Towards Views Extraction to Ease Concurrent Review of Systems Engineering Models

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Agenda

Context and Problem Statement

Views Extraction Specification for Review

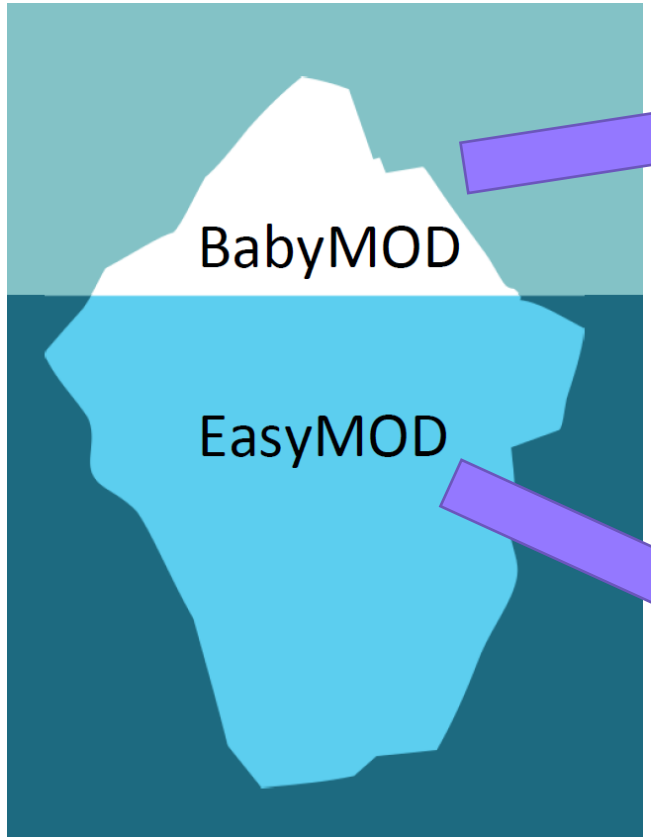
Implementation and Results

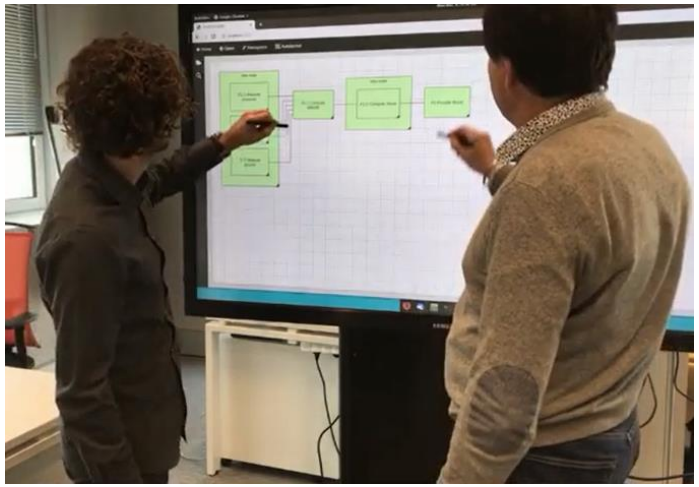
Conclusion and Perspectives

Context and Problem Statement

09/11/2022

EasyMOD@ESA Project Context





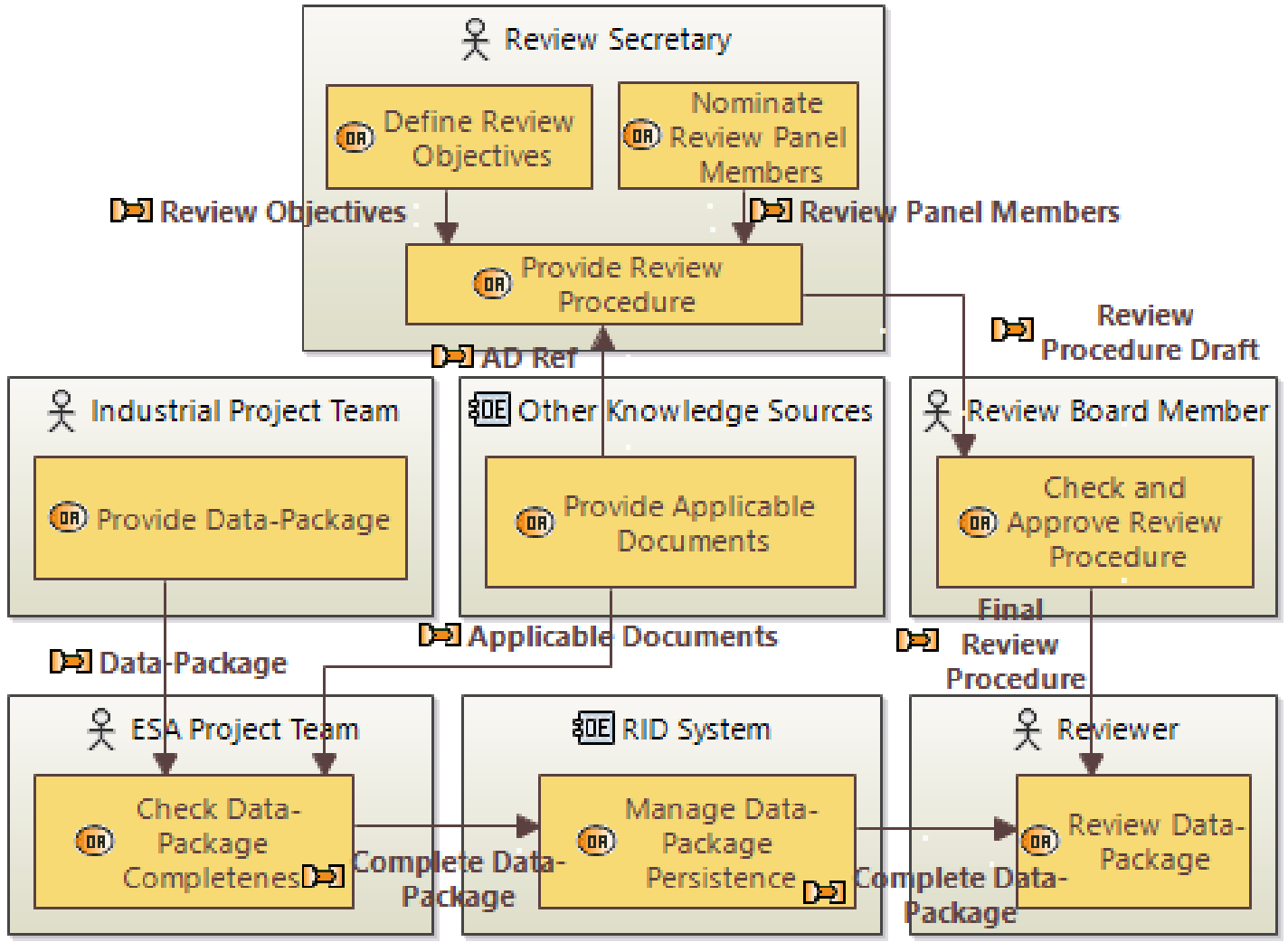
proof of concept – Youtube Video

- Sketch recognition
- Voice Recognition
- Collaborative edition on touch screen

ESA OSIP – Focuses on model reviews

EasyMOD – New Hardware, Personnal Assistant, Incremental Formalisation, Enhanced Navigation….

