Bridging the Product Gap
towards an
Integrated Control Center

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Outline

- COTS Integration Cost Drivers
- Reducing COTS Integration Costs through GSA Standard Interfaces (GSASI)
- Integrated Control Center Architecture Based on the GSASI Concept
- GSASI Adapters for COTS Software Integration with Standard Interfaces
- Benefits to System Integrators and Product Vendors
COTS Integration Costs

- **COTS Integration Cost Drivers:**
  (as Identified by USC-CSE in the COCOTS Model)
  
  - COTS Assessment - Evaluation of COTS Products
  - COTS Tailoring - Configuration of COTS Products
  - COTS Releases - Volatility and Integration of COTS
  - COTS Glueware - Development and Test
    - Application Specific Functionality
    - Control and Status (C/S) of COTS and System Components
    - Data Exchange among COTS and System Components
COTS Glueware Cost Drivers

- **COTS Products Maturity**

- **COTS Products Interfaces:**
  - Complex, Proprietary, Non-Standard
  - Lack Adequate Documentation and Training

- **COTS Products Incompatibility**
  - Not Designed to Inter-Operate with other COTS Products or Custom Software

- **COTS Integration**
  - Highly Constrained by the Design of the COTS Interfaces
  - Often Deferred until Late in the Program Schedule
    - Eliminates Possible Vendor Changes to the COTS Product.
    - Eliminates Changes in Selection of COTS Product.
    - Increases Amount and Complexity of the Application Glueware Software
Reducing COTS Integration Costs through GSA Standard Interfaces

- Adopt a set of GSA Standard Interfaces (GSASI) for the Ground Station Domain.

- **GSASI Provides:**
  - Interface Definitions for each GSA Functional Area
  - Open, Non-Proprietary Definition of Interfaces based on Industry Accepted Standards (e.g. IDL)
  - Plug and Play of COTS Products which Support the GSASI
  - Program Risk Reduction - Vendors would Support Defined Mission Operations GSASI and Associated Services

- **GSASI Adapters**
  - Provides the Connector From the Existing COTS Product, or Custom Software, to the GSASI.
Mission Operations Functions and Interfaces

Legend:

- Control/Status
- Information (Data)

Source: Adapted from “ANSI/AIAA R-023A-1995 Recommended Practice: Human-Computer Interfaces for Space System Operations; Appendix A: Architectural Views of Space Missions Operations”

Sample Architecture Based on the GSASI Concept

Legend:
- **OS/ICC Component**
- **Other Component**
- **Other COTS**
- **Oracle**
- **Sybase**
- **SQL**
- **Custom/Other COTS**

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Sample GSASI Adapter for COTS Integration with GSASI

- Define GSA Standard Interfaces (GSASI) for Mission Control
- Drop-In Existing OS/COMET COTS Product and APIs
- Develop GSASI Adapter to Provide Connectivity Between GSASI and the OS/COMET COTS Product.

Legend:
- OS/ICC Component
- Other Component

GSASI A Adapter

GSASI B Adapter

GSASI C Adapter

OS/COMET COTS (STI)
Examples of Standard Interfaces
In Other Domains

**Simulation**

- **HLA - High Level Architecture**
  - Developed by the Defense Modeling and Simulation Office (DMSO)
  - General purpose architecture for simulation reuse and interoperability under the HLA federated concept.
  - HLA was adopted by the Object Management Group (OMG) in November 1998 and is now in the process of becoming an open standard through the IEEE.

**Software Data Radios**

- **MMITS - Modular Multifunction Information Transfer System**
  - Open, Non-profit Corporation with Government and Industry Participation
  - Support the development, deployment, and use of open architectures for advanced wireless systems.
  - Developing Standard Architecture and Interfaces for Plug-in of RF Waveforms
Benefits

■ System Developer Benefits
  - Reduces Costs and Risk associated with COTS Integration
    - COTS Packages Support Defined GSASI
  - Support for Open, Industry Standard Interfaces
  - Substitutability of COTS Products that support the GSASI

■ Vendor Benefits
  - Makes Basic Services Commodities, Allowing R&D Funding to be Redirected for Add-on Services
  - Provides an Avenue for Competing Directly with Custom Software Components.
  - Standardizes Interfaces for Inter-COTS Communications, Increasing the Use of COTS Products in Ground Station Architectures.