National Aeronautics and Space Administration

Goddard Space Flight Center

Two Columns

Summary

The GMSEC architecture provides a scalable, extensible ground and flight system for future missions. The architecture enables quick and easy integration of functional components, which are selected to meet the unique needs of a particular mission. The architecture also enables the addition, deletion, and exchange of components to meet the changing requirements of missions as they progress through their lifecycles. The architecture provides a rapid, flexible, and cost-effective means to fulfill a variety of mission concepts, including concepts not yet fully developed.

Overview

To create a vision and architecture on which to base continued ground system and flight software development efforts at GSFC over the next 10 years, GMSEC will support the development of compatible mission support tools that can easily be integrated and made available (as tested) within the GMSEC Architecture. GMSEC provides this support by maintaining the Reference Architecture, defining Standard Messages, and supplying interface software. Other GMSEC project documents discuss guidelines and policies of assembling a system with the GSMEC Architecture. The Branches provide software development of functional components and tools. Missions select components that best fit their operational needs. By selecting the GMSEC architecture approach and using the GMSEC certified components where appropriate, the development organization can prepare a system at a lower cost that is compatible with other GSFC systems. In addition, as technology advances or operational requirements change, new components can be added and components can be swapped in and out of the system with low risk and minimal integration effort.

VIEW LARGER DIAGRAM

Team Roles

- GMSEC "owns" the Reference Architecture and the Standards
- Branches are responsible for their domain areas
- Current and future missions are GMSEC customers

GMSEC Reference Architecture

The GMSEC Reference Architecture and its flight/ground system instantiation have characteristics that render it an attractive choice for GSFC missions.
More flexible mission component selection
- Standard message formats for component information exchange
- Improved component reuse
- Quick & easy functional component integration
- Middleware support for GOTS/COTS software
- Scalable, extensible ground & flight system architecture
- Exchangeable & dynamic component activation on operating ground or flight system
- Increased system wide automation
- Additional capabilities added to ground/flight system without impacting existing system/design
- Mission and GSFC-wide configuration management
- Security, remote & shared access
- Shared operations with another site (University, commercial provider)
- Mission critical system risk improvement
- Collaboration across missions
- Greater choice & lower cost through standardized component communications
- Anticipation of movement of some functions on-board

Features

The Reference Architecture features include Plug-and-Play Components, Standard Messages, and the Software Information Bus. Plug-and-Play Components can be core functional applications/subsystems such as Telemetry & Command, Planning & Scheduling, Assessment & Archive, Guidance Navigation & Control, and Simulation & Modeling or new stand-alone functions. To be GMSEC-compliant, the components publish/subscribe to Standard Messages with defined contents. Standard Messages are used as to request a service, to share data, or to provide status. A GMSEC Applications Programming Interface (API) shields the components from dependencies on communication protocols, operating systems, and hardware platforms thus facilitating platform transparency for the components. The API interfaces with the underlying middleware to route the messages over the Software Information Bus and also to pack/unpack the message contents.

The Software Information Bus provides the communications pipe used to carry information between GMSEC components. GMSEC can swap different middleware products in and out, providing additional flexibility. Legacy components interface to the Software Information Bus using an Adapter. The Adapter is custom software that translates Legacy Component messages and/or message protocols to those that are GMSEC-compliant. Additionally, legacy components may, in combination with GMSEC, continue to use legacy interconnections.
Core GMSEC System Supports any Domain

GMSEC's common service tools bring immediate value to any system.

GMSEC Message Bus Architecture

GMSEC-compatible functional components include:
- Secondary & Command
- Flight Dynamics
- Component 1
- Component 2
- Component 3
- Adapter

- COTS, GOTS, legacy or new components
- Interface "adapters" if needed
- API to isolate middleware
- Optional message format validation
- Standard messages for interoperability
- Middleware options

GMSEC Project Manager: Dan Smith
GMSEC Curator: Lisa Kane
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