Ground System Architectures Workshop
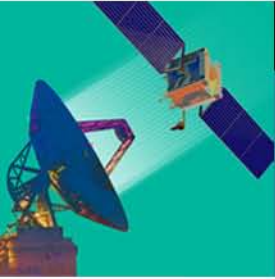
Focusing on the User

Plenary Sessions Summary

Dan Balderston
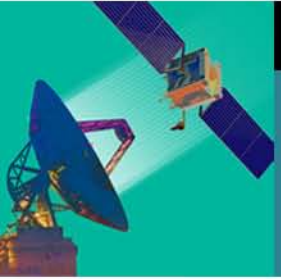*Judy Kerner*
The Aerospace Corporation
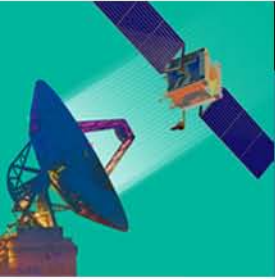
Themes

- Responsiveness - faster than "speed of need"
- User engagement
  - Culture changes needed on multiple fronts
    - Resource, data sharing
    - Explosion of new technology and potential
  - Tools / techniques continue to mature
  - Mission, business focus
- Enabling evolution
  - Use of open systems, standards
  - Evolution-driven architectures (interoperability layers)
- Enabling interoperability, integration and data sharing
  - Continued fighting "isolated silos of information"
  - 'Sharing' in tension with IA and culture.   "Need to share everything, except…"
- Standards – key to enabling advances
  - XML everywhere, but by itself is not sufficient
  - Some maturing well (XTCE for core CMD/TLM)
  - UML, GEMS, SOLM, UPMS/SOAML, CCSDS, DTN
- SOA reality check
  - Hard engineering work still must be done
  - Serious trade-offs at system level
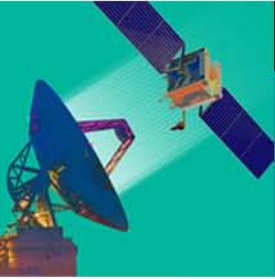 - Net-centricity / system-of-systems objectives even harder

Upticks

- **SOA is taking root**
  - DCGS, GMSEC, TSAT/TMOS
- **Virtualization, cloud computing is real**
  - Data centers are converting in ESA, DoD, NRO
- **Key GS standards in operations**
  - XTCE, CCSDS
- **Explosion in consumer demand for data**
  - All domains
- **Information assurance, cyberspace, threat increases gaining recognition**
  - As GS moves to share …
  - As adversary threats mature
- **GSAW community collaboration – advancing / increasing**
  - USN, other commercial providers for link services
  - ORS using NASA GMSEC as a message passing protocol
  - Push for CMD/TLM standard across U.S. and international organizations
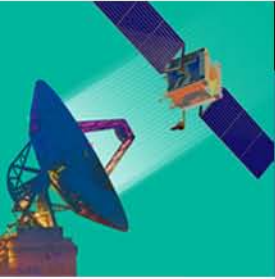 - Lots of hall talk, networking, continuing efforts beyond GSAW

… the more they stay the same

- **User engagement through lifecycle is key**
  - Challenges remain
    - Who are all the users?
    - Don't know early on who will operate the system
    - Users have their day jobs (can reservists bridge gap?)
    - Unanticipated users
    - What to automate, can users trust/accept it
  - Solutions continue to develop
    - Methodologies for capturing and validating user needs
    - Strategies for engagement throughout lifecycle
    - Defining quality attributes, rule- and scenario- driven engineering

- **Open source, open architectures key**
  - Continued challenge to define, implement, enforce

- **Political, economic, business, cultural barriers to information sharing**
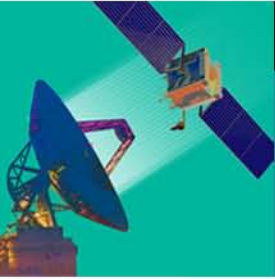
Downticks

- Information silos <u>slowly</u> merging, opening up

- Current workforce
  - Tail-end of baby-boomers

- Future workforce
  - Academic sponsorship, research (software)
  - K-12 engineering / sciences

- Stability
  - Yesterday will always be more stable
    - Technology, national security, economics, workforce, exploding consumer demand, …

Quotes

- **Responsiveness**
  - Faster than the speed of need
  - Space mission is a 3-dimensional chess match.   Then mix in cyber space…
  - Many of our systems are old enough to vote (some old enough to drink)
  - Don't look at your calendar, look at your watch

- **Users sharing computing services**
  - …like pay toilets on airlines
  - {various analogies to breaking down family structures}
  - …like convincing the user that a Tata car serves the same function as his Ferrari
  - "Mine, Mine"

- **Engineering**
  - We're building enterprises, but we have no enterprise architects, enterprise engineers
  - Maybe we can't integrate the systems, but we can interoperate them
  - We have a complete list of all the standards we don't use

- **Space-Ground**
  - Only 2 things come from space: debris and data
  - A satellite without a ground system is like a kite without a string
  - Ground is the enabler of the mission, it is the heart and soul

Some Take-Aways

- **Standards take persistence, time, application, but pay off**

- **Architectures must be evolved in concert with users needs**

- **Sharing means giving up control**
  - **Trust? Who will pay? Own?**

- **Real collaboration everywhere**
  - **The GSAW community is alive, collaboration is spreading**

- **Technological advances continue exponentially**
  - **Can I task the satellite from my iPhone yet?**
  - **The ground enables the mission**

    >> Have you overestimated next year, and underestimated the next 10? …

> **… Come back and share your vision at GSAW 2010**
> *Innovation on the ground*