



Introduction

The Object Management Group® (OMG®) Space Domain Task Force (SDTF) (<https://www.omg.org/space/>) has developed four specifications that reduce the cost to develop, deploy, and maintain space systems. Additional specifications are planned. Each specification plays an important role in increasing interoperability of ground system components as well as reducing costs and risk for space applications. They are:

- **XML™ Telemetric and Command Exchange™ (XTCE™)** – A non-proprietary standard description language of telemetry and command parameters that allows the definition of space link frames and packets to be exchanged among manufacturers, vendors, testers and operators.
- **Ground Equipment Monitoring Service™ (GEMS™)** – Standardized message protocol and syntax for ground equipment that reduces system integration costs.
- **Satellite Operations Language Metamodel™ (SOLM™)** – A specification for the interchange of satellite operations procedures between organizations and ground systems.
- **XTCE Profile for US Government Satellites™ (XUSP™) (aka GovSat)** – A defined subset of the XTCE exchange format for satellites using the CCSDS packet protocols for space links that reduces the impact on a ground system to support XTCE.

Value Proposition

Using subsystems that comply with SDTF standards has several potential benefits:

- Provide **Modular Capability** for known effective system builds among space-based systems;
- Provide ready **Building Blocks** that improve portability, reduce costs, promote quick rebuild and avoid vendor lock-in;
- Allow **Reprogrammable Repeatable Products for Changing Requirements and Missions**;
- **Reduce Risks** with standard-compliant solutions from trusted suppliers with expertise in the domain;
- Limit **Risk Budget** through eliminating unknown variances in cost, schedule and performance; and
- **Accelerate** business development with standards-based solutions.

OMG Space Domain Specifications

OMG XTCE uses a carefully defined and annotated XML™ schema to allow the exchange of telemetry and command definitions. Using a common exchange format streamlines the process of transferring definitions from the satellite integrator to the operations team and between ground systems supporting the same satellite. This reduces the need to develop mission-specific database import/export tools and enables the creation of multi-mission command and telemetry database tools for space link definition management. A satellite operator transitioning from one ground system to another can simply move an existing command control and telemetry database compliant with this specification to the new system. Visit <https://www.omg.org/spec/XTCE/1.1/Beta1/About-XTCE/>.

OMG GEMS defines a lightweight, easy-to-use interface model suitable for control and status of nearly all types of devices within space-related ground systems, such as modems, frame synchronizers, antenna controller, etc. Ground systems contain many devices and the control and monitoring software must be adapted to accommodate numerous interfaces defined by different manufacturers. System integrators must learn multiple APIs and develop applications libraries to account for significant variations in API designs and system behaviors from one vendor to another. GEMS solves this complexity by specifying a Platform-Independent Model for device control (using OMG's Model Driven Architecture® design approach), and then mapping that model to a specific protocol and syntax. One driver implementation can support many different devices. Visit <https://www.omg.org/spec/GEMS/1.3/About-GEMS/>.

OMG SOLM defines a Satellite Operations Language Metamodel to represent spacecraft operations procedures. These procedures contain sequences of instructions to conduct spacecraft operations, typically consisting of spacecraft commands and spacecraft telemetry comparisons. Historically, these procedures have been captured in flowcharts, text manuals, and a number of different scripting languages used for ground station automation. SOLM instead provides a unified way to represent procedures for spacecraft operations, based on a standardized metamodel. This facilitates the transfer of these procedures between the spacecraft integrator and the spacecraft operator. Visit <https://www.omg.org/spec/SOLM/1.0/Beta2/About-SOLM/>.

OMG XUSP defines a subset of XTCE that was originally referred to as GovSat before it was formalized and published as an OMG specification. By agreeing on a common subset of exchange fields, a higher percentage of telemetry and command definitions can be interchanged between different ground systems with no development costs. Visit <https://www.omg.org/spec/XUSP/1.0/Beta2/About-XUSP/>.

The SDTF specifications are designed to reduce ground system costs by increasing interoperability and reducing the cost of technology refreshes that update ground hardware and software. The SOLM specification includes a data model that supports both the XTCE and GEMS concepts of telemetry parameters, so that portable procedures can be developed to control spacecraft and configure ground equipment. The SDTF plans to use the OMG Model Driven Architecture® to create further specifications that allow spacecraft operators to migrate the knowledge base of operations experience and data to new ground equipment and computers.

Next Step

We are happy to discuss how OMG membership will benefit your organization! Feel free to explore our website at www.omg.org and when you are ready, please contact bd-team@omg.org or call + 1-703-231-6335 to get started.

About OMG

The Object Management Group® (OMG®) is an international, open membership, not-for-profit computer industry standards consortium. OMG Task Forces develop enterprise integration standards for a wide range of technologies and an even wider range of industries. OMG modeling standards enable powerful visual design, execution and maintenance of software and other processes. Visit www.omg.org for more information.

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