GSAW 2019 Tutorial K:

Introduction to Space Domain Task Force (SDTF) Specifications – XTCE, GEMS, SOLM, XUSP, and C2MS

Length: Half day

Overview:

SDTF SPECIFICATION OUTLINE

I. Introduction
   a. Who are your instructors?
   b. What are your expectations for the tutorial?
II. Command and Control Messaging Specification
   a. Origin of C2MS (GMSEC, CompatC2)
   b. Message Interaction Patterns
   c. Message Header Fields and Usage
   d. Key Message types for satellite control
   e. Transport layer independence
   f. Programs using C2MS
III. Ground Equipment Monitoring Service (GEMS)
   a. What is GEMS?
   b. Model-Driven Architecture and the GEMS monitoring model
   c. GEMS Messages
      i. GEMS-XML
      ii. GEMS-ASCII
      iii. GEMS-JSON (Future)
   d. System Considerations for using GEMS
      i. Device Definitions
      ii. Data Transport
      iii. Authentication
      iv. Versioning
      v. Transports & Encryption
   e. Programs/vendors using GEMS
IV. Satellite Operations Language Metamodel (SOLM)
   a. What is a Language Metamodel?
   b. What are the benefits of using SOLM?
   c. The basic elements of SOLM: Procedure, Activities, Parameters, Commands, Actions.
   d. The SpacePython definition and mapping in SOLM
   e. Portability Considerations
   f. Programs/vendors using SOLM
   (Break)
V. XML Telemetry and Command Exchange (XTCE)
   a. What is XTCE?
   b. Overall Structure of an XTCE document
   c. Data Types
   d. Containers
   e. The Telemetry Side of an XTCE document
      i. Parameters
      ii. Containers
      iii. Alarms
   f. The Command Side of an XTCE document
      i. Command elements
   g. Command processing flow

h. TrivialSat (Hello, World in XTCE)
i. Programs using XTCE

VI. XTCE US Government Satellite Conformance Profile (XUSP)
a. Why Does XTCE need a Conformance Profile?
b. Structure of the XUSP specification
c. Using Xpath to test conformance
d. The XUSP template XTCE document
e. Extending the telemetry definitions in the XUSP template
f. Extending the command definitions in the XUSP template
g. Programs using XUSP

VII. How the Specifications Work Together
a. All of the specifications contribute to a maintainable ground system
b. Future specifications to aid ground system maintainability
c. Web Links, Contacts

Instructors: Brad Kizzort, Peraton, Inc.; Gerry Simon, Kratos Integral Systems; Luis Rodriguez, AMERGINT Technologies; and Jay Bugenhagen, ASRC Federal Technical Services

Biographies:
Brad Kizzort – over 25 years' experience building ground operations and I&T systems for spacecraft. Currently chief technologist for the OS/COMET product and is responsible for insuring the product evolves to meet new and existing customers' requirements for spacecraft monitoring and control. One of the original contributors to the SOLM specification and was task force chair for the publication of XTCE 1.2, XTCE 1.1, XUSP 1.0, SOLM 1.0, and C2MS.

Gerry Simon – has 28 years' experience in software, hardware, and systems engineering within the space and telecommunications industries, including positions as System Engineering Manager, Chief Engineer, Chief Technologist, and Chief Architect. One of the original contributors to the XTCE specification and task force chair for the publication of XTCE 1.0

Luis Rodriguez – 15 years' experience developing and delivering solutions in the space communications industry. Currently the front-end software architect at AMERGINT Technologies focusing on evolving solutions to meet customers' needs with new technologies. Other original author of the GEMS specification and a current co-chair of the SDTF.

Jay Bugenhagen – over 20 years' experience building software and systems for the space and aviation industries. ASRC Federal Technical Service's system engineer on the GMSEC project at NASA Goddard Space Flight Center working with development and mission support. Contributor to the C2MS submission and task force chair for C2MS 1.0.

Description of Intended Students and Prerequisites:
Students having some familiarity with spacecraft operations would clarify the purpose of each of the specifications. The tutorial accepts no prior knowledge of any of the specifications. The tutorial will be useful for program managers and system engineers interested in understanding the scope and applicability of the specifications.

What can Attendees Expect to Learn:
Attendees will be introduced to the concepts behind each of the Object Management Group (OMG) Space Domain Task Force (SDTF) published specifications.

- XML Telemetry and Command Exchange (XTCE)
- Ground Equipment Monitoring Service (GEMS)
- Satellite Operations Language Metamodel (SOLM)

- XTCE US Government Satellite Conformance Profile (XUSP)
- Command and Control Messaging Specification (C2MS)

Students will learn the requirements covered by each of the SDTF specification. Students will learn how satellite programs can benefit from adopting each specification, how to apply the specification to a particular satellite program, and how the specifications can work together to reduce satellite ground system acquisition and maintenance costs.