GSAW2006:
Applying Technology to Operational Goals
Plenary Sessions Summary

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Heard at GSAW2006

- **Cheapest way to do things is to do them right the first time**
- **We build stovepipe systems really well**
- **Satellites are just expensive peripheral devices**
  - Ground is the brains of space systems
  - Ground is the heart of space, determines capabilities for the user
- **Or, in grid services approach, satellites are just the service**

- **Technology tree, opportunity tree, decision tree**
- **Service-oriented architectures, complexity**
- **Consensus   (turtles)**

- **Interoperability - more of a coordination challenge than a technical challenge**
- **Interoperability isn't everything**
- **Lights-out autonomous model-based operations, configured via XML**

The Way It Was:
GSAW97 User/Acquirer Goals

User/Acquisition Community Goals

- Lower cost (development, operation, maintenance)
- Fewer operators
- "Normalized" operations
- Integrated operations
- Interoperability and commonality
- Vendor-independence
- Flexible, extensible systems

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10th Anniversary
1997 to 2006
GSAW 06
Ground System Architectures Workshop

User/Acquisition Community Questions

- How do we standardize interfaces?
- How do we achieve open architectures?
- Is "modular" software the right thing to do? Does OO get us there?
- How do we realize the benefits of re-use and COTS?
- How do we achieve interoperability and integration? (and when is interoperability really needed?)

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10th Anniversary 1997 to 2006
GSAW 06
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GSAW97 Supplier Responses

Supplier (Integrator, Vendor, Government) Community

- We know how to do it. Just use our
  - Open, scaleable, distributed, standards-compliant, (COTS-based), plug-and-play, componentized, object-oriented, workstation-based, table-driven, customizable, layered architecture

- Don't mandate
  - architectures (how to do it)
  - rigid requirements (e.g. subsecond response time)

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Technology Community - Solutions

- Software Architecture Attribute Analysis - Risk driven "just do it"
- Identifying architectural mismatches that arise from architectural styles
- Novel architectural styles (e.g. C2)
- Intelligent integration infrastructure ("wrappers")
- Customizable, generic, and dynamically reconfigurable architectures

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GSAW2006: Old Themes, New Semantics

☞ **Using technologies: from concepts to prototypes to ops experience reports**

- **Mission success: delivering capabilities and services to end users**
- **Horizontal integration**
- **Product lines**

- **Mitigating macro-risks**
- **Software development standards are coming back**

- **Layered architecture for extensibility and evolvability**
- **Wrappers or adapters to incorporate COTS and legacy systems**
- **Common interfaces, standard communications and formats**
- **Consensus reference architecture**

- **Cultural challenges - using trust to overcome fears**
- **Change is hard - not bad, but hard**

Some of This Year's Acronyms

- **Info systems evolution: RDBMS -> CORBA -> EAI -> SOA**

- **CCSDS, SLE, ITIL**
- **XML, WSDL, UDDI, SOAP, and also XTCE**

- **SOA, EDA, NCES, COI**
- **NCO, NCOW, NCOIC**

- **GHIPS, GSPML. GMSEC, GSMO**
- **CEV, CLV, ISRU**

- **ESA, DLR, CNES, …**

- **M&C, FDS, MPS**

Increasing Complexity

- **Integrated systems of systems, grids of grids**
  - **Even for smaller systems**
- **Net-centric systems, net-centric operations**
- **High situational awareness**
- **At least 2 orders of magnitude more code on the ground than in space, and likely more in the future**

- **Complex systems are more likely to fail than simple systems**
- **Complexity is the archenemy of security**
- **"Software allows us to build systems with a level of complexity and coupling that is beyond our ability to control"- Prof Nancy Leveson**

- **Incremental block acquisitions**
- **Simplicity paradigms - "Less is more" and "KISS"**

GSAW97 Headliners

KISS!
Just do it!
Small is beautiful!

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Challenge for 2007

- **How do we apply and evolve today's technologies to control tomorrow's increasing complexities?**

- **Come back for GSAW2007 March 26-29, 2007**
  - and tell us!
  - or - come find out!