Working Group 11E
Architecture-Centric Evolution (ACE) of Software-Intensive Systems

Chairs

John Arcos, The Aerospace Corporation

Sergio Alvarado, The Aerospace Corporation

Dan Balderston, The Aerospace Corporation

Sheri Benator, The Aerospace Corporation

Maryann Hutchison, The Aerospace Corporation

Mark Nixon, The Aerospace Corporation

Phil Schmidt, The Aerospace Corporation

Jeff Estefan, Jet Propulsion Laboratory

Shana Lloyd, The Aerospace Corporation

Eltefaat Shokri, The Aerospace Corporation

ACE Working Group Goals

- **Seventh of a GSAW series**
  - ❖ Forum for software-intensive system experts, users, developers & researchers to collaborate and elucidate high-level recommendations for improving software architectures representation, development, & analysis

- **Topic**
  - ❖ SOA (Service Oriented Architecture) based approaches for architecting satellite ground systems in a net-centric environment – Where we are today

- **Presentations & panel discussion**
  - ❖ Focus on sharing experiences in determining when (and if) a SOA-based architecture applies and experiences and lessons learned in developing or prototyping a SOA-based architecture.

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ACE Invited Presenters/Panelists

- **Acquisition and Oversight Perspective**
  - ❖ Michael Kramer, Aerospace
  - ❖ Major Steve Paine, USAF
  - ❖ John Arcos, Eltefat Shokri, Aerospace

- **Development Perspective**
  - ❖ Magdi Carlton, NASA JPL
  - ❖ Morris Brill, Northrop Grumman

- **Research Perspective**
  - ❖ Scott Tilley, SEI/CMI
  - ❖ Richard Taylor (UCI), Nenad Medvidovic (USC), Eric Dashofy (Aerospace)

- **Moderators**
  - ❖ Dan Balderston, Sheri Benator, The Aerospace Corporation

ACE Discussion Questions - 1

- **Software Architecture Considerations and Tradeoffs**
    - ❖ In your experience what types of ground system applications benefit best from a SOA architecture style (vs. other styles)?
    - ❖ What do you see as some of the prime tradeoffs in whether to use a SOA-based architecture?
    - ❖ Based on your experience how applicable is a SOA architecture style (vs. other styles) to software with real-time or near real-time performance requirements such as command and control software?
    - ❖ Discuss considerations in architecting for a single program vs. an enterprise (multi-program) development.
    - ❖ Discuss tradeoffs and techniques in maintaining independence from single vendor solutions in the software architecture.
    - ❖ "-ilities" are often drivers of architecture, implementation and operations, yet are typically difficult to quantify.   What "-ilities" are formost drivers, and discuss techniques or approaches quantifying them in the ground system domain

- **Successes, Challenges, and Lessons Learned in Applying SOA**
    - ❖ Are there any examples of successful SOA implementations for ground system applications?
    - ❖ Discuss successes, failures, and major challenges you've experienced with a SOA architecture.

ACE Discussion Questions - 2

- **Successes, Challenges, and Lessons Learned in Applying SOA**
  - ❖ Discuss some of the lessons learned in developing and/or using software with a SOA architecture.
  - ❖ Discuss your experience and lessons learned with addressing real-world security and access challenges.
  - ❖ What programs or systems have successfully implemented outward facing web services in the ground system domain? Have there been any successes while retaining heritage (non-SOA) internal system architectures?

- **Implementation Considerations**
  - ❖ Discuss any experiences in incorporating legacy applications, reuse, and commercial software into a SOA-based architecture.
  - ❖ Web services are a typical way of realizing SOA, what are other approaches?
  - ❖ What engineering skills gaps are you finding among space ground system developers to implement SOA or Net-Centric systems? (for example, anything from object-oriented development to web farm architecture, engineering, management, to vocabulary engineering and taxonomy / metadata technologies)
  - ❖ How do you insert new technologies into real-world applications?
  - ❖ What software process implications do SOA architectures have?

ACE Discussion Questions - 3

- **Systems Interoperability**
    - ❖ What should we do in the acquisition world to leave architecture unconstrained yet maintain interoperability?
    - ❖ Where do you see the role of SOA governance? What is the state-of-practice, for example in technologies, standards, life-cycle-management?
    - ❖ How do you deal with ownership issues in a net-centric environment?
    - ❖ What architecture and implementation guidelines exist for various space system communities for integrating into a net centric environment (e.g. CJCSI 6212-E)? What is your experience with those guidelines?
    - ❖ How do you balance unique vendor capabilities with interoperability?
    - ❖ How do system interoperability concerns impact the software architecture (for example, interoperability among vendor products targeting like protocols, single product with evolving versions, constrained network environments)
    - ❖ Does net-centricity have any implication in internal architectures of systems?
    - ❖ What is the main goal in net-centric systems: interoperability or adherence to a single architecture?

ACE Discussion Questions - 4

- **Standards and Core Services**
  - ❖ Are you aware of and/or using current and emerging SOA standards, specifications, practices or other technical products from the open standards community (e.g., W3C, The Open Group, OASIS, and OMG)? Just to clarify, we are talking specifically about technical products related to the architectural paradigm of SOA; not SOA implementation technologies such as Web services.
  - ❖ What web-service standards seem promising / emerging, and which seem to be falling out of favor?
  - ❖ Discuss the role of and examples of applying core enabling web services exist in the domains that our space ground systems serve.
  - ❖ What ground system data standards are emerging to foster interoperability, and how mature are they?

- **Future Predictions**
  - ❖ What should we do in the acquisition world to leave architecture unconstrained yet maintain interoperability?
  - ❖ How do you see the role of SOA ten years from now? Net-centricity?
  - ❖ Lately some analysts have claimed that SOA is dead. What is your reaction to this?

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Ground System Architectures Workshop

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