SDB NEXT
a step to virtual satellite

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Thales Alenia Space
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Model Based System for requirements and design

Model Based System Engineering is spreading

Model Based System Engineering is widely deployed at Thales Alenia Space for Avionics design
- Use of Arcadia methodology with Melody Advance / Capella Modeling Tool (open source)
  https://www.polarsys.org/capella/
- System / sub-system transition approach: Modelling is performed at different levels
- Engineering model allows to design system elements (architectural aspects)
From Engineering Models to SRDB

Engineering Domains detail technical data

- **OPERATION**
  - Operational Concept definition
  - OPS Procedures preparation

- **SYSTEM**
  - System specification
  - System Tests Specification & preparation

- **AVIONICS**
  - Avionics Specification & Engineering
  - Avionics Tests Specification & preparation

- **SW and HW level**
  - SW Design Equipment Requirements
  - SW / Eqpt test Specification & preparation

System Reference Database is a data repository allowing for data management and data sharing. The repository is populated and continuously updated by Engineering domains. Technical data of the system elements is progressively detailed and refined.
SDB-Next - Data Population Process

Progressive improvement of technical data by different domain contributions

Hardware
- Equipment interfaces
- Equipment connexion
- Equipment TM/TC
- Harness

Software
- Software interfaces
- Missionization
- Hard/Soft Mapping

Interface Definition
SW Validation
ATB
AIT
OPS

GCS & OPS Procedures
EGSE & Test Procedures

SRDB data maturity

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SRDB new challenges

SRDB needs to evolve

In the past, SRDB was used only to share spacecraft M&C data across domains. Adoption of model-based techniques creates a need for more technical data sharing. SRDB perimeter is increasing: new domain users/new models taken into account. Product lines add requirements for reuse and traceability of system elements across space systems.
Thales Alenia Space product: SDB-NEXT

Plug-ins add Engineering Domain specific views

SDB Next has a modular architecture:
- SDB-Next Meta-model
  - Data is organized in system elements and defined within models
- SDB-Next Kernel
  - Manages system elements change tracking and configuration definition
  - Runs continuous model based checks to assess cohesiveness of the managed data
- SDB-Next Bridges
  - Plugins to add data format transformations
- SDB-Next Editor
  - Plugins to add domain views on the data
SDB-NEXT Data Organization

Data Organization follows ECSS standards

System Elements are defined by ECSS 10-23

- They host multiple data with domain specific models
- Shared data is maintained within one common metamodel

Spacecraft
AOCS    DHS    EPS    Payload
RW  RW  SS    BAT

Common metamodel conforms to EGS-CC CDM

- Starts from M&C perspective
- Extended for additional data (link with harness, test results)
Smooth branch management is a key concept

Within SDB NEXT Kernel

- Data is managed in configuration at System Element level
- Rely on Git for flexibility with tag and branch management
- Change Tracking is performed in link with the tool currently used in TAS
**SDB-Next: Model Evolutivity**

Eclipse Modelling Framework isolate metamodel evolution from applicative code.

Metamodel will evolve in the timespan of a product line
- New needs come from engineering processes improvement

In SDB-NEXT Architecture:
- Most kernel services work at System Element level, independently of the data content
- Kernel is extended by plugins (typically to implement domain specific views)
- Data content aware services rely on metamodel generated plugins
- Metamodel ecore representation allows some generic services such as checks and comparison
- Kernel is designed for multiple metamodels (e.g. successive versions)
- Allows migration decision at program level

[Diagram showing kernel, model, ecore, data, api, tool connections with numbers 1 and 2 for bridges and editors]
SDB-Next - Conclusion

SDB NEXT is under development

First objective is to manage M&C perspective of SPACEBUS NEO Product Line

Already designed for extension to cover all technical data domains that make up the virtual satellite.
Thank you for your attention

Questions?