

SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (4)

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A NOVEL SOFTWARE ARCHITECTURE FOR INTELLIGENT TASK AND HEALTH
MANAGEMENT ON COMMUNICATION SATELLITE

Abstract

As the "longevity" of all the spacecraft, communication satellite can serve up to 15 years. But with the growing number and more function demands of communication satellite, the workload of application software development and on orbit maintenance has rapidly increased. To solve this problem, the intelligent management is used to reduce the need of on ground maintenance, and further decrease the cost of on orbit maintenance. Thus, this paper proposed a novel software architecture for application software, which could not only cut down the cost of application software development through the components reuse and reconfiguration, but also support intelligent task and health management.

The software architecture was divided into service layer and application layer. The service layer provided the basic support for communication satellite application software, including interface design and component design. Among which, interface design defined the data transmission protocol based on the software bus and opened to other users. While a set of standard components were designed to realize the function demand of communication satellite. The component could also be modified according to different tasks, thus improving the efficiency of application software development. Furthermore, considering on orbit maintenance and application software upgrade, the component could be loaded dynamically.

The application layer realized the communication satellite management and its on orbit tasks, such as energy management, control management, load management and so on. The paper also defined a task scheduling component which was the core of intelligent task and health management on communication satellite. What's more, the novel architecture could accommodate the CCSDS(Consultative Committee for Space Data Systems) standard, providing components to analyze telemetry data and execute telecommand. According to the architecture, all components were completed to achieve intelligent task and health management on communication satellite, considering how important the component was and when the component was used.

Finally, the paper proposed a novel architecture to develop application software and tested its performance. Compared with the traditional design of application software, the novel architecture improved the performance of application software in efficiency, reconfiguration and intelligence.