Paper ID: 87104
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57th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES (D5)
Cybersecurity in space systems, risks and countermeasures (4)

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DEVELOPING A CCSDS COMPLIANT PLATFORM TO RELIABLY SECURE CURRENT AND FUTURE SPACE DATA LINKS

Abstract

The space sector is expanding at an increasing rate thanks to the momentum provided by the NewSpace industry. With this rise of new satellite services and facilities, the stakes of this economy have reached new heights. Ensuring the security of satellites is more essential than ever to preserve the critical infrastructure in space. An identified weakness of satellite platforms is their communication link with Earth-based ground stations. With access to radio equipment and knowledge of standard data link layer protocols, ill-intended actors are able to access sensitive and confidential data downlinked by satellite. Reverse engineering of telecommands and seizing control of the satellite from their operators is only a step away. Industry standardization efforts have aimed to address this, with a 2015 data link layer security protocol by Consultative Committee for Space Data Systems (CCSDS). The Space Data Link Security (SDLS) protocol, complemented with the SDLS Extended Procedures (SDLS-EP) in 2020, allows to secure a satellite's communication link at the data link layer. The authors propose a portable, easy to use, and hard to misuse implementation of the SDLS protocol in an effort to homogenize the industry's security best practices. To support the development of this implementation and other inter-operable implementations of the industry, a development platform is presented. It is composed of two test environments, one to test the security of the core SDLS procedures, another to test high level use cases surrounding the SDLS-EP. The versatility potential of these tools for improving the security of satellite communication is discussed, and the initial results of the security implementation to a variety of test scenarios are detailed.