National Aeronautics and Space Administration

NASA and Compat C2

(we call it GMSEC)

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Introduction

The Goddard Mission Services Evolution Center (GMSEC) is a satellite mission operations center software <u>framework</u>.

We've had close collaboration with others to ensure its success and increase its value and broad use.

- Command and Control system product vendors
- Major integration contractors
- Other NASA Centers
- Other U.S. government space organizations

GMSEC is referred to as CompatC2 across much of the DoD and as Mission Services Interface (MSI) at the ORS.
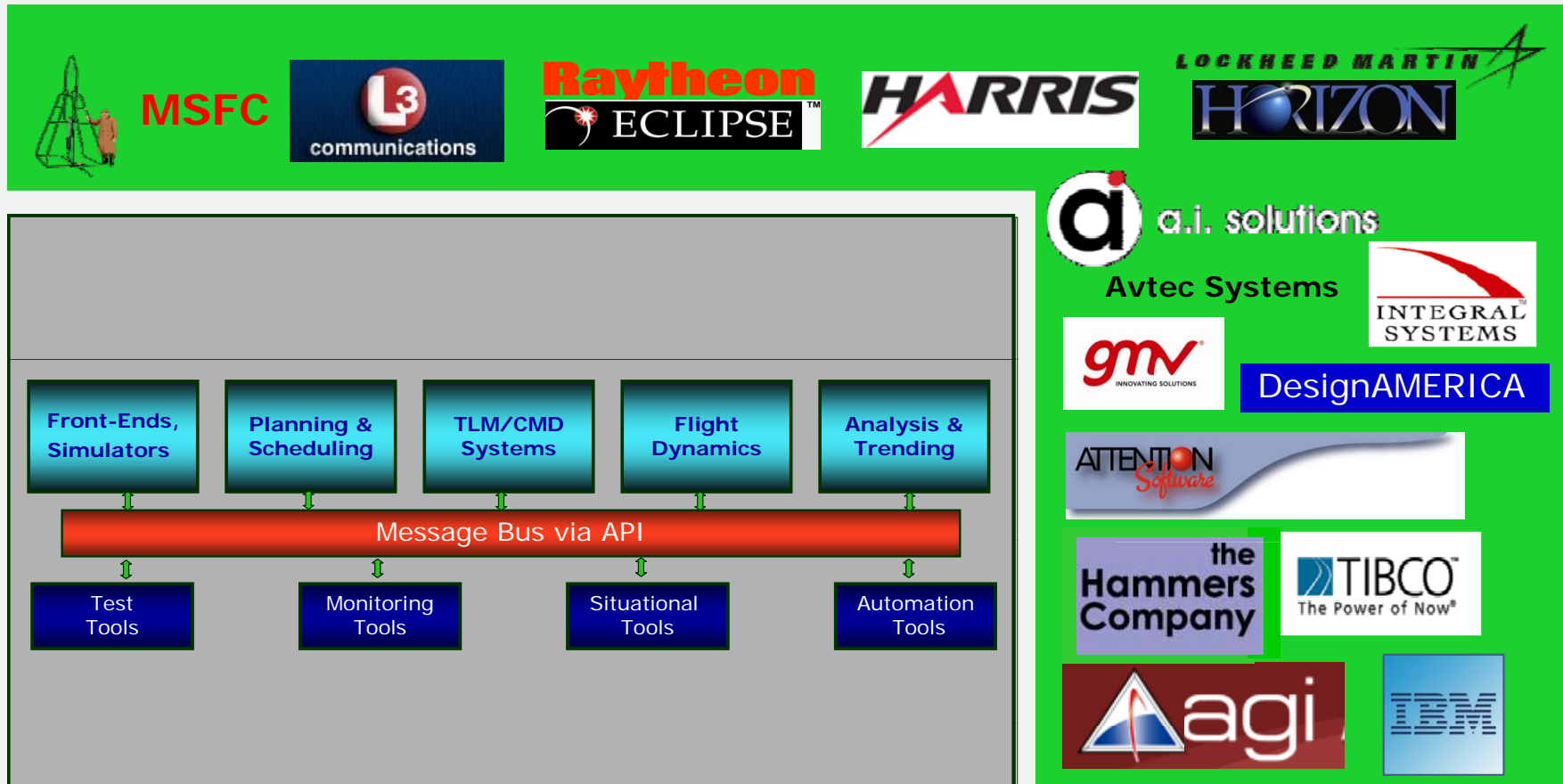
GMSEC Background and Introduction

GMSEC was established in 2001 to coordinate ground and flight data systems development and services at GSFC. It has been operational since 2005.

- Goals
  - Simplify development, integration and testing
  - Facilitate technology infusion over time
  - Support evolving development and operational concepts
  - Allow for mix of heritage, COTS and new components while avoiding vendor lock-in

- Concepts
  - Standardize interfaces – not components
  - Provide a middleware infrastructure
  - Allow users to choose – GMSEC doesn't decide which components are best or dictate which components a mission must use. It's the mission/user's choice!

- Some say it is like what Apple has done – created a simple interface standard and communications approach and let others develop compatible tools beyond anyone's expectations.

Other NASA Centers and U.S. government space organizations are now recognizing the benefits of these simple concepts and are each working with NASA/GSFC's GMSEC Team.

GMSEC and the Satellite Control Domain

MSFC

Front-Ends, Simulators | Planning & Scheduling | TLM/CMD Systems | Flight Dynamics | Analysis & Trending

Message Bus via API

Test Tools | Monitoring Tools | Situational Tools | Automation Tools

Users can choose the best products for their needs. Many COTS command and control systems are now GMSEC compatible, and other products can be easily adapted.

