

Utilizing Focused Standards as Building Blocks for Satellite Control

GSAW 2009

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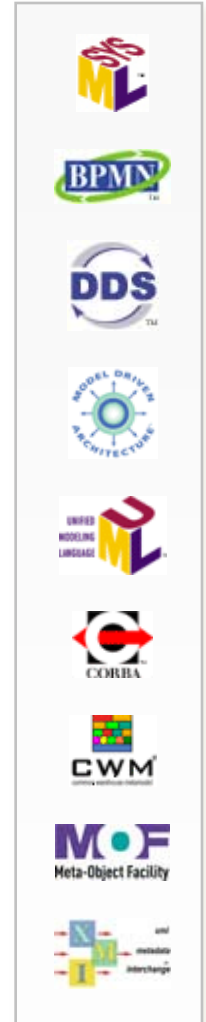
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OMG Space Domain Task Force

- Object Management Group (OMG)
 - International, Not-For-Profit Consortium
 - Platform & Domain Task Forces
- OMG Space Domain Task Force (SDTF)
 - Fosters cost-effective, timely standards for the Space Domain
 - XTCE (XML Telemetry and Command Exchange)
 - Aids In The Transfer Of Telemetry and Command Databases From Satellite Manufacturer To Control Center
 - Now A CCSDS Blue Book
 - GEMS (Ground Equipment Monitoring Service)
 - Simple Model-Based Protocol For Device Control
 - SOLM (Spacecraft Operations Language Metamodel)
 - Aids In Porting Scripts From One TT&C Procedure Language To Another