Review Activities at ESA



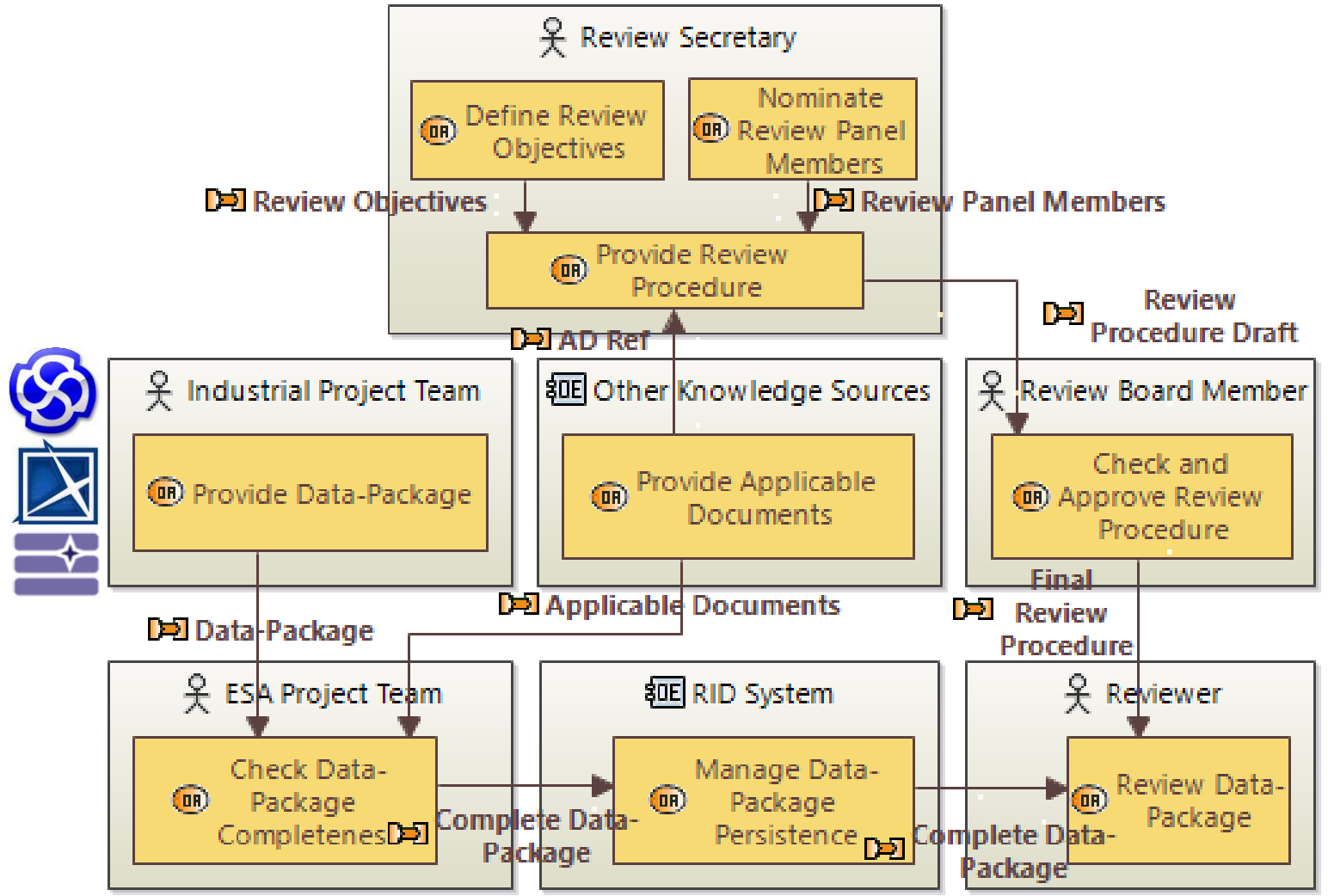
Prepare the Review

OC

Perform the Review

OC

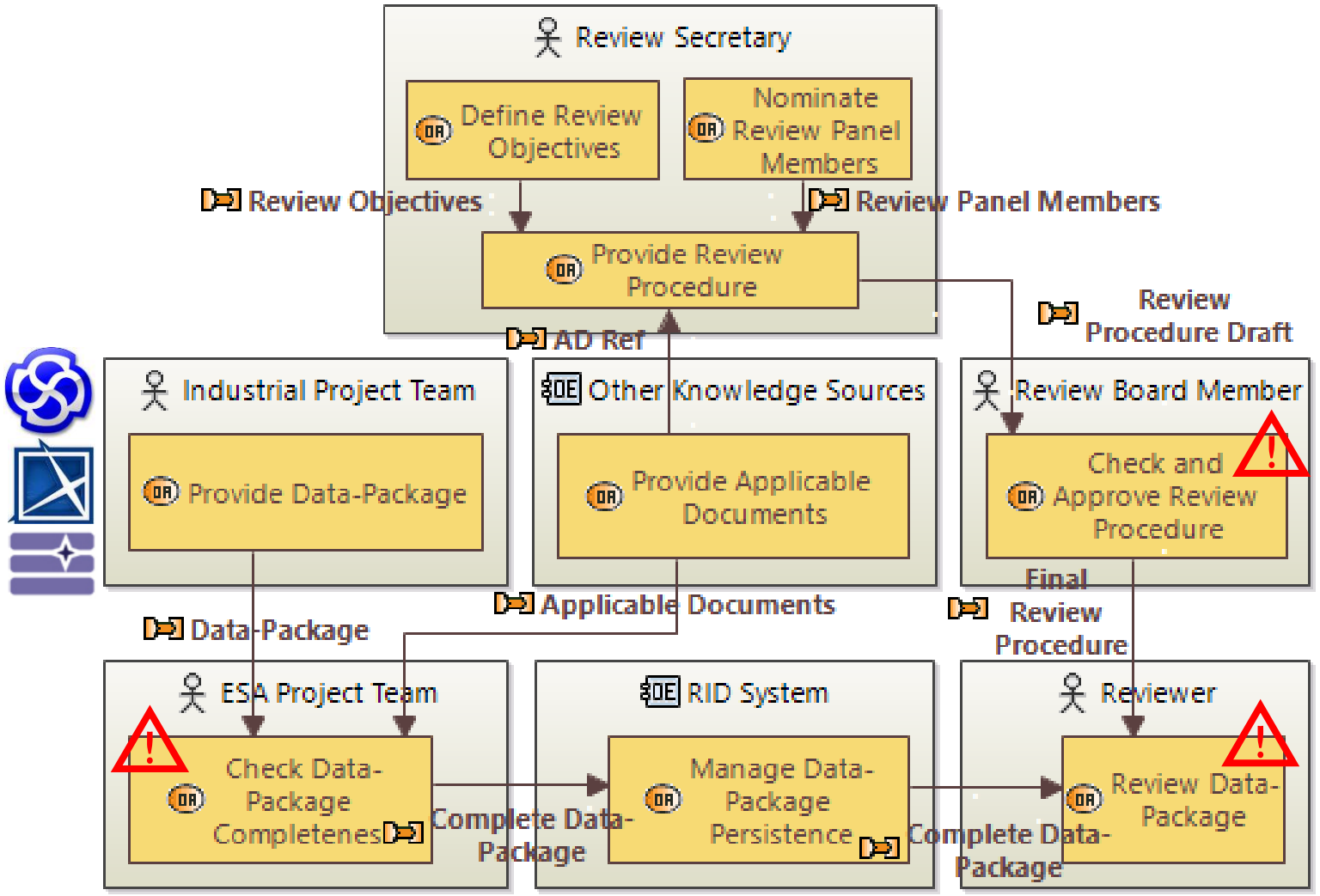
Review Activities at ESA



Prepare the Review

