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DMS-MOD: MODERNISING THE DATA MANAGEMENT SUBSYSTEM IN THE COLUMBUS MODULE OF THE ISS

Abstract

Since its berthing to the International Space Station in 2008, the Columbus module has undergone several hardware upgrades. Columbus systems at launch were designed solely around CCSDS-based communication, requiring tailor-made ground and flight software for any incoming payloads. In order to reduce the complexity of integrating new payloads and thus maximise the scientific output of the module, Internet-protocol based communication hardware was installed in Columbus, starting with the European Multi-Purpose Communications Computer (MPCC). The most recent activity in modernising the Columbus Data Management System (DMS) involved transitioning from the two at-launch ("legacy") Columbus LAN Switches (CLSW) to a new generation of LAN switches (CLSW Mk II). These new LAN switches offer new features and better integration of the systems present on-board the ISS, further bridging the gap between the legacy Columbus DMS components based on CCSDS protocol, and the IP-based MPCC, including the Columbus Ka-band terminal (Col-Ka). The two CLSW Mk II are central components of Columbus LAN, utilised for communication between the individual DMS nodes in Columbus, as well as ESA and NASA payloads present in the module. The DMS modernisation project (also called DMS-Mod) also involved several support activities, such as deployment and installation of the Columbus Monitoring and Administration Unit (CMAU) required to support the operation of the switches, software updates to the MPCC system, and updates to the legacy systems reflecting the installation of the new hardware. This new system configuration is set to pave way for additional infrastructure, such as the Columbus Data Management Infrastructure (CDMI), to further expand IP-based operations within the module. The transition was successfully implemented on-board the ISS in the Columbus module, as well as on the ground, in January 2023. This paper describes the process of the hardware transition, the current architecture of the Columbus systems, and the future capabilities gained by modernising the Columbus DMS architecture.