Examples of GMSEC's Mission Benefits

The architecture enables new approach for automation
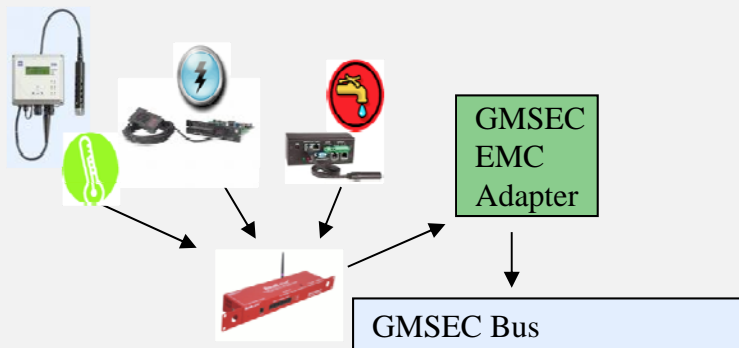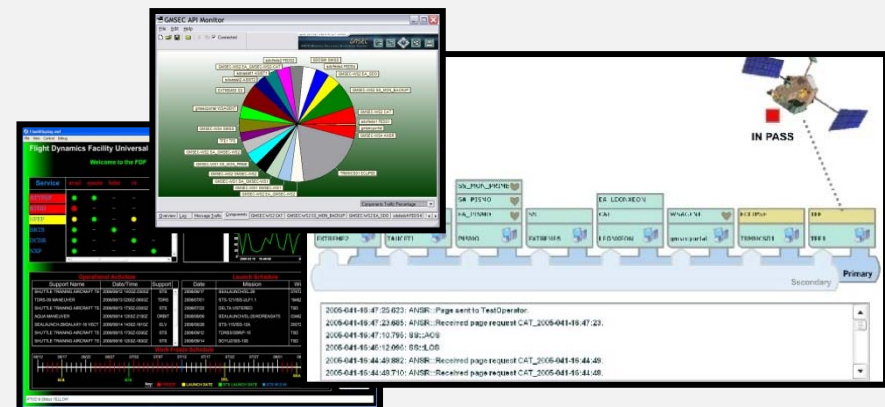
- Can "listen" for status from all components → situational awareness

- Can direct actions of component → system-wide control

- Recognize status and respond → event-driven automation
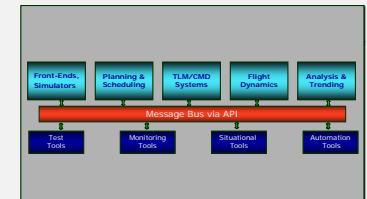
GMSEC will allow for monitoring of temperature, humidity, disk usage, etc. for GSFC control centers.

New tools show network performance, system configuration, and processing status.

GMSEC Community


```
GMSEC
├── GSFC Support
│   ├── Flight Dynamics Facility
│   ├── Wallops
│   ├── Current Missions
│   │     FERMI
│   │     MMOC/SMEX
│   │     TERRA, TRMM
│   │     SDO
│   └── Future Missions
│           GPM, MMS, LADEE.
│           In discussions with JPSS, NICER, others.
├── Other NASA Sites
│   ├── IV&V Test Suite
│   ├── JPL Collaborations
│   └── ARC Mission Use
├── Other Government Space
│   ├── Air Force
│   │   ├── Los Angeles AFB; Chantilly, VA
│   │   ├── Kirtland AFB – SDTD/MMSOC
│   │   └── AFRL
│   ├── NRO
│   └── ORS
│       └── Ties to NRL – Blossom Point
├── Organizations & Committees
│   ├── JSCC
│   ├── NMOSSG
│   └── CCSDS
└── Vendor Community
    ├── Contractors
    ├── Product Vendors
    └── Conference Panels
```

Current GMSEC Activities / Status

- Recently upgraded NASA's GMSEC Lab and began work on portable demo
  - Will provide both product and ops scenario demos
  - Will be able to perform before/after tests to assess virtualization changes

- Adding IBM Websphere and Apache Active MQ as recommended middlewares
  - TIBCO SmartSockets is near the end of its product life – replacements needed
  - Demonstrates a key value of GMSEC

- Working on IA controls and approval
  - Coordinating with Air Force
  - Receiving support from NASA's IV&V Facility
  - "Secure API" now available

- Still working w/ standards bodies to formally publish tailored XTCE "GOVSAT" guide

- Starting work on idea of common data access services for archive data access

- Working with the JSCC and others on long-term governance concepts

Final Comments

The GMSEC architecture and software is enabling new levels of collaboration between government and industry to efficiently meet the long-term goals we all share. The benefits of simplified integration, a broader set of available components, increased automation and the enabling of new operations concepts are realized through the open GMSEC architecture.

Backup Charts

Possible Governance Concept

DSC Support Activity (JSCC?) → *Framework Guidance* → **Lead Organization**

Lead Organization → *Issues & Enhancements* → **DSC Support Activity (JSCC?)**

- Generic Needs
- Strategic Plan

- Framework Guidance

- Needs, plans

Gold Standard Lab

Sat C2 Framework Support Group

Technical Support Team –
Repository knowledge, adapter support, framework experts

→ *Consult* →

Multiple Small Development Teams

Gold Integration, Test & Demo Lab

QA
CM
Test
Archive

Gold System Certified Framework, Applications Components and Data Models

→ *Gold Products* →

Programs

System X Program Office

Engineering and Design Group

Dev. & Integration Group

QA
CM
Test

← *New Products* ←

SYSTEM X