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MODULAR AVIONICS TEST BENCH FOR SPACE SYSTEMS

Abstract

In recent years, the space industry has been advancing towards miniaturisation and commoditisation of its components, producing more powerful processing units with smaller sizes and costs. This has caused the space sector, especially the New Space counterpart, to move towards industrialisation with the perspective on modularity, quick delivery speed, and reusability. However, mass production and industrialisation are mainly restricted to companies with vertical integration and sufficient in-house experience.

Taking a different route, Space Products and Innovation (SPiN) is developing intelligent nodes, such as Multipurpose Adapter Generic Interface Connector (MA61C), which simplifies the connection between the subsystems and the satellite without driver installation or user configuration. It is compatible with most digital interfaces and communication protocols in the current space industry.

Contracted by ESA, SPiN is currently working on a New Space project called the Modular Avionics Test Bench. In this project, the suppliers, their subsystems, along with the drivers are mapped to upgrade MA61C as a completely modular plug-and-play system; that can digitally interconnect between most components/subsystems from European suppliers. This creates an ideal digital design system that can be used to build Smallsats/Cubesats from existing space heritage components while focusing on the lowest cost and shortest lead time without compromising on quality or requiring a large amount of engineering. The modular avionics test bench can also be used by customers for fast and cost-effective design and integration services (built around MA61C), where SPiN acts as a satellite integrator, providing modularity as a service. The avionics test bench will allow multiple user configurations and designs to be tested before starting the procurement process and the actual integration.

This paper describes the Avionics Test Bench project that will be a turning point towards enabling modularity as a service for small satellite manufacturing, widening the supplier database to the satellite owner, and giving an opportunity to all suppliers to have an increased market outreach. Furthermore, it will explain how this concept shall reduce the time and cost, and improve the quality of space system design. Alongside, the paper will also discuss how SPiN is approaching modularity, reusability, and digitalisation; with the aim to transform products into commodities, simplifying design and assembly by eliminating customisation, being a stepping stone towards space-industrialisation and mass production that is not constrained to only vertical chains.