S2GICD

Executive Summary

SPACE TO GROUND ICD MODELING AND GENERATION

1 Summary

1.1 Purpose

The *MBSE and Space to Ground ICD* activity started with the goal of applying MBSE practices to the preparation of the Space to Ground ICD (S2GICD). This study involves the following main steps:

- 1. Analysis of existing models and documents: starting from existing documentation, identify potential candidates for configuration items to be modeled that can be beneficial for automatic processing.
- 2. Modeling of selected CIs: using a suitable modeling approach, prepare an initial model for a sample mission.
- 3. Development of proof-of-concept tool: the prototype tool helps users visualize and edit the model. The prototype also demonstrates the power of MBSE by exploiting the model to generate related artifacts automatically.

This summary is an annex to the Final Report for the activity.

1.2 Approach

Using ORM as a modeling technology to describe the structure of key points of existing S2GICD, the resulting model was converted to Ecore and Eclipse technologies which allowed us to implement a graphical modeling editor on top of OPEN.

The models created with this editor allows the user to generate:

- The Ground Segment Requirements Document
- The MCS-CC system configuration, filled with values from the model
- The SLE configuration, for missions using SLE

The outputs generated from the model are used to deploy an MCS-CC automatically.



Figure 1 Overall approach

1.3 Conclusions and Future Work

Applying MBSE tools and practices to represent the S2GICD can help reduce the effort to set up a new mission. As more new missions adopt a modeling approach for the S2GICD and the models get more mature, more automatic processes can be implemented to benefit from the information stored in the models.



Figure 2 Prototype editor in OPEN

A simple case scenario has been demonstrated by modeling basic information for a sample mission and deploying an example MCS based on EGS-CC automatically with minimal human intervention.

However, further work is recommended. The S2GICD contains a lot of information and there are still many areas that can benefit from being included in the model.

Furthermore, the conversion between the ORM model that describes the structure of the S2GICD, and the Ecore model that powers the OPEN modeling editor can be automated to simplify the process to enhance the S2GICD model. As it is now, when new elements are added to the ORM model they need to be manually converted into Ecore. After that step is done the developers can work on improving the modeling editor. This could be improved if the conversion was done using automatic tools.

While the results presented in this activity are just a proof-of-concept, there's a significant benefit to using MBSE for the S2GICD that can only be enhanced as MBSE is introduced in more missions.