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PLUG AND FLY

Abstract

Currently, a large number of universities, space industries, and research groups design, manufacture, and launch small/micro satellites. In many cases, the main study of these projects is the design of a good command and data handling (CDH) subsystem. Even though the focus is on developing a standard generic CDH platform as a solution for multiple missions, every satellite project comes with its own hardware solution. Each of these solutions uses certain technology and is suitable only for specific missions. This is due to the difficulty in space standards in both traditional and new-space sectors where the protocols and connectors are unique and customised to the mission requirements. Even in mass manufacturing, there are heavy investments made for customisation in the initial design phase to reduce the recurring cost per satellite. This limits the spacecraft design options in the later phase, thus making any small change in the process complex, expensive, and lengthy.

Space Products and Innovation UG (SPiN) presents an innovative CDH concept involving a decentralised and highly configurable data handling architecture for small/micro satellites. It is based on having multiple intelligent data nodes with capabilities from Industry 4.0 such as plug and play technology, different protocol compatibility, routing, and identification functionalities. These data nodes sit on each panel of a satellite and house different space standard protocols to make it avionics and payload flexible. Satellite system engineers can easily integrate subsystems by just plugging the elements near the location of the data node without the need for additional programming. This eases the interfacing of commercial-off-the-shelf (COTS) in the satellite. It reduces the architectural complexity while enhancing hardware reusability and reduces the time to orbit. Moreover, it eliminates technical incompatibilities, which lowers the manufacturing cost of the primes significantly and increases the competitive advantage of smaller companies.

The intelligent data node developed by SPiN is called Multipurpose Adapter Generic Interface Connector (MA61C). It was presented at IAC-2016 with the first prototype manufactured in 2018 as an Engineering Model (EM) to aid in AIT functional testing. This paper describes a new approach in small/micro satellites manufacturing and integration with a decentralised and highly configurable data handling architecture using MA61C.