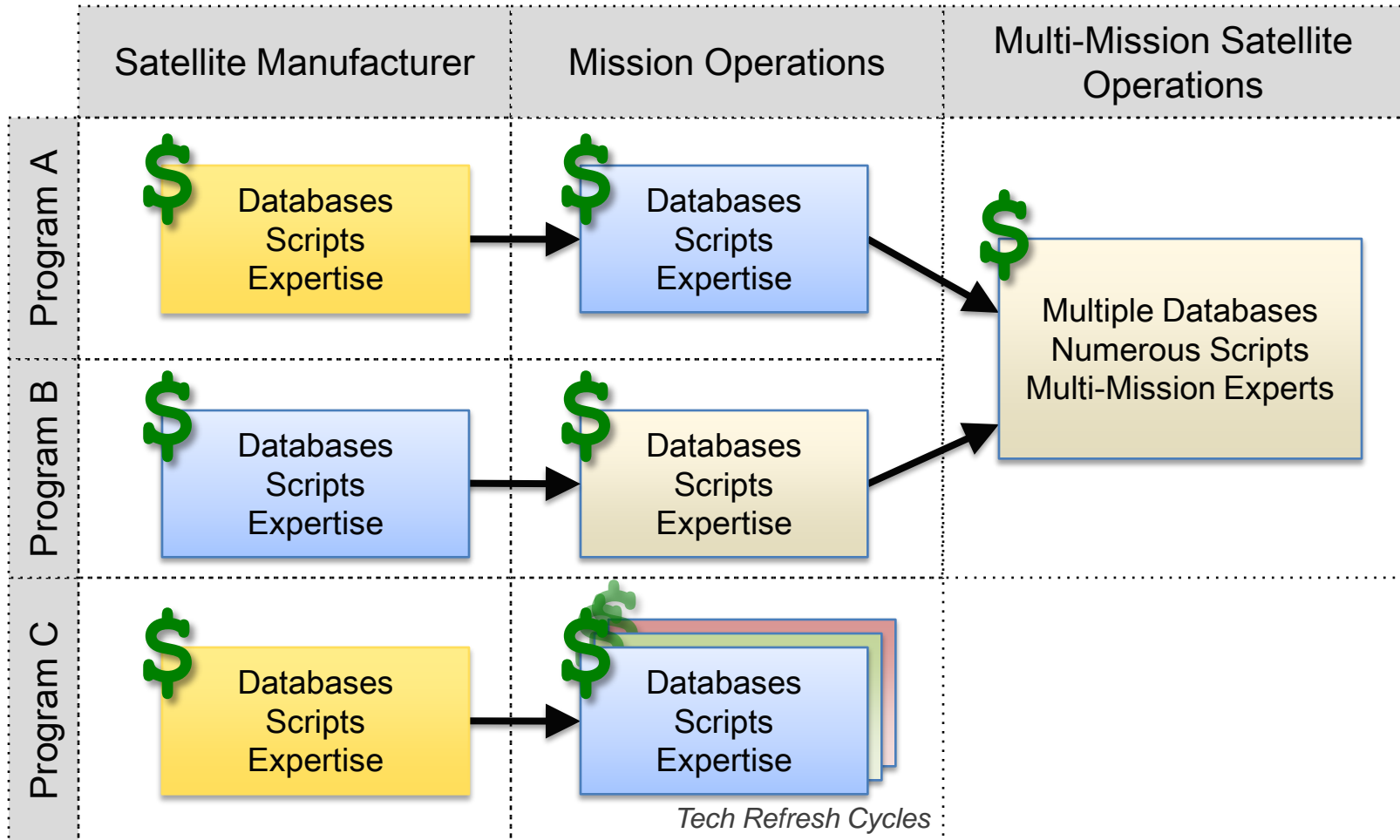
Key Questions About Standards

- Key Questions Regarding Standards
 - How do we measure the success of a standard?
 - Short-term or long-term cost savings?
 - Number of implementations?
 - Longevity?
 - Positive thinking?
 - Does the success of a standard correspond to the size/scope?
 - Are implementers more likely to adopt a smaller or larger standard?
 - Does size/scope affect how the standard is used in other domains?
 - How do we balance standardization with rapid technology change?

Unique Concerns For The Space Industry

- What makes the space industry such a challenge?
 - Longevity
 - Space programs can last for 5, 10, even 20+ years
 - Complexity
 - Spacecraft operations require a sophisticated suite of test equipment, ground equipment, software and databases
 - Variety
 - Purpose, schedule and cost of space missions vary greatly
 - Ancillary Concerns
 - Security, politics, intellectual property rights etc. have significant impact
- Defining one-size-fits-all standards is very difficult
 - What if we slice the pie differently?

Satellite Lifecycle Costs

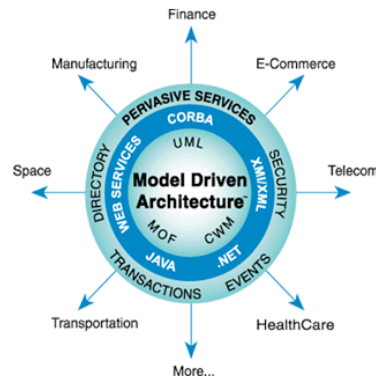


Standardizing The Transfer Of Data and Information Is Key

- Change at these various stages is inevitable
 - Technology, Architecture & Vendor changes are common
 - Need easy and cost effective adoption of new technologies
 - It is easy to standardize your way in to a hole
- Focus on data and information that does not change
 - Satellite Command & Telemetry
 - Operational Scripts
 - Ground equipment configurations (e.g. frame parameters etc)
- Use standards that are ‘future proof’ and easy to adopt
 - Model Driven Architecture (MDA) provides for this
 - Standardize on small platform independent models
 - Then translate from one platform to another

Model Driven Architecture (MDA)

