GSAW Ground Systems MBSE Working Group

MBSE Framework and Generic Model Discussion

February 28, 2018

Ground System MBSE Framework & Library

- Use Case
  - *As ground systems engineers we want*
    - a standard MBSE framework/structure and a library of common ground system subsystem and component models
  - *to be able to*
    - efficiently communicate, exchange and assemble ground system architecture models
    - efficiently integrate ground system or ground system component models
    - efficiently integrate with flight system and user system models
- Domain
  - *Enablers*
    - SysML, UPDM/UAFP, system modeling tools
  - *Space System Ground Systems*
    - Architecture: system, subsystem, major components, minor components, interfaces
    - Requirements: architectural, functional, parametric/performance
    - Logical: use cases, modes and operations, test cases, information exchanges

Objective Benefits

1) Have horizontally complete and vertically as complete as needed sets of requirements and specifications (architecture, interfaces, functions, parametric thresholds, objectives and relationships)
2) Enter or import or update changes once
3) Build/trace all requirements from user needs to component specifications
4) Generate a TRD level system model suitable for a contractor to respond to with a proposed systems, subsystem and component level specification model
5) Explore and maintain bounding architectures to establish the architectural, functional and parametric database
6) Capture and maintain excursions/innovations
7) Capture and maintain supporting rationale, analysis and analysis results
8) Integrate acquisition and development models with enterprise and systems models
9) Integrate systems models within an enterprise or System of Systems model
10) Add to/import from a system/subsystem/component library to accelerate requirements development, acquisition and concept exploration
11) Conduct configuration management and change analysis of funded and/or operating systems and Systems of Systems
12) Rapidly locate operational deviation involved components and assess alternative courses of actions and historical data
13) Have a nominal model of the system to assess deviations and attacks against
14) Have developed and captured modes and responses models to deal with deviations and attacks
15) Have a database framework in which other databases (such as the MAB) can be indexed (via associative meta/data
16) Conduct all of the "so that" activities inline or as the normal documentation/capture/communication process (i.e., as or more efficiently than current approaches)
17) Rapid assembly of new and excursion ground system architecture models
18) Efficient orientation and navigation within models from different but coordinating sources/organizations
19) Efficient integration of government reference architecture and contractor proposed ground system models in an MBSE environment
20) Database facilitated requirements traceability

Long Term Working Group Products

- Ground System baseline framework description
  - *Practical (very step by step) implementation example*
  - *Consistent among participants*
  - *Either consistent with INCOSE and OMG standards or foundation for discussions*
- Generic "starter" Ground System Model
  - *No proprietary or controlled information*
  - *Suitable as starting configuration(s) to tailor to specific concepts/designs*
  - *Appropriate for public release and general use*
  - *Development of the Generic Model informs framework development*
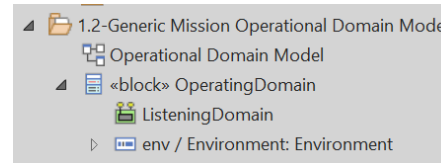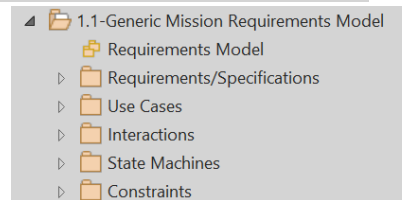 - *Defines appropriate interfaces to enable model integration/federation*
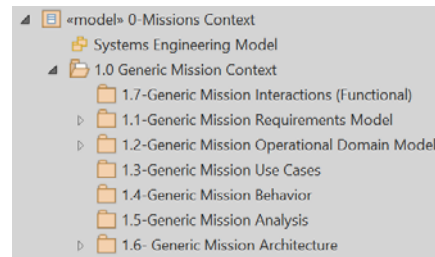
Today's Working Group Products

- Discussion of the merits of a common framework

- Discussion of the merits of a generic ground system model

- Identification of interested participants (present and who should be approached)

- Timing of a possible follow-on meeting to address actual effort & resources

Initial list of possible framework issues

- Definition of use cases (stakeholder requirements) for the modeling framework and for models built from that framework
- Package structure
- Interface model structure and types
- Black box and components parametric modeling
- Use of blocks/classes and parts structure
- Utilization of activity and related diagrams
- Decomposition structure (levels) of
  - *Architecture*
    - Hardware
    - Software
  - *Requirements*
  - *Functions and activities*
- Availability and suitability of ongoing efforts on common frameworks
- Identification/naming of common
  - *requirements*
  - *subsystem, component and part parameters, and performance*
  - *functions, operations, modes, failure modes*

Hypothetical
"partial" folder
Example

Generic Model Potential Approach Example