The Analysis toolchain, through which both static and dynamic system analysis is performed. Of particular interest was the ability to exchange data between SysML and other engineering tools such as CAD and Dynamic Simulation tools.

For this study, the team selected a Mars Lander vehicle as the element to be designed. The paper will discuss what system models were developed, how data was captured and exchanged, and what analyses were conducted.