Perform the Review

Review Activities at ESA



Prepare the Review

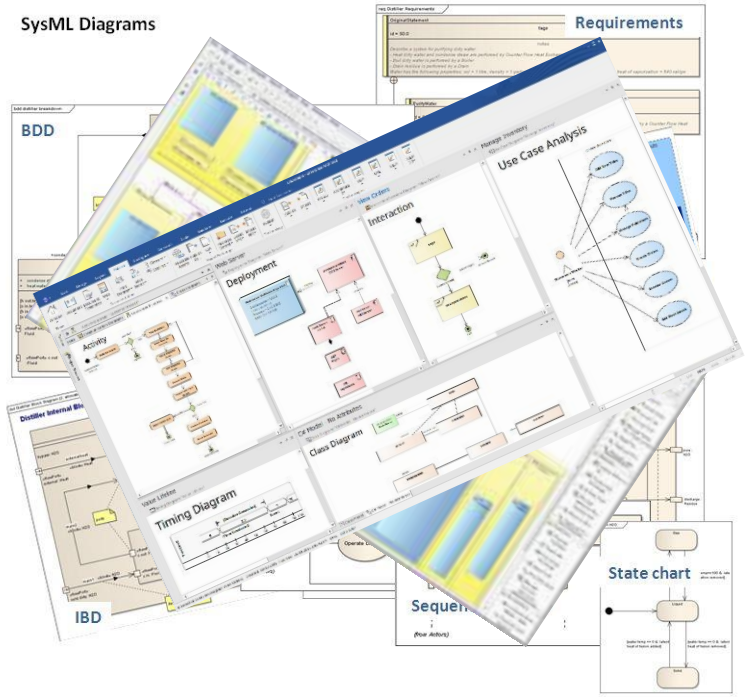
OC

Perform the Review

OC

Challenging for **non-MBSE experts**
e.g, systems specialists (mech, elec, thermal, ….)