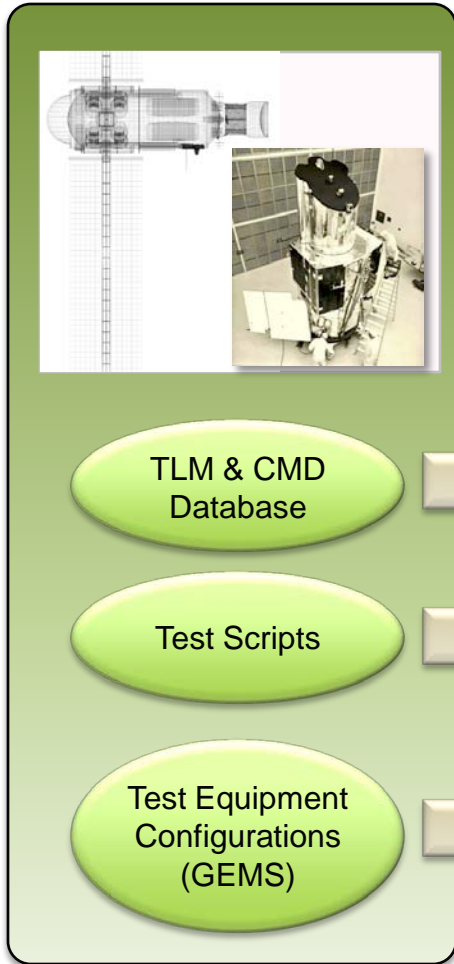
- Using OMG's MDA To Define Key Interfaces We Can
 - Standardize fundamental interfaces independent of the platform
 - Independent of the TT&C System
 - Independent of the Ground Equipment
 - Independent of the Middleware / Network
 - Avoid tying standards to a specific technology
 - Map Standard Models To Multiple Platforms
 - Automatically translate from one platform (technology) to another



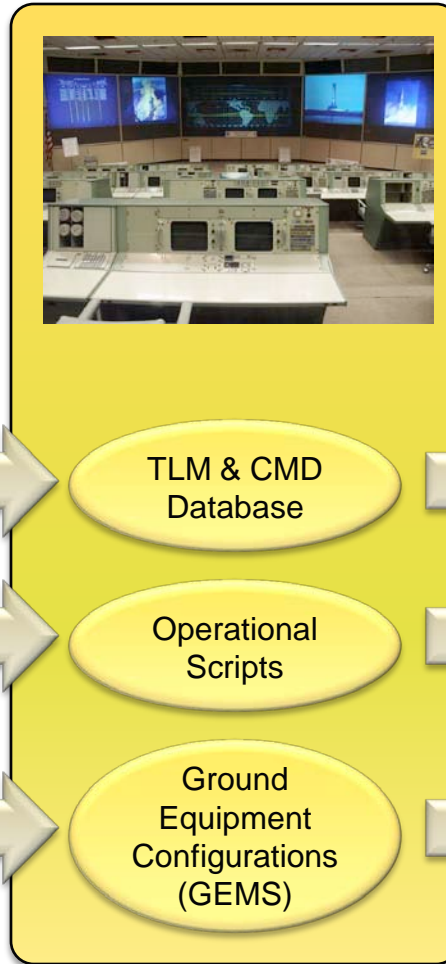
OMG's MDA Architecture
<http://www.omg.org/mda/>
 Model Driven Architecture Logos™

Using MDA-Based Standards In A Satellite Life-Cycle

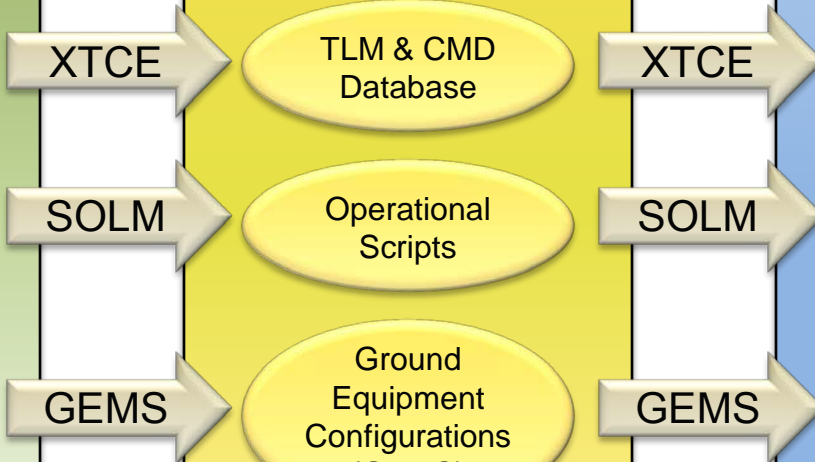
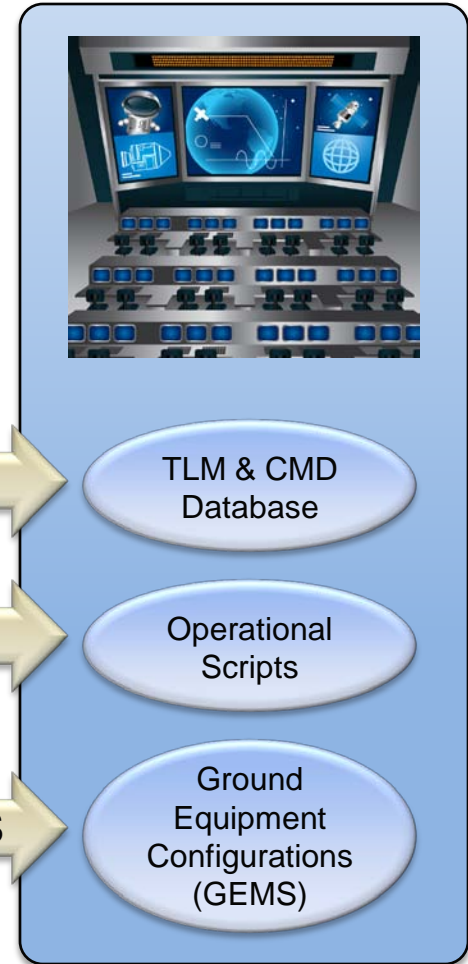
Satellite Manufacturer



