Space Universal Modular Architecture (SUMO)

Progress and Prospects

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SmallSat 2014
Topics

• SUMO Overview
• SUMO Transition Plan
• SUMO Workshop
• CSIS Workshop
• SmallSat Implications/Opportunities
• Conclusions and Prospects
**Space Universal MOdular Architecture (SUMO)**

**Goal:** Reduce the cost of satellites and help the US industry be more responsive in a growing international space market

**What:** Interoperability of satellite components through universalized environments and standardized data and electrical interfaces

**How:** Leverage existing & evolving standards to help US industry embrace industry consensus standards (which could become international)

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**Collaboration**

**SUMO Certified Components**

**Standards Process**

**Transition Plan**

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**SUMO Certified Components**

**Space Universal MOdular architecture SUMO**

**Plug & Play**

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**US Space Industrial Base**
- More Competitive Internationally
- Larger Addressable Market
- Less Time to Market/Orbit
- Increased Innovation

**US Government Buyer**
- Reduced Acquisition Costs
- Enhanced Capabilities

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**ODNI**

**NRO**

**AFRL**

**SMC**

**NASA**

**Industry**
SUMO Interfaces Concept

Component Interfaces Defined by Application

Supplier A

Symbol

OR

Prime X

Symbol

Prime Y

Symbol

Prime Z

Symbol

Catalog, Common, or Custom Bus

Component Interfaces Defined by Industry Consensus

Supplier A

Symbol

OR

Prime X

Symbol

Prime Y

Symbol

Prime Z

Symbol

Modular Bus with Open Interfaces
Leverage past and present government and industry investments to progress from proprietary, custom architectures to modular, open network architectures

Industry:
- Time-Triggered Gigabit Ethernet
- SPA Variants
- IRAD >$100M
- Integrated Modular Architecture
- Universal Qualification Environments
- Platform Commonality Framework

SUMO Heritage

AFRL: NGSIS
DARPA: F6 Experiment Opportunities $300M
ORS: MSV Risk Reduction Opportunities $50M
NASA: Common Instrument Interface
SMC: MONA and SNAP for Hosted payload interfaces
NASA: SpaceAge Bus $4M, 13 Missions
AFRL: MONARCH (SPA) $130M
NASA: Core Flight Executive $12M, 20 Missions
Industry: Universal Qualification Environments

Collaboration Fora:
EXISTING:
- Integrated Transition Team
- SUMO Special Interest Group*
- CCSDS Spacecraft Onboard Interface Services
- One-on-one technical interchanges

DEFINED:
- Letter of Intent
- Space Industrial Base Council Working Group
- DPA Title III Presidential Determination

DEVELOPING:
- Cooperative R&D Agreements
- Consortium for Space Industry Standards

Setting the Environment for Industry-Consensus Standards

*http://mailman.ccsds.org/cgi-bin/mailman/listinfo/uspacesig
SUMO Transition Plan

**Track I**

Engage Stakeholders

- Gov’t Agency Collaboration (ITT)
- Industry Consensus (CSIS)

**Agreements:** Inter-Agency LOIs
**Charters & Forums:** SIBC/ITT, CSIS

**Track II**

Develop Standards

- Detailed Plan
- Develop Standards
- Codify Standards

- Industry Leads
- Government at Table
- Develop Standards
  - Gap Analysis
  - Harmonize existing
  - Develop New
  - Design Conformity
  - Assessment
  - Consensus Draft
  - SDOs Support/Codify

**Track III**

Demonstrate Standards

- Bench Demos w/ 1st Article Production Components at Gov’t Labs

- Component Demos/Prototypes
- Flight via One-Offs & Hosted P/Ls
- Requirements for Standards on PORs
- Programs of Record (PORs)

**Legend**

- Government Agencies
- Industry (Primes & Suppliers)
- Standards Devel Orgs (SDOs)
• “The What”
  – Interface standards
  – Common qualification environments

• “The Why”
  – Business case

• “The How”
  – SUMO ITT
  – CSIS
• Overview
  – Kick-off the formal standards efforts
  – Transition to industry leadership
  – 75 participants ~50-50 government-industry

• Technical Working Groups
  – More than 20 breakout sessions
  – Software Architecture, Electronic Data Sheets, Cyber Security, Hardware Interfaces, Hosted Payloads, and Common Qualification Environments, and many others
CSIS Structure

- SUMO Architecture of Standards (AoS)
- Consortium for Space Industry Standards (CSIS) Steering Committee

CSIS Sub-Groups:
- Data Interface Standard(s)
- Electrical and Physical Interface Standard(s)
- Environmental Qualification Standard(s)

Electronic Data Sheets

- SW Reference Architecture
- Physical Characteristics
- Signal Characteristics
- Component Qualification
- Parts Qualification

Data Model

- Data Link
- Bus Power Voltage and Quality

Cybersecurity

Level of Maturity

- Used to organize our efforts
- Puts Candidate Subject Areas in Context
- Aligns to Industry Survey Interests
CSIS Organization(s)

Facilitate SUMO Transition
Advise Industry

Govern Standards Process

Develop Standards

ITT
Integrated Transition Team

CSIS
Consortium for Space Industry Standards

TWG 1
Technical Working Group

TWG 2
Technical Working Group

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Industry-Led, Government-Advised, SDO-Supported Standards Development

ITT – Integrated Transition Team (Tri-Chair: NASA, SMC, NRO)
CSIS – Consortium for Space Industry Standards

TWG – Technical Working Group
SDOs – Standards Development Organizations

Advisory Group
Cooperative Relationships
Sub-Domain Working Groups
SmallSat Implications/Opportunities

- The Small Satellite movement provides much of the foundation for SUMO and CSIS success
- SmallSat players are conspicuously involved
- SmallSats will, almost certainly, be leveraged to demonstrate and validate the technologies
- The SmallSat industry will benefit greatly from SUMO success
- SUMO may open the doors to smallsats and smallsat manufacturers moving up-market
Conclusions and Prospects

• The transition to industry leadership is occurring

• Government and industry are coordinating formal commitments

  ⇒ Business cases that close

• CSIS is established and operating

• The stage is set, but it is not yet a “slam-dunk”
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