Challenges during Review of MBSE models



Modelling language knowledge

Challenging for **non-MBSE experts**
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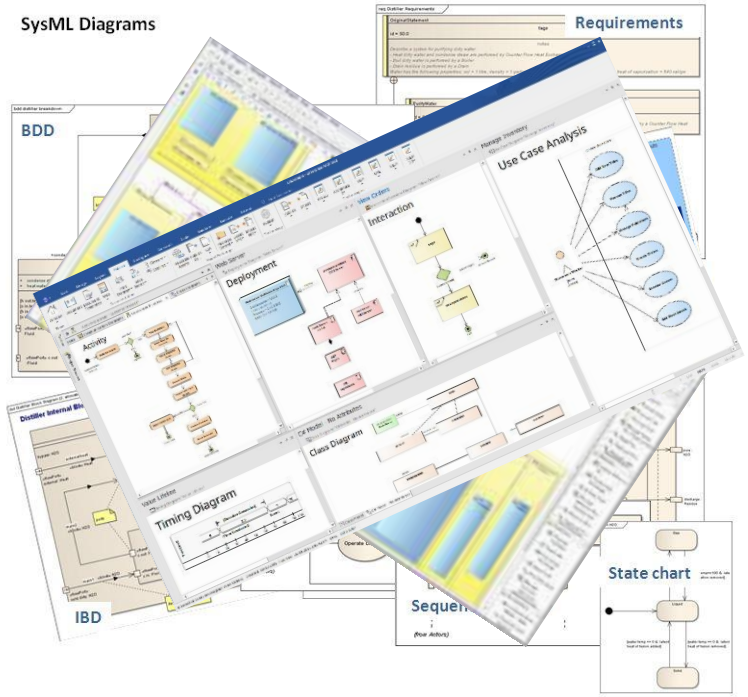
Challenges during Review of MBSE models



Modelling language knowledge

Navigation in scaled SE models

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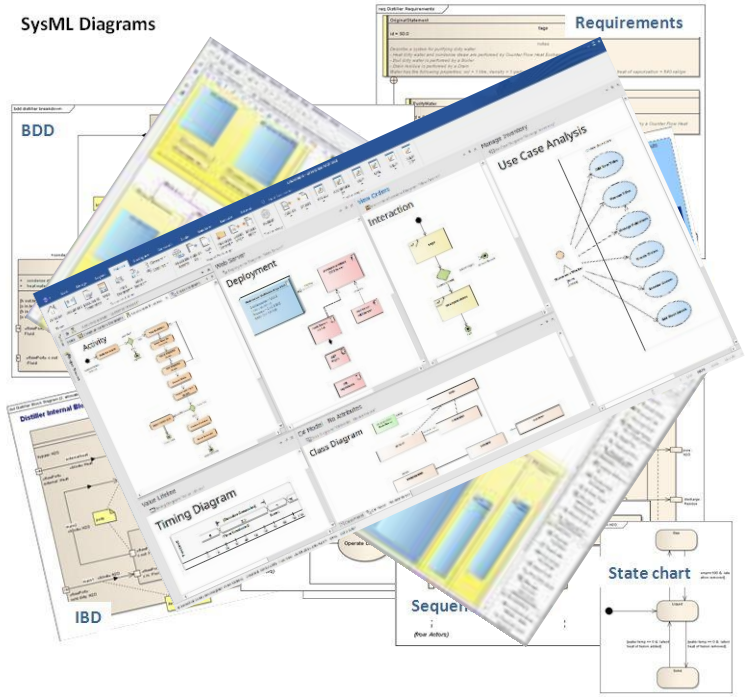
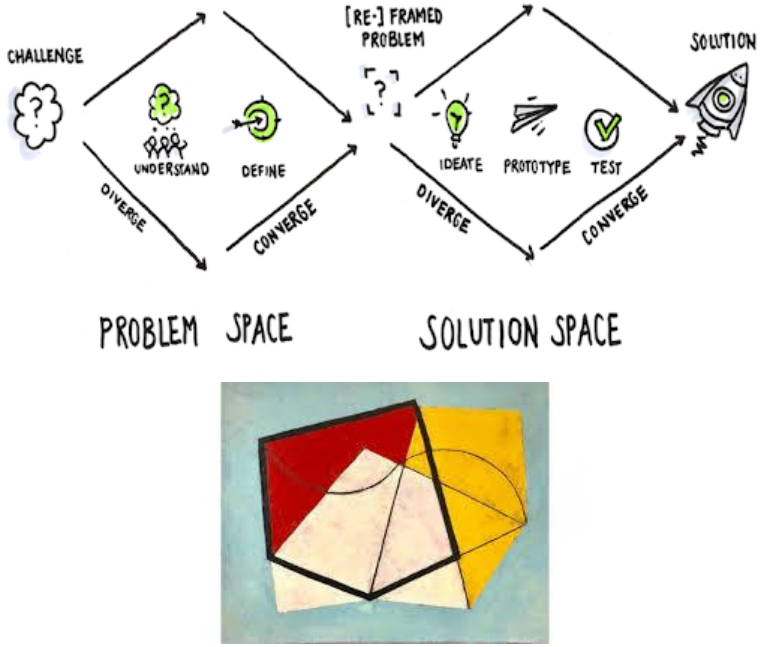
Challenges during Review of MBSE models



