

# **Ground System Harmonization Efforts at NASA's Goddard Space Flight Center**

Dan Smith

NASA Goddard Space Flight Center

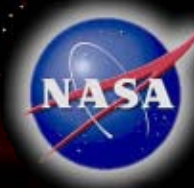




## Key Elements of NASA GSFC's Harmonization Effort

1. Moving to a Common Framework
2. Use of CCSDS Standards
3. Collaboration Across NASA Centers
4. Collaboration Across Industry and other Space Organizations

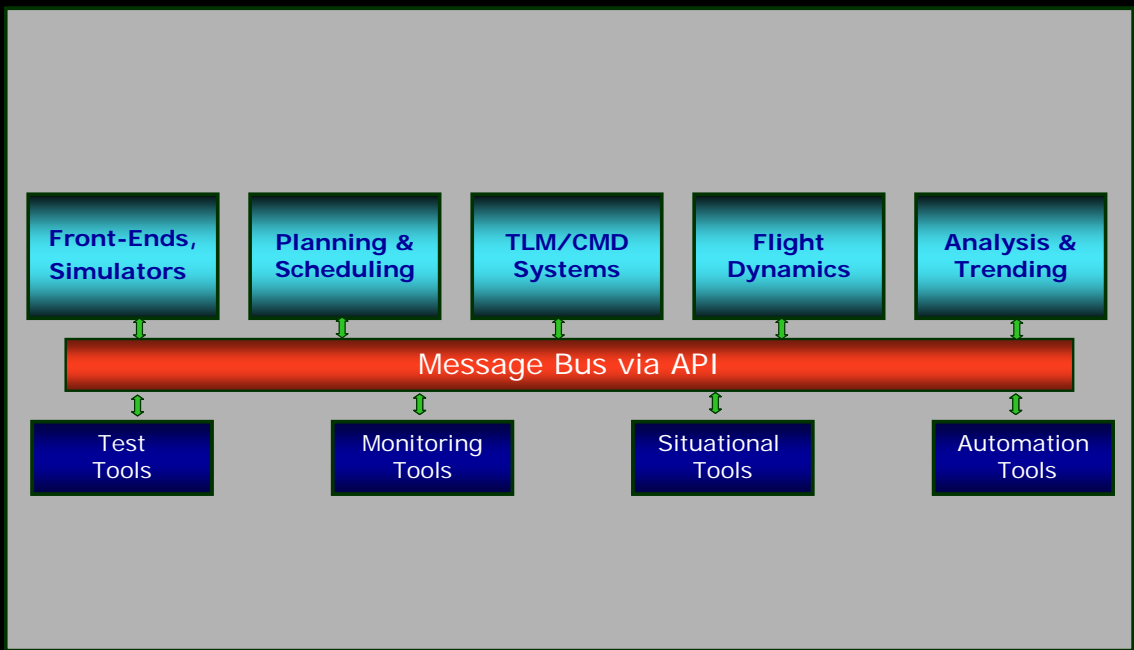
Today, the primary objective of harmonization is to reduce development and operations costs. For the future, we also see it as a way to enable new operations concepts, to increase interoperability, and to move towards enterprise approaches of managing our fleet of space assets.



# NASA/GSFC's "GMSEC" Framework Architecture



MSFC



a.i. solutions

Avtec Systems



DesignAMERICA



The Goddard Mission Systems Evolution Center (GMSEC) provides a publish/subscribe framework to enable rapid integration of commercially available satellite control products.



