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Interactive Presentations - 57th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES (IP)

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RACCOON OS: A SECURE OPEN-SOURCE OPERATING SYSTEM FOR SATELLITES

Abstract

The escalating threat of cyberattacks on satellites calls for easily accessible cybersecurity countermeasures for any satellite manufacturer, from large system integrator to university. To this day no cyberattacks have been reported onboard satellites outside academic research. Due to the increasing number of critical services provided from space, it can be assumed that the probability of such events increases. To address these challenges in a systematic way a tailored operating system platform called "RACCOON OS" is developed within the scope of the RACCOON project of the Technische Universität Berlin and presented in this poster. The project is funded by the German Space Agency (DLR). One of its key characteristics is that it will be released as open-source software.The aim is to make the satellite community more secure by reaching a wide range of users. The users utilize a common software substrate, so that improvements can be shared with the wider community.

The OS is logically divided into a Linux-based secure platform, a middleware enabling topic-based communication, and a set of applications implementing core satellite functionality such as CCSDS encoding/decoding, command authentication, telemetry storage, timed command execution. The secure base platform comprises a hardware root of trust that enables the system to only boot authenticated software, preventing persistent malware infections. Applications running on the system will be isolated from each other by using the access control infrastructure of the Linux kernel. Special care is taken to address the constraints of the space environment. A redundant file system minimizes data corruption and/or loss. The filesystem is versioned and updated by small "binary diffs" on the spacecraft. Both the applications and configuration can be managed in this manner. The remaining onboard storage can be used to store payload or bus data.

RACCOON OS aims to support common hardware platforms used on satellite On-Board Computers. The initial prototype is being developed within the scope of the RACCOON mission. Other commercially available platforms, such as e.g. the CyBEESAT, will be supported in the future. To ease the use for developers the OS will also be distributed as QEMU-compatible virtual machine images, as well as containers. A prototype for the RACCOON hardware is developed and qualified to be integrated into a technology demonstration mission. The project team plans to organize hackathons to familiarize the security community with RACCOON OS and identify further partners and supporters of the project.