Modelling language knowledge

Navigation in scaled SE models

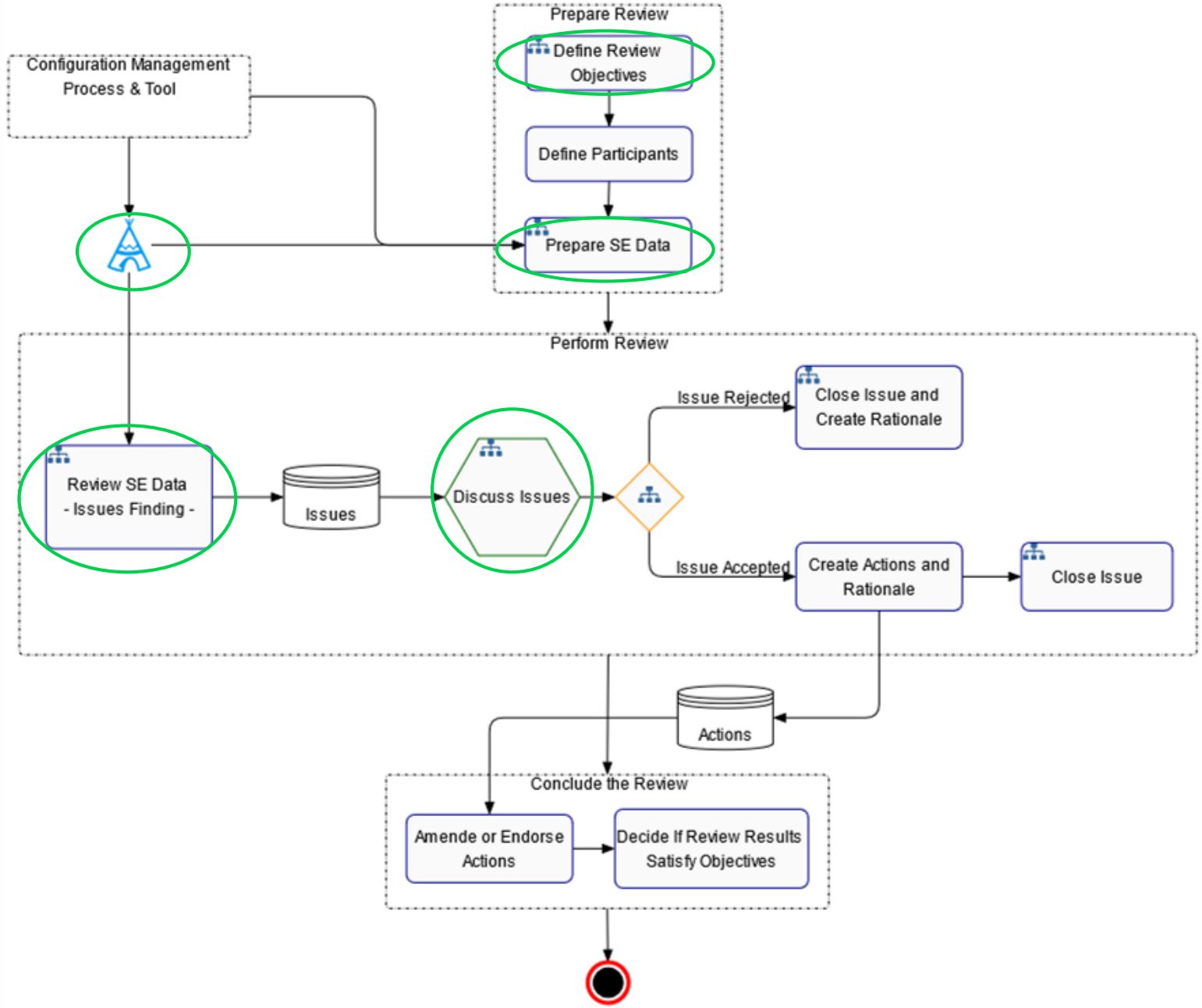


Abstraction levels

Challenging for **non-MBSE experts**
e.g, systems specialists (mech, elec, thermal, ….)

EasyMOD@ESA Contributions

1. Extract model views abstracted from unnecessary concepts for a given review
2. Link the extracted model views with Review Objectives and integrate them within the Review Procedure
3. Navigate between concepts and views without losing the context of the review activities
4. Create comments and replies on the Review Procedure or on the model views in a collaborative way



