GSAW 2008
Achieving Operationally Responsive Ground Systems
Plenary Sessions Summary

Tim E. Travis
Judy Kerner
The Aerospace Corporation
Thursday, April 3, 2008

Space Is Integral to Our Daily Lives

- World continues to become more dependent on space
  - Direct uses such as communications and GPS, plus advances in basic science from NASA and others
  - Military and civilian, with the line between the two becoming increasingly blurred
  - However, dependence on space can become a vulnerability
- Changes should be transparent to the system users
  - Last year's GPS ground station upgrade took place without users even being aware of it
- At the same time, we often undervalue and ignore the end users—they are the real customers, not the satellite operators

The Importance of the Ground

- **The heart of every space system is on the ground**
  - **Benefit from space systems comes from what the ground can do with them**
  - **Need an integrated satellite operations capability**
- **Ground systems are the enabler of operationally responsive space**
  - **Over the life of a program, ground becomes more expensive than space**
    - **But it also provides more opportunity for near-term responsiveness**
  - **Ground systems need to be "forward compatible"**

The Need for Responsiveness

- **Ground systems must work to increase responsiveness to support a number of goals:**
  - **Adapting to rapidly changing mission requirements**
  - **Shorter development and deployment times**
  - **Reducing cost of ownership**
  - **Improved customer satisfaction—for all types of "customers"**
- **We must be able to quickly integrate new technologies and legacy systems**
  - **Some of which will be stovepipes**

The Demands of Responsiveness

- **Responsiveness requires efficiently and effectively adapting existing resources to accommodate unanticipated changes in:**
  - **Mission requirements and objectives**
  - **Users**
  - **Architectures**
  - **Software packages**
  - **Hardware platforms**
  - **Interfaces**
  - **Vendors**

The Challenges of Responsiveness

- Quit competing infrastructure and emphasize mission
- Must come to grips with excessive risk averseness
  - Encourage innovation
- Never forget that better is the enemy of good enough!

The Role of Standards

- **"What few things must be the same, so that everything else can be different?"**
  - **Eliot Christian**
- **Responsiveness implies change, and change is facilitated by the use of widely adopted, open standards and modularity**
- **Standards support the mixing and matching within:**
  - **Algorithms**
  - **Architectures**
  - **Platforms**
  - **Technologies**
  - **Scheduling of system enhancements and technology refresh**
  - **Vendors**

The Importance of Testing

- Design and implementation isn't everything—testing takes on additional importance as the need for seamless evolution increases
- Testing must go beyond testing to requirements (verification) and include "test as you fly" (validation)
- The use of test beds and simulators should span the life of the program
  - Early prototypes lead to development simulation tools which in turn lead to high fidelity system simulators
- Goal is to test using as much of the real system as possible

Many Past Themes Are Now Common Practice

- What used to be major GSAW topics can now be simply mentioned in passing
  - COTS/reuse/Java/XML/Web services/…
  - Architecture methodologies, UML, etc.
  - Reference architectures
- Focus is shifting to different issues and newer technologies
  - Pervasive dependence on space
  - Net-centricity and service oriented architectures
    - Security and privacy
  - Recurring architectural patterns
  - "Back to basics"
    - E.g., sound systems engineering practices