Implementation of MBSE solution for Advanced Digital Ground Segment Engineering

MBSE2021 Virtual Event

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Agenda

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- Project Approach
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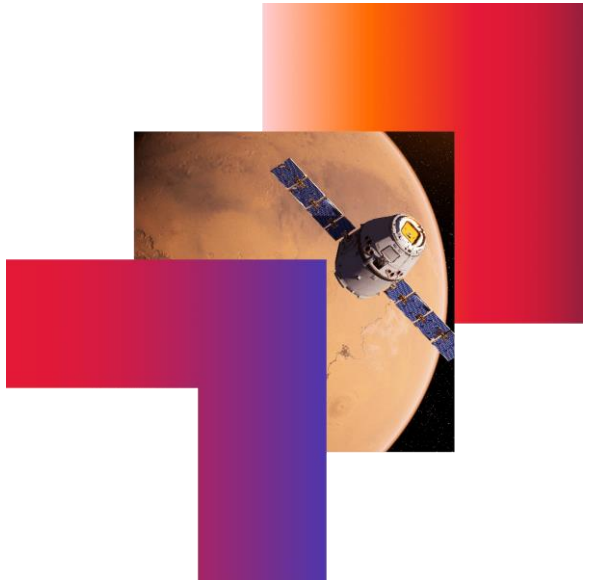
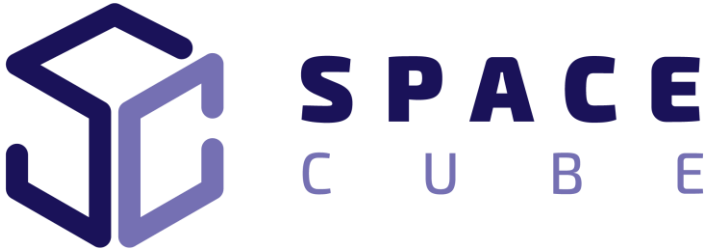
- Conclusion



Introduction

Advanced **D**igital **G**round segment **E**ngineering (**ADGE**)

- ESA/ESOC
- GSTP funded (Estonia, Germany, Switzerland)
- Consortium of three companies:



Background

- Space Systems Engineering
- Document centric approach
  - Risk of overlapping, redundant information
  - Lack of formal semantics
  - Textual representations not formalised
  - Lack of reuse potential and low ‘precision’ of reuse
  - Time consuming and high risk change management

