Evaluation of the ASHLEY seamless tool-chain on a real-world avionics demonstrator

The ASHLEY project (Avionics Systems Hosted on a distributed modular electronics Large-scale dEmonstrator for multiple tYpes of aircraft) is a European FP7 research programme that carries out research on top of existing state-of-the-art Integrated Modular Avionics (IMA) and focusses on the areas where most innovations are expected. Part of the research is the development of an efficient IMA 2nd generation (IMA2G) tooling framework solution that remains compliant with IMA2G industrial and certification constraints. The ASHLEY project is in its final year and integrates all technologies into a large-scale demonstrator that will be designed, optimised, configured and integrated using the ASHLEY seamless toolchain that has been developed by several partners. This paper summarises the achievements, experiences and lessons-learnt from the practical work with the tool-chain on the demonstrator.

The tool-chain covers specialised tools for each step in the process of IMA2G based system- and software design and addresses especially validation, data consistency and data exchange in the different design-, development- and integration stages. In recent publications, some of the essential tools were presented, like the IMA Platform Optimisation- and Configuration Tool, developed by Hamburg University of Technology (TUHH). Furthermore, model-based algorithms have been developed and presented that allow an automated transfer of data from the IMA design- towards the development and integration process.

In advanced processes, the developed methods and tools in the ASHLEY seamless tool-chain for an efficient implementation of future IMA technologies are consequently used and validated thanks to the ASHLEY large-scale aircraft representative demonstrator. From a process point of view, the demonstrator covers the design and optimisation of the IMA platform that consists of different IMA modules, including newly developed remote components, equipment and communication layers. Furthermore, the design and development of the required system functions with different criticality and the management of resource allocations hosted on different IMA modules using model-based methods is carried out. Derived from the platform architecture and resource allocations, the configuration for the modules is developed and integrated on the physical modules using respective module-specific tool-chains. The avionics network is optimised, based on the configuration data. Before the integration, all data is pre-validated at aircraft-level to avoid unnecessary iteration cycles. The different tools used in this process use a newly developed backend to exchange their data and implement version control and change management.

Compared to a state-of-the-art process, new tools are involved that replace nowadays time-consuming manual process steps. The complexity of IMA architectures and systems increases which is as a consequence of the increasing number of functions, modules and therefore design-space. Model-based approaches combined with automated processes seem helpful. However, for a system- and function- supplier “another tool” is often not helpful, especially if interfaces between tools are not working properly. Based on the real-world experience the advanced processes and tools are critically reflected. This covers their benefit towards an optimised, early-validated architecture, ease of resources allocations, development, integration and validation of different system functions. The study is carried out from the perspective of a central tool in the tool-chain namely Platform Configuration Tool from TUHH.

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