Satellite Operations

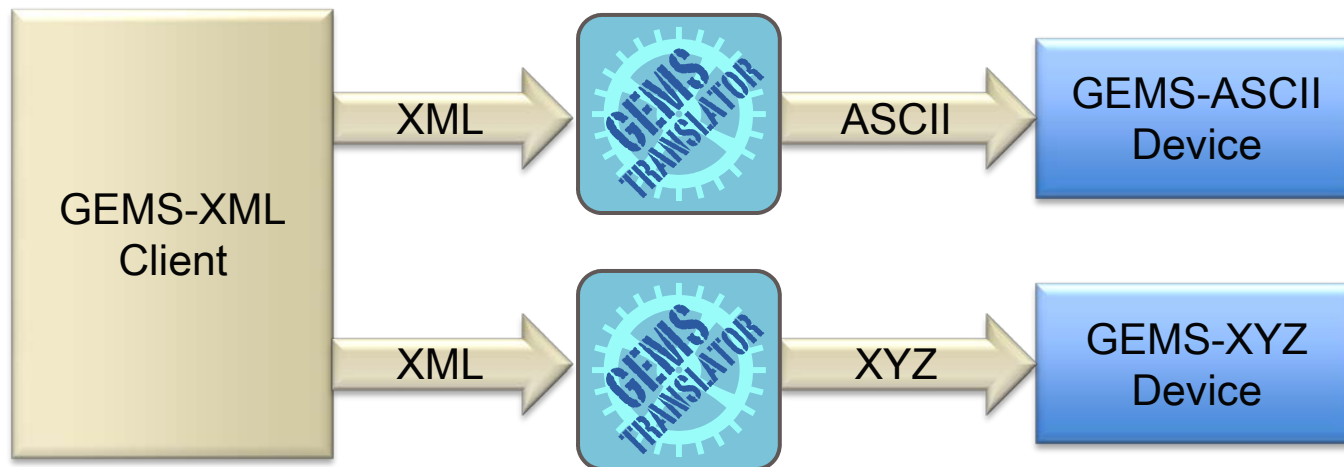


Technology Refresh

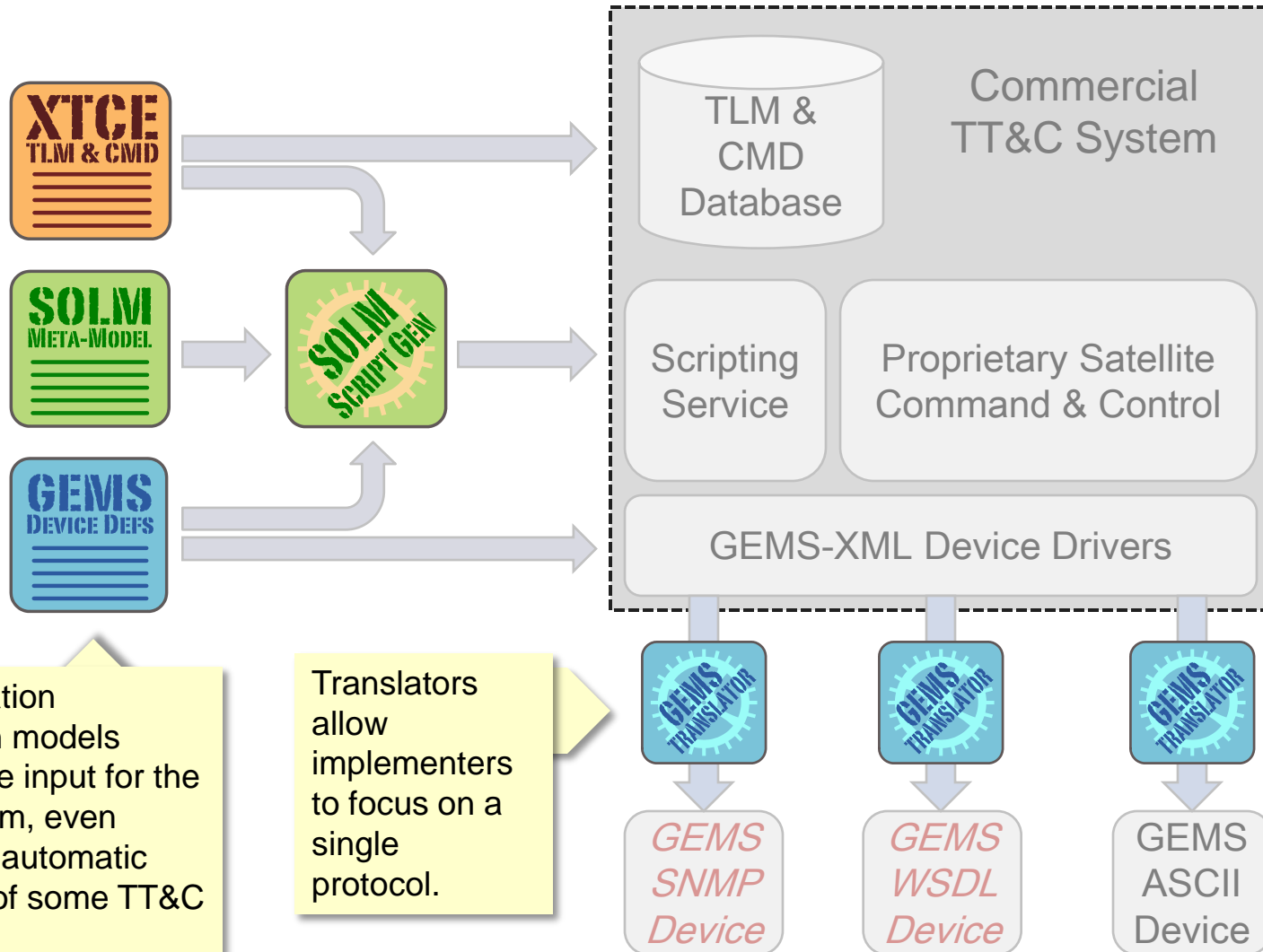


Taking This Approach One Step Further

- With Standard Models, Automation Becomes An Option
 - XTCE Database Import/Export
 - SOLM Script Conversion
 - GEMS Protocol Translation
- Translators Become The 'Glue' Between Components
- Potential For Significant Reduction In Integration Costs



Using Focused Standards And MDA For TT&C



The information contained in models becomes the input for the TT&C system, even allowing for automatic generation of some TT&C functions.

Translators allow implementers to focus on a single protocol.

Summary

- Standards In The Space Industry Can Be Enablers
 - Take the unique needs of the space domain in to account
 - Broaden the view of standards to cover full life cycle
- To Help Define Successful Standards
 - Utilize a MDA approach to ‘future proof’ standards
 - Small standards avoid burdening vendors/implementers
- By Leveraging Small, Focused Standards We Start To See An Agile Framework Evolve

THANK YOU