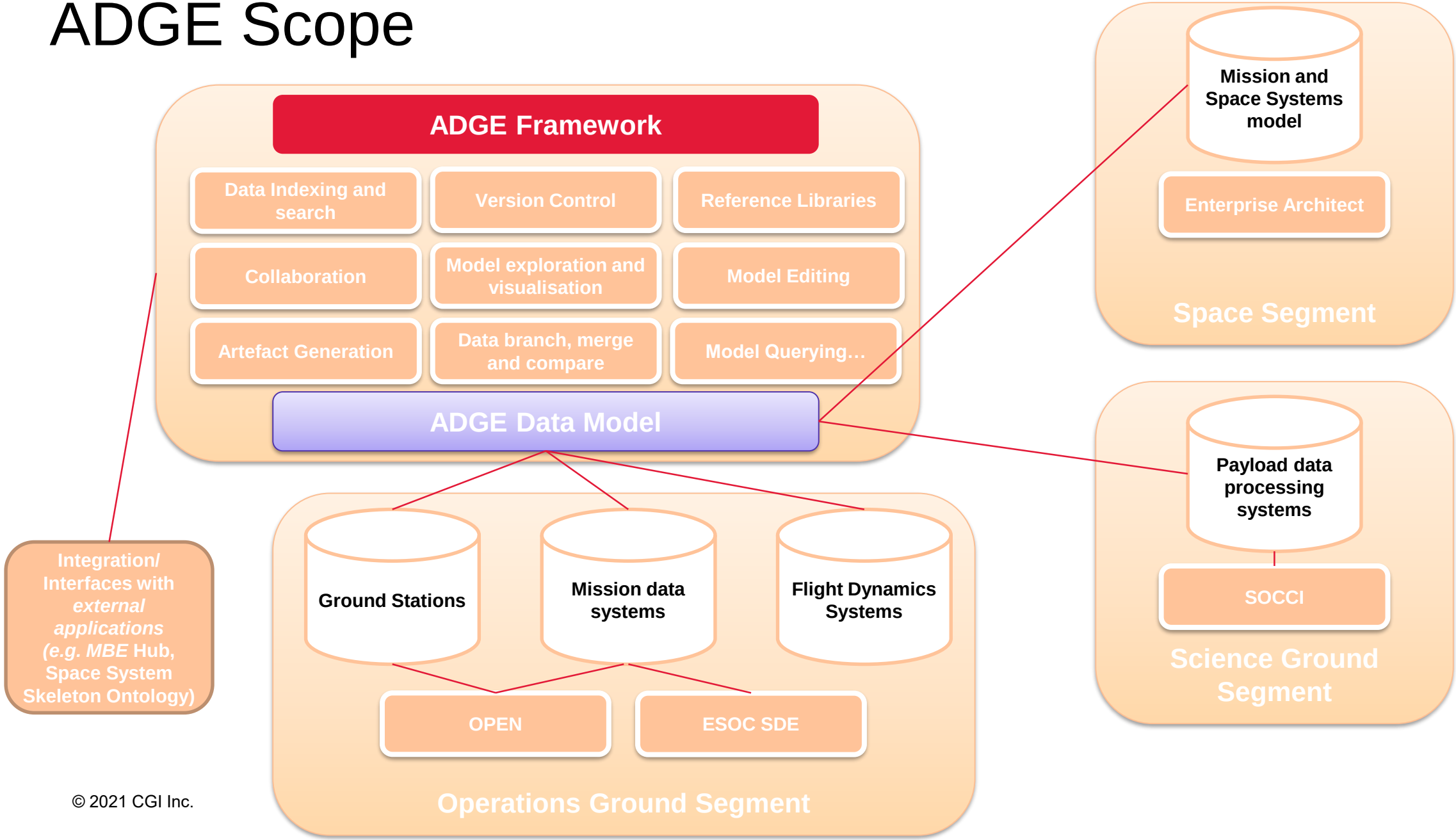
- Model centric approach
  - Adoption challenge: learning curve, organization culture
- Paperless End-to-End Ground Segment Engineering (PLGSE) study
  - Ground Segment Engineering Framework (GSEF)

ADGE Project Objectives

To build a mature, modern, fully web-based platform that enables a model based approach to Ground Segment engineering

- Traceability
- Trade-offs analysis
- Change-impact analysis
- Configuration control
- Communication & Collaboration
- Re-use
- Authoritative source of truth
- Digitalisation

ADGE Scope



Design – Custom Development of GSEF

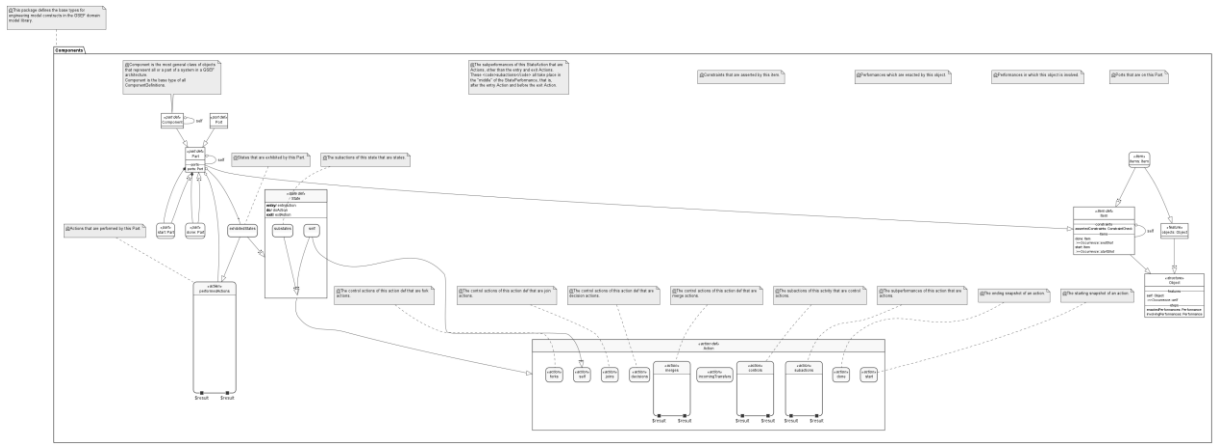
Lack of alternative solution that provides a fully web based platform that enables all the required functionality

