**DEFINE - Multidisciplinary 3D Digital models for AIT environment**

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1. **Introduction**

ESA currently has, or has had, spacecraft in orbit around all planets in our solar system, as well as a fleet of research and operational satellites in various orbits around the Earth. The planning, assembly and testing of ESA's spacecraft is either followed or done at ESA's technical centre ESTEC in Noordwijk in the Netherlands.

Here some of the largest clean rooms and specialized test chambers in Europe are located to test the thermal integrity of spacecraft and ensure that spacecraft can handle the intense vibrations during launch. The design, assembly and test phases of a spacecraft's development process must be thoroughly documented and archived, for later reference and mission control, as well as for future versions of the spacecraft.

However, building and testing a spacecraft generates a high amount of data, often from multiple sources, in various versions, and in different electronic formats. This data must all be accessible and compatible with each other to prevent cumbersome and time-consuming processes.

DEFINE, Jotne's new project for ESA, will develop a platform for managing digital model, simulation and test data and information for spacecraft development. The project will utilize the ISO 10303 standard (STEP) and more specifically its application protocols AP242 (*Managed model based 3D engineering*) and AP209 (*Multidisciplinary analysis and design*) to improve the efficiency of spacecraft design, assembly, integration and test procedures.

1. **Cross domain model integration**

One of the challenges in the DEFINE project is the large number of different simulations and 3D tools that are in use, with no standard for making them mutually compatible and accessible. These models contain different kinds of information at different levels of detail.

The project takes basis in a set of ESA use cases which the resulting platform should make more efficient. These use cases include; *3D model comparison* (CAD models, FEA meshes, thermal models, cloud of points, etc.), *projection of thermal images* onto CAD models for visualization and FEA models for generating thermal loads, comparison of measured displacement from *videogrammetry* with analysis displacements, comparison of *sensor measurements* (accelerometers, load cells, strain gauges, etc.) with analysis results, and more.

The platform being developed in the project is an extension of Jotne’s simulation data management software, an ISO 10303 compliant repository. Mapping specifications between the application specific formats, and the STEP AP242/AP209 formats will be developed. The different models, from different domains and tools, will be converted to STEP when imported to the system. The models are then integrated into a *federated model,* which manages the cross-model relations, for example, between sensors and FEM mesh locations, versioning and other engineering data configuration control. This federated model is also stored in STEP, thus all information is collected in one single standard format.

Some of the tools to be integrated into DEFINE are; Nastran solvers, a variety of CAD applications, Light Tools and ESATAN-TMS.

At the SECESA event and during the DEFINE presentation, real life data will be demonstrated in the various applications accessing the data from the repository.