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FLYING A SATELLITE BY A ROBOT – AN ADVANCED SATELLITE CONTROL CENTER FOR THE AUTOMATED OPERATIONS OF EDRS-C

Abstract

The European Data Relay System (EDRS), also known as SpaceDataHighway, provides high speed data links between ground stations and satellites in low earth orbit. The SpaceDataHighway is a public–private partnership between the European Space Agency (ESA) and Airbus, with the laser terminals developed by Tesat-Spacecom and the DLR German Space Administration. Commercial services for the SpaceDataHighway are provided by Airbus, which owns and operates the System. The satellites' operations of EDRS are conducted by the German Space Operations Center (GSOC) at Oberpfaffenhofen.

In January 2016 the first node EDRS-A has been launched and is in routine operations since mid-2016. Presently, up to 400 links per day are commanded by the ground-system established at GSOC via EDRS-A only. This high command load is beyond the capabilities of a classical operational concept with manual operations. Therefore an automated system has been implemented, with human interaction only necessary in case of an anomaly.

In August 2019, EDRS-C, the second satellite of the system has been launched. Since EDRS-C is now the first satellite dedicated to the SpaceDataHighway mission, the control center at GSOC has to be capable of not only operating the EDRS payload, but must take care of the entire satellite operations, which comprises additionally a hosted communications payload owned by London-based satellite communications operator Avanti. The DPCC ground segment was designed to be independent of the particular spacecraft platform. This is realized via a layered system architecture centered on the core Monitoring Control System (MCS), with layer 1 consisting of the commanding front-end and automation engine, while layer 2 comprises the Link Management System (LMS) and interface to the external ground segment partners. This layered architecture has been designed to ensure a seamless phase-in of EDRS-C, with no software changes required for layer 2 and only minor upgrades to components of layer 1. Differences in the platform shall be masked through the versatility of the core MCS.

This paper will present the evolution of the DPCC system to the Satellite Control Center (SCC) for EDRS-C. While an utmost re-use of heritage components has been basis for the system design, the actual arrangement of the components had to be revised after an assessment of the DPCC's performance. Furthermore, the paper will provide insight on the foreseen extension of the system to handle not only the operations of the payloads on EDRS-C, but also to automate the platform operations.