- Flexibility
- Control of user experience
- Capitalise on cutting edge developments
- Open source, community licensed software

Design – SysML V2 Data Model

- Migration of GSEF to a SysMLv2 domain model library

- Data model tailoring
- Reuse
  - Model elements
  - Infrastructure systems
- Viewpoints & Behaviours



- **Flexibility**
- **Efficiency**

- Challenges: Increased complexity: Modifying values, Comparison and Merge, Queries and artefact generation → Intermediate abstraction layer

Design – Eclipse CDO model repository

- Concurrent Editing
  - User parallel working on same model branch
  - Opportunistic locking for web clients

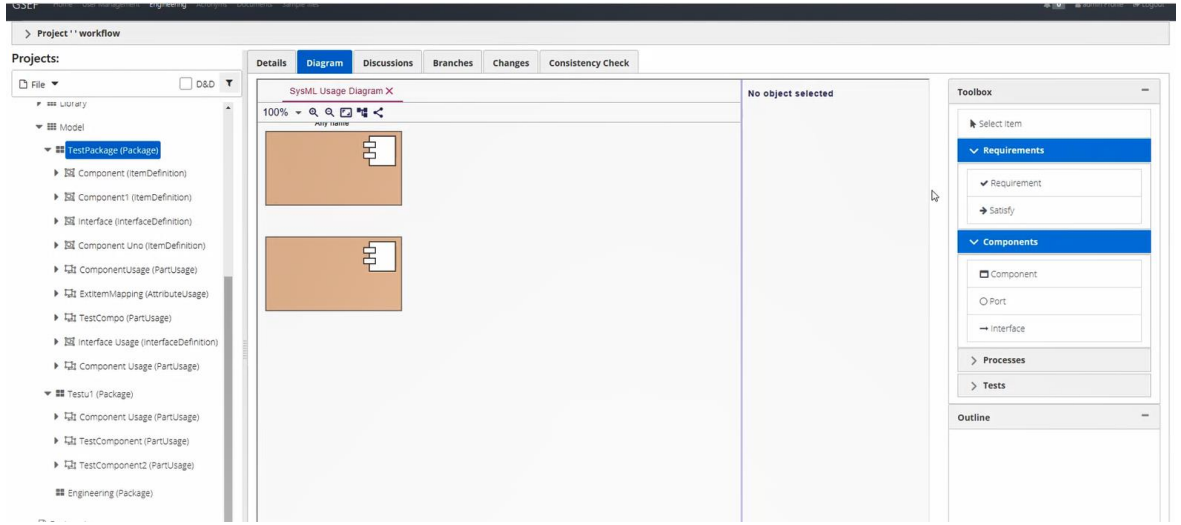
- Support multiple branches and merging

- **Collaboration**
- **Multi user access and communication**
- **Configuration control**

- Challenges: Increased complexity – adaptation for non EMF based persistence - SysMLv2 intermediate abstraction layer

Design – SiriusWeb Diagramming

- Use of Eclipse SiriusWeb platform for model diagramming solution
- Spring boot technology for back end components
- React based front end leveraging Eclipse Sprotty



- **Good useability and UI**
- **Simple & modern layout**
- **Highly Customisable**

