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EVALUATION OF A CYBERSECURITY SYSTEM APPLIED TO SMALL SATELLITE MISSIONS

Abstract

The rapid rise of small satellites has transformed the space industry, offering cost-effective solutions for communication, earth observation, technology demonstration, and scientific research. However, these satellites often lack strong cybersecurity measures, making them susceptible to cyber threats that can disrupt operations, compromise data, and manipulate onboard functions. To address these risks, this study proposes a hardware architecture that integrates encryption, authentication, and monitoring functions using commercial off-the-shelf (COTS) components. Although COTS parts improve adaptability, updatability, and cost-effectiveness, their performance and reliability must be assessed for space missions. The paper analyses the selection of devices for security requirements, reliability, and resource demands to guide informed selection of components. Space environment analysis, simulations, and operation tests are conducted on the candidate devices to ensure reliability in performance. Based on these findings, a hardware architecture was proposed to prove the concept of a system that addresses threat vectors while maintaining performance and CubeSat-class platform constraints. Adopting the proposed architecture, a system is being developed for deployment on a 6U CubeSat in a Sun-synchronous orbit, and some system operation considerations are discussed. The ultimate goal is to establish a scalable security solution to protect small satellites in an increasingly contested space environment.