Views Extraction Specification for Models Review

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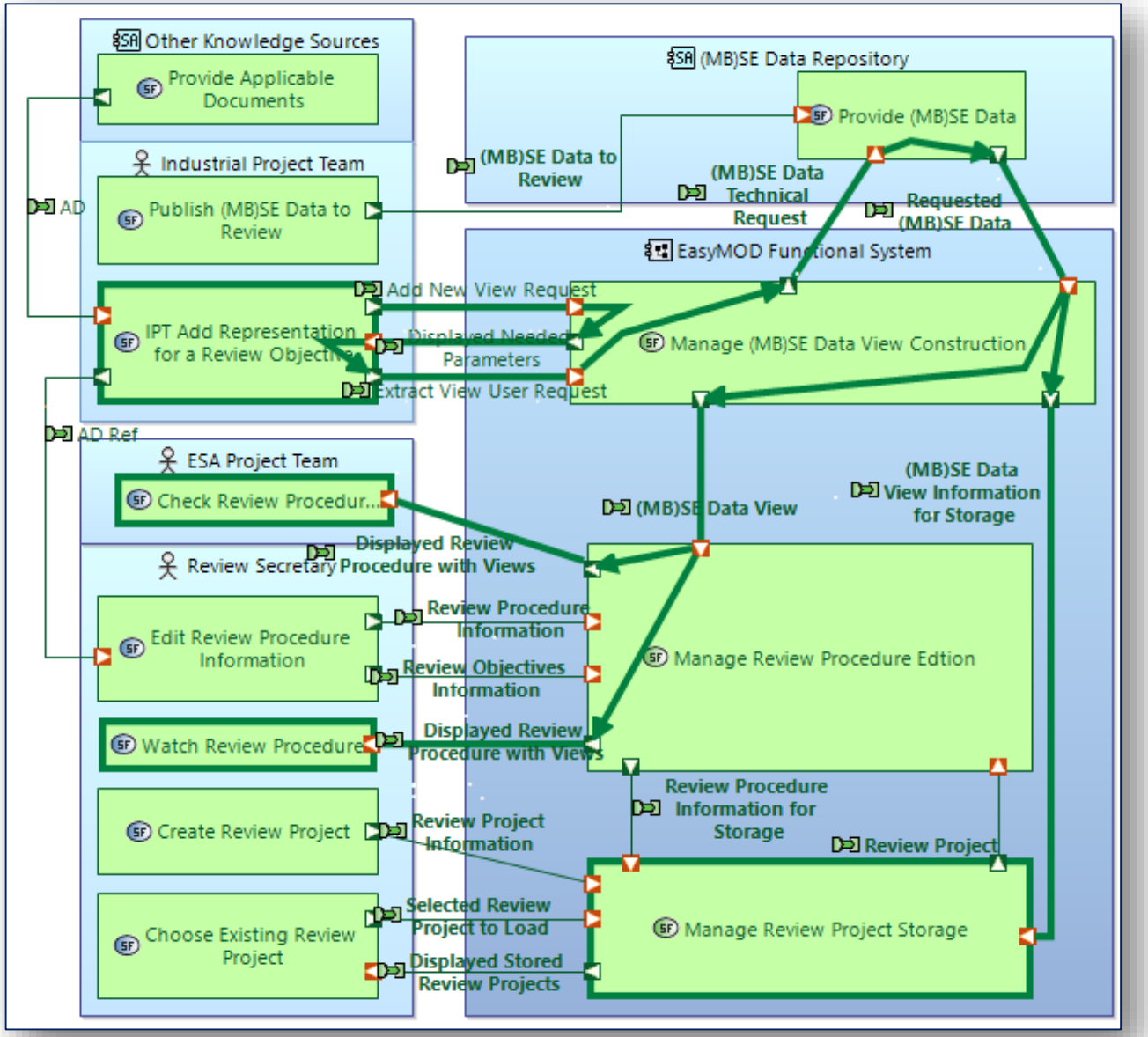
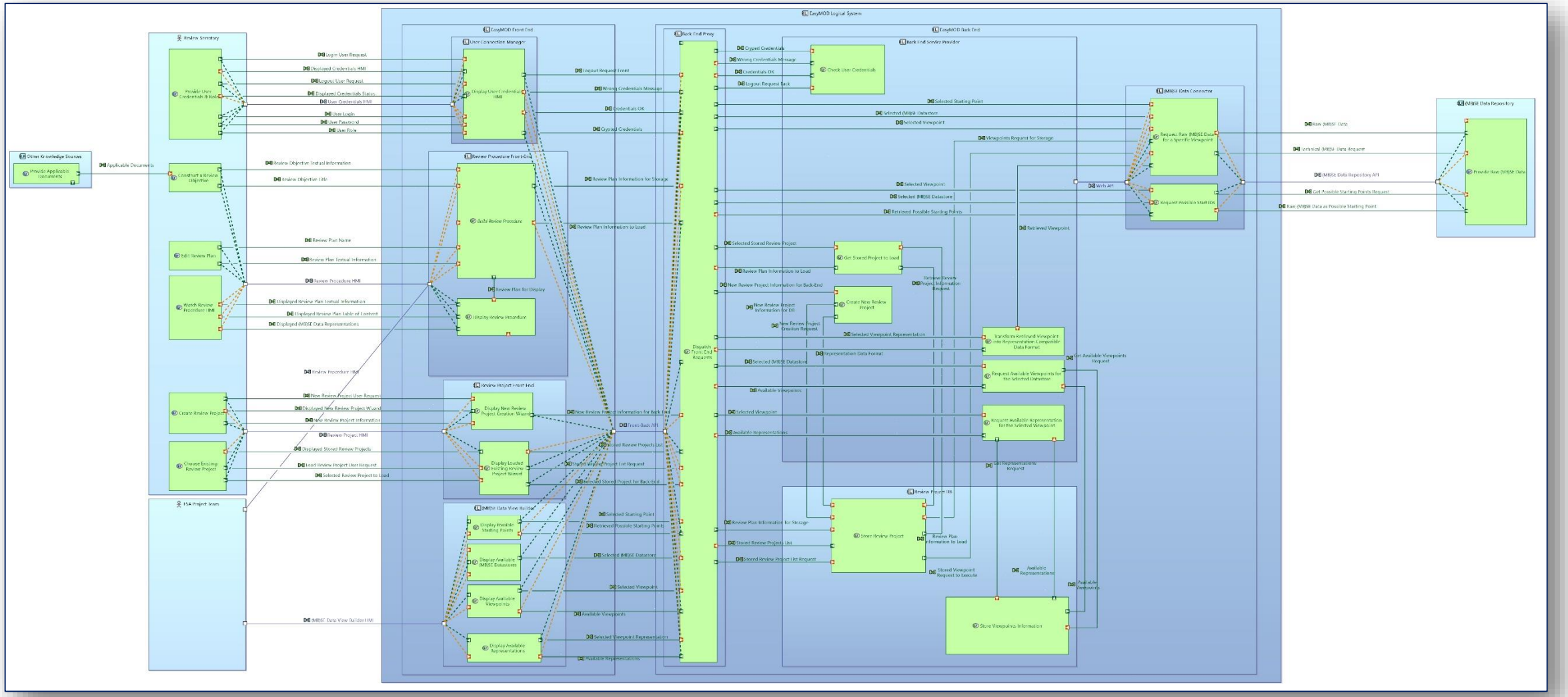
Capella Model System Functional Specification

