Software Cost-Benefit Evaluation for Future Ground Systems

The Aerospace Corporation’s Concept Design Center’s Work in Progress

GSAW 99
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Agenda

- Concept Design Center’s conceptual design approach
- Cost-benefit considerations for 2005-2020 time frame
- Critical issues
Ground System Team

Team is under development
• Kickoff midyear 1998

Future conceptual design activities
• New ground systems
• Block upgrades
• Technology insertion

Product overview
• Report with high-level
  • Design
  • Cost
  • CONOPS / requirements
**Goal**: Design high-level ground systems considering the interactions of IA, software, processing, comms, staffing, cost, etc.

**Types of studies**: New systems, block upgrades, technology and commercial component insertion, alternate comms architectures, trades

**Products**: Reports (e.g., design, cost, issues)

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**GST High-Level Design Data**
- NASA & commercial comms
- IA summary for systems
- Processing parts lists
- GST module costing data
- Staffing info
- S/W and COTS sizing

**Tailored CDC Process & Tools**
- Staffing info
- S/W and COTS sizing

**Team Experience**: 20+ to 35 years on ground systems. The team members experience includes future architecture studies, ground and space system development, systems engineering (e.g., requirements and concept of operations), proposal support, cost estimation and research activities.
Estimation at Conceptual Design Phase

- Concept Design Center conceptual designs
  - Address the 2005-2010 time frame
  - Initially, new programs focus on payload /mission
    - High-level or non-existent CONOPs
    - Incomplete functionality and requirements

- Conceptual design team
  - Captures functionality across the system
  - Predicts future capabilities and associated costs
  - Provides coherent high-level CONOPs for the system
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Hidden Costs of Saving Money

- Commercial Off the Shelf and legacy software
  - Hidden costs (e.g., glue, COTS understanding)
  - Maintainability for 10+ years

- Commercial comms & relay for military systems
  - Concept of operations
  - Performance impacts (e.g., priority)
Better, Faster, Cheaper, but Riskier

- Demo ground systems focus on near-term goals
  - Aim for faster, better, cheaper
  - Require less rigor in their rapid development
  - Simplify software development and documentation
  - Provide lower redundancy and reliability
  - Generate cheaper, smaller software modules

- Plan for legacy components in operational system
  - Address reusability of key demo system components
  - Adhere to standards and accepted practices
Information Architecture can provide

- System of system cross program integration
- User-friendly, high-volume information management
- Emphasis on standards-based solutions

Information Architecture issues for large systems

- Maturity of technology and enterprise management
- Complexity of design and test
- Data warehouse multi-level security challenges with integration of text, image, video, voice
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Critical Issues

- Selecting the appropriate technology & services
  - Utilizing commercial and legacy components
  - Predicting market trends and capabilities

- Assessing benefits for 2005+ time frame
  - Better, faster, cheaper, interoperable
  - Supporting seamless system of systems operations

- Estimating ground system costs and risks
  - Predicting future pricing strategies and capabilities
  - Assessing market impacts of commercial space