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
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Workshop Steering Committee
• Mike Hogan
  ❖ The Aerospace Corporation

Presenters
• John Bristow
  ❖ NASA Goddard Space Flight Center
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• Larry Preheim
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• Ramesh Rangachar
  ❖ Intelsat
• Daniel Vanderwarker
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Participants (2)

- **Shane David**
  - The Analytic Sciences Corp.
- **Brad Kizzort**
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- **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**
  - Boeing Satellite Systems
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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