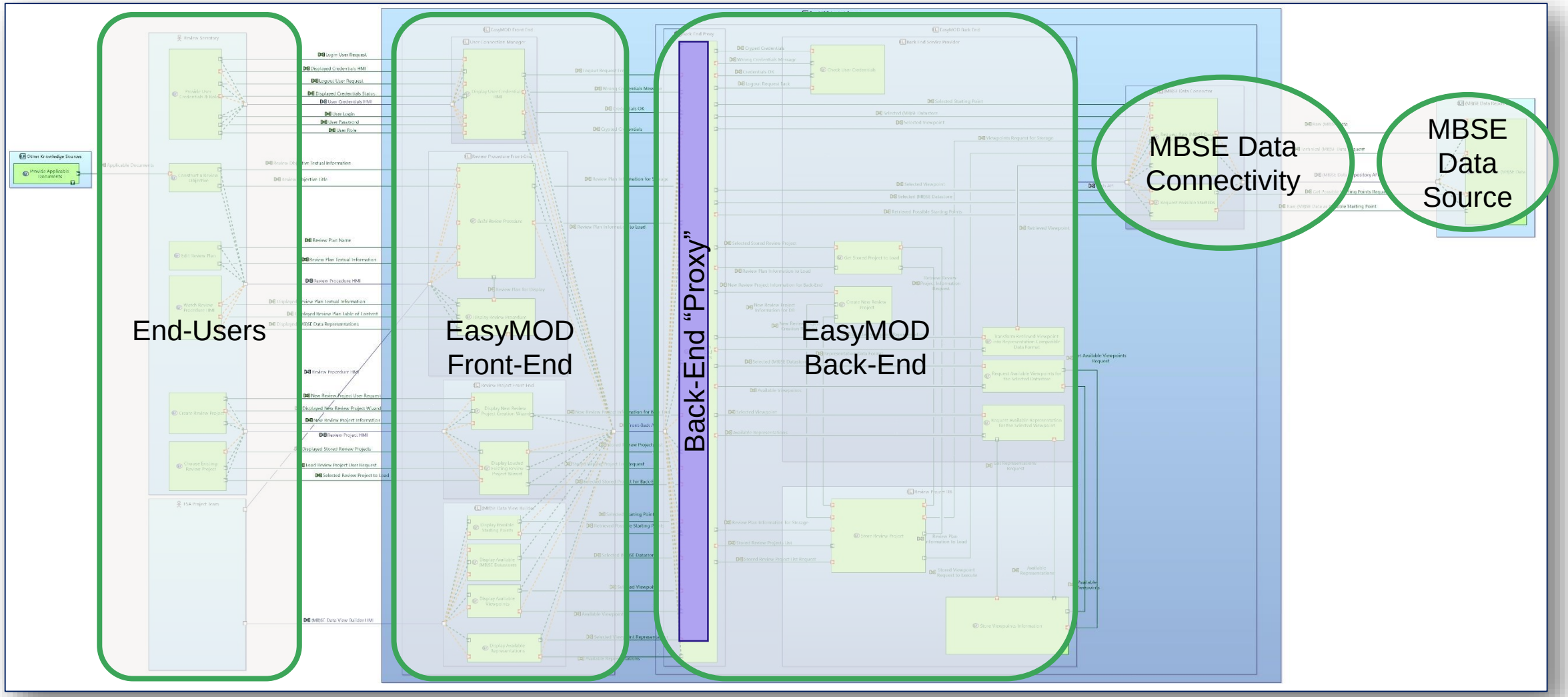


Functional Chain focused on View Extraction for Review Procedure construction

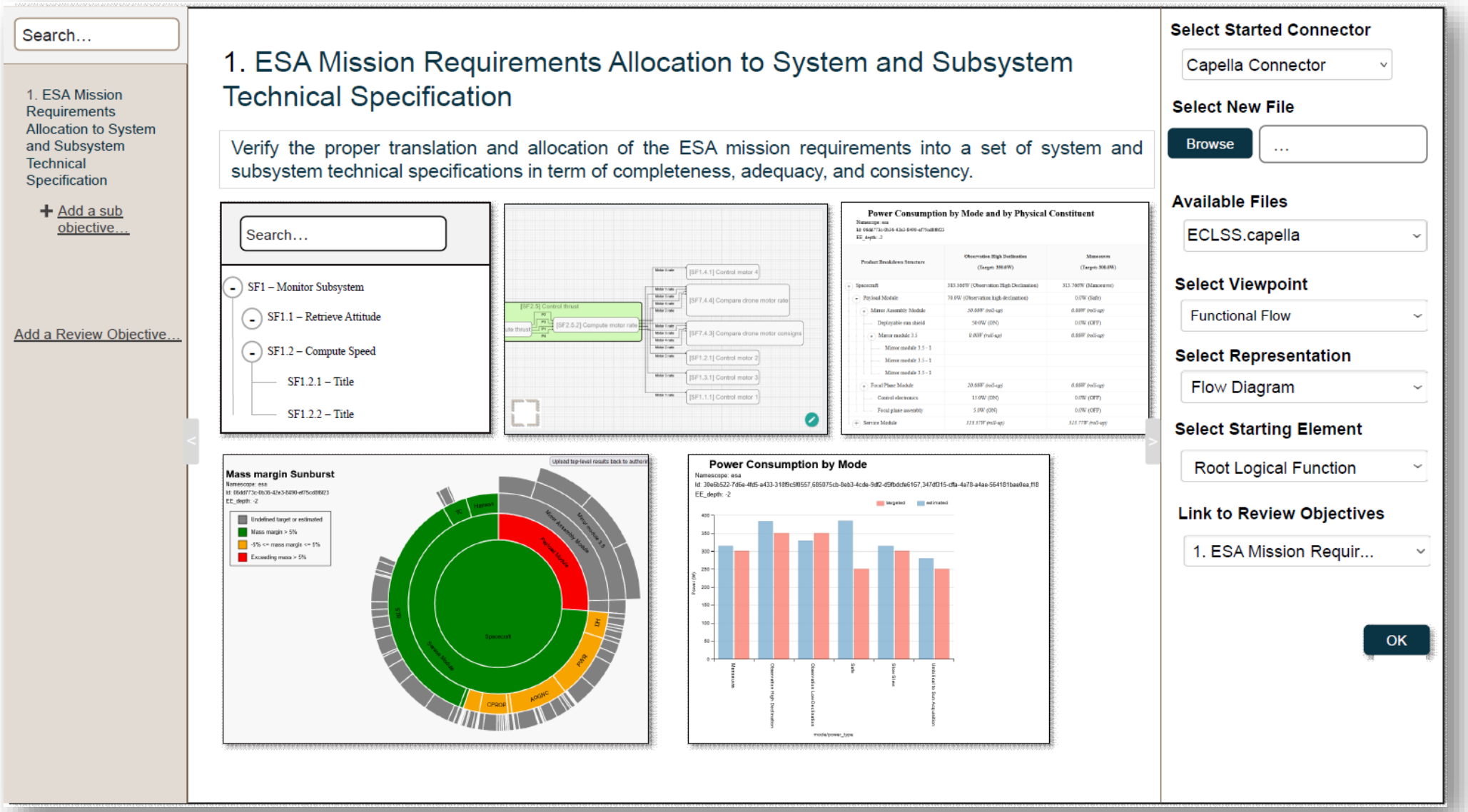