# Harmonization: Use of CCSDS Standards

- ◆ Standards allow for common software, use of COTS, and low-risk development and operations.
  1. CCSDS standards for telemetry and command packetized data used on nearly all NASA missions over the past 20+ years
  2. Many missions now moving to common file transfer protocol – CFDP
  3. Many missions now using standard protocol to interact with ground stations (SLE, parts of standard still under development)
  4. XTCE/GovSat has now been applied to multiple missions and tests
    - ✦ GSFC is working with CCSDS management on formal publication plans
  
- ◆ NASA is also involved with CCSDS effort to develop a Service Oriented Architecture for space/ground system harmonization
  - ✦ Very ambitious, long-term, currently being prototyped on a limited basis
  - ✦ If adopted across Europe, then it will be important for U.S. collaborative missions to utilize the new approach (at least for interfacing with international partners)



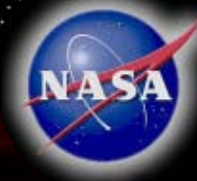
# Harmonization Across NASA Centers

- ◆ GSFC often works with other Centers
  - ❖ There is no NASA directive to harmonize mission data systems or operations; but collaborations across Centers are appreciated and may make limited funding more available.
  
- ◆ NASA now has a committee with members from multiple Centers to look at common approaches, strategic directions for standards, etc. (i.e. “Harmonization”)
  - ❖ Interesting how different terminology can be
  - ❖ The group looks at interesting questions to identify areas of common interest and understanding

**Does NASA/GSFC have more in common with the European Space Agency, other NASA Centers, or other U.S. government space organizations?**

**What if these other groups have differing views on harmonization?**

## Collaboration Across Industry and other Space Organizations



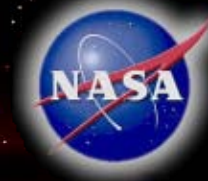
- ◆ Still firmly committed to the Joint SatOps Compatibility Efforts
  - ❖ Excellent high level NASA support and advocacy of interactions with Other Government Agencies (OGAs)
  - ❖ There have been impressive collaborations in the past year involving NASA, the ORS, the Air Force, and the NRL
    - ✦ Each relied heavily on support from the commercial product industry
- ◆ The level of support, enthusiasm, and commitment from the commercial vendors has been fantastic – there seems to be a realization that things really do need to change and that we can work together to make everyone successful.

**There is an inherently governmental role in creating the business case for contractors and commercial product vendors to move in directions beneficial to multiple government space organizations.**

# Looking Forward



- ◆ We need to work on governance of cross-Agency common software
  - ❖ Logistical, legal, and control issues need to be addressed
  - ❖ Should GMSEC become a formal standard, or just shared software and documentation?
  
- ◆ We are almost there with XTCE/GovSat
  - ❖ Changes based on first 3 uses now being addressed
  - ❖ Working with CCSDS management on formal publication
  - ❖ Working on approval cycle to release GovSat support tools as NASA Open Source
  
- ◆ We can rely on the JSCC to maintain cross-Agency communications
  - ❖ We feel that we really are changing how the U.S. government space organizations can work together towards our shared interests



# NASA Mission Statement, Vision, and Strategic Goals

## December 13, 2010 – stresses working with other government agencies

**Vision:** NASA leads scientific and technological advances in aeronautics and space for a Nation on the frontier of discovery.

**Mission:** Drive advances in science, technology, and exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of the Earth.

**Goal 1:** Extend and sustain human activities across the solar system.

### **Goal 3: Create the innovative new space technologies for our exploration, science, and economic future.**

3.1 Sponsor early stage innovation in space technologies in order to improve the future capabilities of NASA, other government agencies, and the aerospace industry.

3.2 Infuse game-changing and cross-cutting technologies throughout the nation's space enterprise, to transform the nation's space mission capabilities.

3.3 Develop and demonstrate the critical technologies that will make NASA's exploration, science, and discovery missions more affordable and more capable.

3.4 Facilitate the transfer of NASA technology and engage in partnerships with other government Agencies, industry, and international entities to generate U.S. commercial activity and other public benefits.

6.2 Promote STEM literacy through strategic partnerships with formal and informal organizations.

6.3 Engage the public in NASA's missions by providing new pathways for participation.

6.4 Inform, engage and inspire the public by sharing NASA's missions, challenges, and results.