ABSTRACT

Up to now models are being used informally in the development of the on-board software to complement some tasks, which are materialized as textual documentation. This traditional document-centric development evolves to a new paradigm where models are the main artefacts exchanged among stakeholders and replace partially or even totally the textual documentation.

The "***Model Exchange for Software Engineering (MODEX)***" study (contract 4000125540/18/NL/FE) formalizes the implementation of the *on-board software development process* when a model-based approach is adopted.

This new implementation does not modify the software life cycle standardized in the ECSS-E-ST-40C, i.e. activities, milestones, etc. The information exchanged is similar but the exchanges are produced in a different way, different granularity and different format. These new exchanges are called *Work Products*. These Work Products can be mapped to the Document Requirements List (DRL)/Document Requirements Definition (DRD) items. In the same way, the ECSS-E-ST-40C processes correspond to specific parts of the proposed process. Both mappings facilitate the adoption and understating of the new implementation, which is formalised using two different formats that are consistent and complementary:

- A BPMN2.0 (Business Process Model Notation) model
- Work Products Table

This approach relies on two key elements: the *Software Factory* and the *Data Hub*. The former represents the infrastructure, composed of a set of tools that allows the production of Work Products and enables the Work Products interchange. Additionally, tools allow a full or partial automatization of tasks, generating the models with minimal human involvement. The latter allows the model exchange, mainly with other domains. Both are key elements that facilitate and ensure interoperability within the Model-Based System Engineering community at software level.

Furthermore, MODEX considers the connections with other domains (e.g. those artefacts produced by the *system factory* that are inputs to the *software development process*) in order to guarantee "Digital continuity".

The process has been partially verified through a demonstrator based on the EagleEye virtual mission. This simulation allowed the refinement of the subset of Work Products verified.

The adoption of the proposed model-based approach to execute the *software development process* defines a new scenario that presents many advantages with respect to traditional development processes and, at the same time, several challenges to overcome. This activity demonstrates the feasibility of its implementation which keeps the current specification of the ECSS-E-ST-40C and takes advantage of the MBSE benefits, e.g. automation of tasks, improve quality, etc.

This ESA activity (Technical Officer: Andreas Jung) has been carried out by the MODEX consortium integrated by the following partners: GMV Aerospace and Defence S.A.U. acting as prime contractor, and Thales Alenia Space France, SCISYS Ltd, and Terma A/S as subcontractors.

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