
Future Visions of Interoperable Ground System Product Lines

**Workshop 4 Outbrief
Second Software Product Line Conference
August 21, 2002**

Issues Raised in CFP

- **Who are the stakeholders of ground system product lines?**
 - ❖ Operators, developers, acquirers, sustainers, others?
- **What are the requirements/desires for interoperability?**
 - ❖ What data is exchanged between ground systems?
 - ❖ Between ground system components?
 - ❖ Between ground systems and space assets?
- **Are current ground system product lines already interoperable?**
 - ❖ Why/Why not?
- **Where they are not, could they be? Should they be?**
 - ❖ Why/Why not?
- **What would it take for ground system product lines to be interoperable?**

Participants (1)

Workshop Co-chairs

- **Judy Kerner**
 - ❖ The Aerospace Corporation
- **Mark Walker**
 - ❖ The Aerospace Corporation

Workshop Steering Committee

- **Mike Hogan**
 - ❖ The Aerospace Corporation

Presenters

- **John Bristow**
 - ❖ NASA Goddard Space Flight Center
- **Cliff Hollander**
 - ❖ The Hollander Group
- **Larry Preheim**
 - ❖ Jet Propulsion Laboratory
- **Ramesh Rangachar**
 - ❖ Intelsat
- **Daniel Vanderwarker**
 - ❖ The Aerospace Corporation

Participants (2)

- **Shane David**
 - ❖ The Analytic Sciences Corp.
- **Brad Kizzort**
 - ❖ Harris Technical Services Corp.
- **Greg Marlow**
 - ❖ Intelsat
- **Ken Shere**
 - ❖ The Aerospace Corporation
- **Dan Smith**
 - ❖ NASA Goddard Space Flight Center
- **Shirley Tseng**
 - ❖ Infinite Global Infrastructures

Non-attending Authors

- **David Cadmus**
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- **Jeff Outwater**
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Workshop Approach

- **Short presentations**
- **Breakout group discussions**
 - ❖ Technology Directions
 - ❖ Transitioning Theory to Practice
- **Group integration of conclusions**
- **Next steps**

Technology Directions Group Results

- **Reference architectures**
 - ❖ Need consensus on services, not structure, of architecture
 - ❖ Services are characterized by interfaces not by implementation
 - ◆ Interfaces are more stable than implementation
 - ❖ Identify/define interface standards for consensus services
 - ❖ Architectures can evolve by extending Interfaces to access new technologies/functions
- **Achieving consensus on reference architecture:**
 - ❖ Seems possible on the set of services
 - ◆ Group was moving toward consensus on granularity
 - ❖ Probably not yet possible for how services are organized/configured/grouped
- **Trade-offs to consider**
 - ❖ Granularity of service definitions: consensus vs. implementability
 - ❖ Customer control of product line architecture vs. developer choice

Transitioning Theory to Practice (“Reality Group”) Results

- **Moving to product lines requires cultural/organization change**
 - ❖ Must make the business case first
 - ◆ Requires enterprise view vs mission view (strategic direction)
 - ❖ Operations concept and system lifecycle can justify product line
 - ◆ Example: NASA GSFC best practices – business process re-engineering of missions, but needed to retain control of funding
- **Getting standards established**
 - ❖ Develop via standards committee process or via individual industry-led or customer-led process
 - ❖ Initial approach
 - ◆ A few high-level standards are more likely to be accepted
 - ◇ Soft meta-standards (e.g., XML) and infrastructure standards
- **Relatively small ground system market makes developing product lines and standards a challenge**

Next Steps

- **Create a resource list**
 - ❖ Best practices/lessons learned
 - ❖ Reference architecture developments
 - ❖ Prioritized list of interfaces for standardization
- **Establish forum to facilitate consensus on reference architecture**
 - ❖ Coordinate with organizations already working in this area
 - ◆ OMG Space Domain Task Force, AIAA
 - ❖ Continue work at next Ground System Architectures Workshop (GSAW)
- **Work to inject ground system standards into DoD programs**
 - ❖ e.g., via Joint Technical Architecture
- **Long term goal**
 - ❖ Achieve consensus on reference architecture for spacecraft ground systems

GSAW2003

- **GSAW is a series of annual workshops to facilitate exploration of issues and potential for consensus in software architectures for spacecraft ground systems**
- **GSAW2003 scheduled 4-6 March 2003 in Los Angeles, CA**
- **See <http://sunset.usc.edu/GSAW/> for previous workshops**
- **For more info on GSAW2003: gsaw@aero.org**