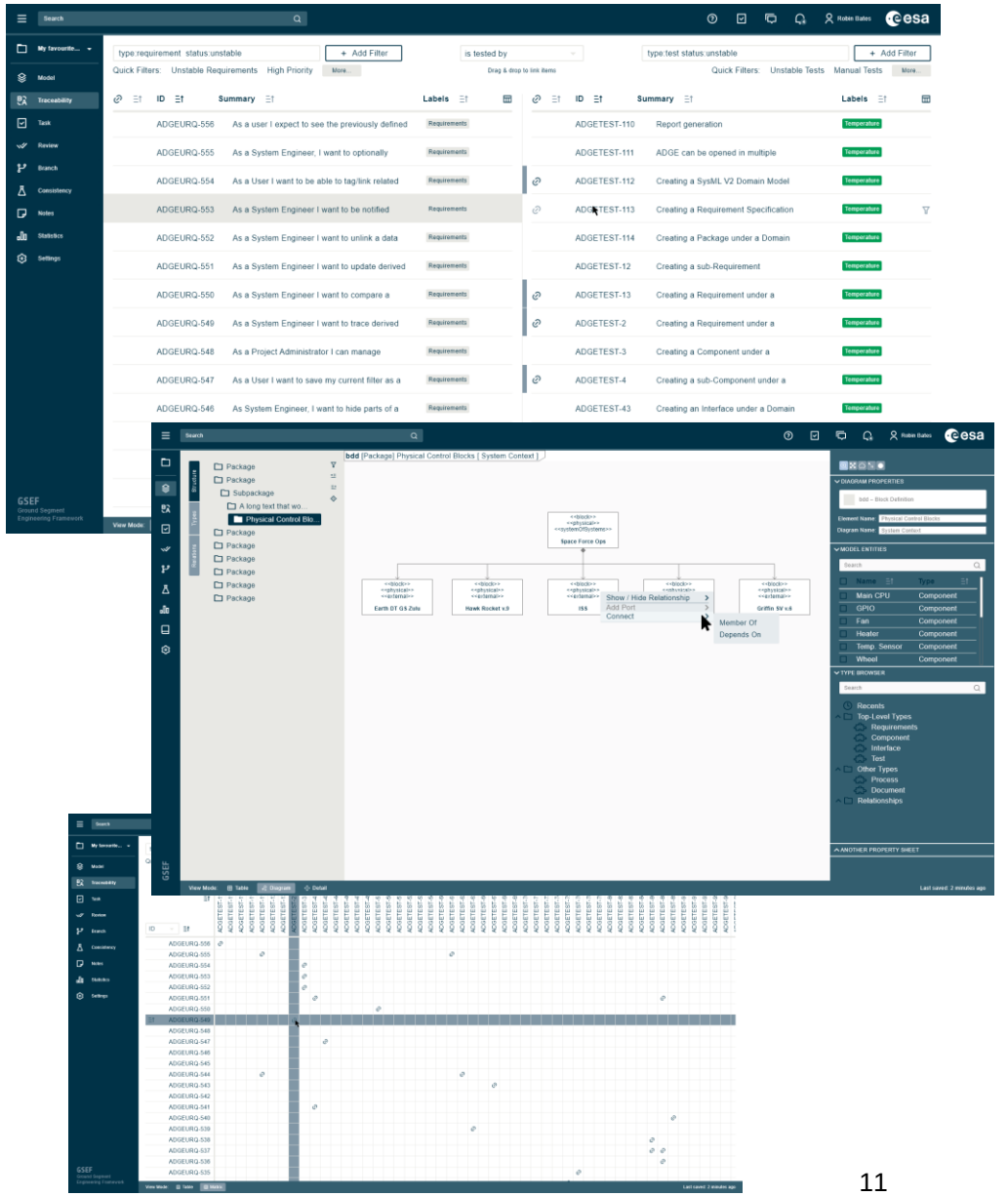
- Challenges: Increased complexity
  - Adaptation for non EMF persistence
  - SysMLv2 intermediate abstraction layer
  - New technology - custom development required for missing required diagram types

Design – Web based UI

- Simple, yet effective UX and UI
- Intuitive, fully web based environment
- As simple as possible, as complex as necessary

- Stakeholder engagement throughout the project

- **Gentle learning curve**
- **Maximise user uptake, minimise user rejection due to complexity**



Timeline

- December 2021
  - Deliver MVP
- January 2022
  - CDR milestone
  - Gather Stakeholder feedback
- February-April 2022
  - Productisation
  - Agile Software Development
  - Testing
- May-June 2022
  - Deliver Final Software package
  - Project close out

Conclusion

- ADGE aims to develop a state-of-the-art web-based MBSE framework
- Building upon cutting edge standards and technologies and positioned to be flexible to future needs
- Providing generic MBSE capability, specifically validated to support ground segment system engineering at ESOC

Insights you can act on

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