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SOFTWARE ARCHITECTURE USING REAL-TIME DESIGN PATTERN FOR SMALL SATELLITES

Abstract

The on-board computer system of the satellite is responsible for platform data processing, payload data handling, propulsion maneuvering, interfacing with various components and attitude control operations that are executed during the course of the mission. The software architecture provides a functional overview of the entire on-board software system. The proposed paper presents a refined Software Architecture design using Real-Time design pattern. The existing architectures are based on service handlers or are equipment driven with layered representation. Some advanced architectures include fault detection, isolation and recovery components. Concurrent components are defined as multi-threaded functional components executed concurrently in the on-board software system. Each subsystem would be a unique concurrent component. The inaccurate definition of these concurrent components of a real-time system can lead to deviation from the requirements during the implementation stage. Such deviations might become expensive to correct in the later stages of development. Being a critical part of the mission, such problems must be avoided. To resolve this issue, an architecture which takes into consideration these concurrent components using Unified Modeling Language defined concurrent diagram notations and real-time design pattern is suggested, providing better understanding of the architecture among the developers and the architect. Apart from reliability, correctness, testability and efficiency, understandability is also considered as a prime quality factor of this architecture. This architecture is planned to be designed, implemented and tested on the small satellite, SRMSAT-2. The SRMSAT-2, currently in its preliminary design phase, is a developing conceptual student small satellite mission with a primary objective of achieving a Low Lunar Orbit through a weak stability boundary trajectory.