

Separation Platform for Integrating Complex Avionics (SPICA) NASA Award

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Purpose

Modern avionics systems must support a large and rapidly increasing number of diverse, mixed-criticality functions, deployed on increasingly complex and diverse avionics hardware, while meeting stringent performance requirements. Currently, effective use of multi-core and distributed avionics systems is hindered by the difficulty of generating integrated schedules across mixed-criticality systems and subsystems. Building on previous work in constraint-based resource allocation, scheduling, and configuration management for fault-tolerant, real-time systems, Adventium's Separation Platform for Integrating Complex Avionics (SPICA) system supports the generation and analysis of schedules and time-phased resource allocations for distributed, hierarchical, and mixed-criticality systems. Treating the whole aircraft as a *system*, rather than as a collection of federated components, SPICA enables effective use of multi-core processors and advanced communications networks.

Background

In current aviation platform development and upgrade processes, integration is performed during late-stage implementation phases, in testbeds, system integration laboratories, and even in operational systems. The key innovation of SPICA is to support early-stage, ideally design-phase, *aircraft-wide* integration by providing and then maintaining guarantees that temporal and other performance requirements will be met by the system as a whole. This will vastly reduce late-stage performance surprises and delays, reducing as well both initial and lifecycle costs of aeronautic systems. The scale, scope, and complexity of this scheduling and resource-allocation problem significantly outstrips current modeling and solver capabilities.

SPICA's potential impact on NASA and national aeronautics challenges is to provide a novel capability for rapid, dependable integration of new functionality, systems, and components into new, experimental, and production aircraft. SPICA will provide this while maintaining performance guarantees of existing capabilities and systems. This will enable certified, flight critical avionics functions to safely and robustly operate side-by-side on shared hardware with functions not certified to the same level, without having to be re-certified as new functions are added. Enabling full utilization of multi-core processors and embedded systems, SPICA will vastly improve the performance, efficiency, safety, and dependability of aeronautical avionics.