Capella Model Logical Specification (1/2)



Capella Model Logical Specification (1/2)

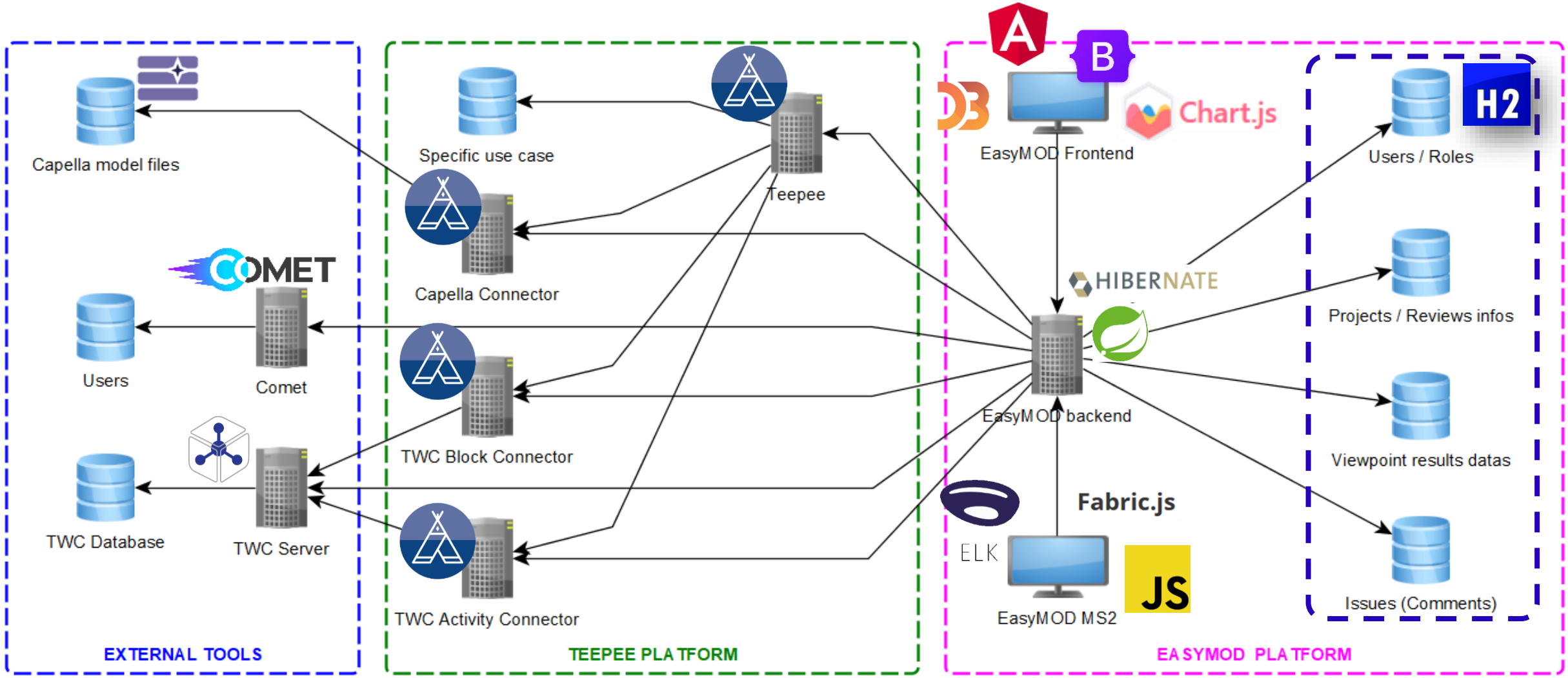


HMI Mockup before Implementation

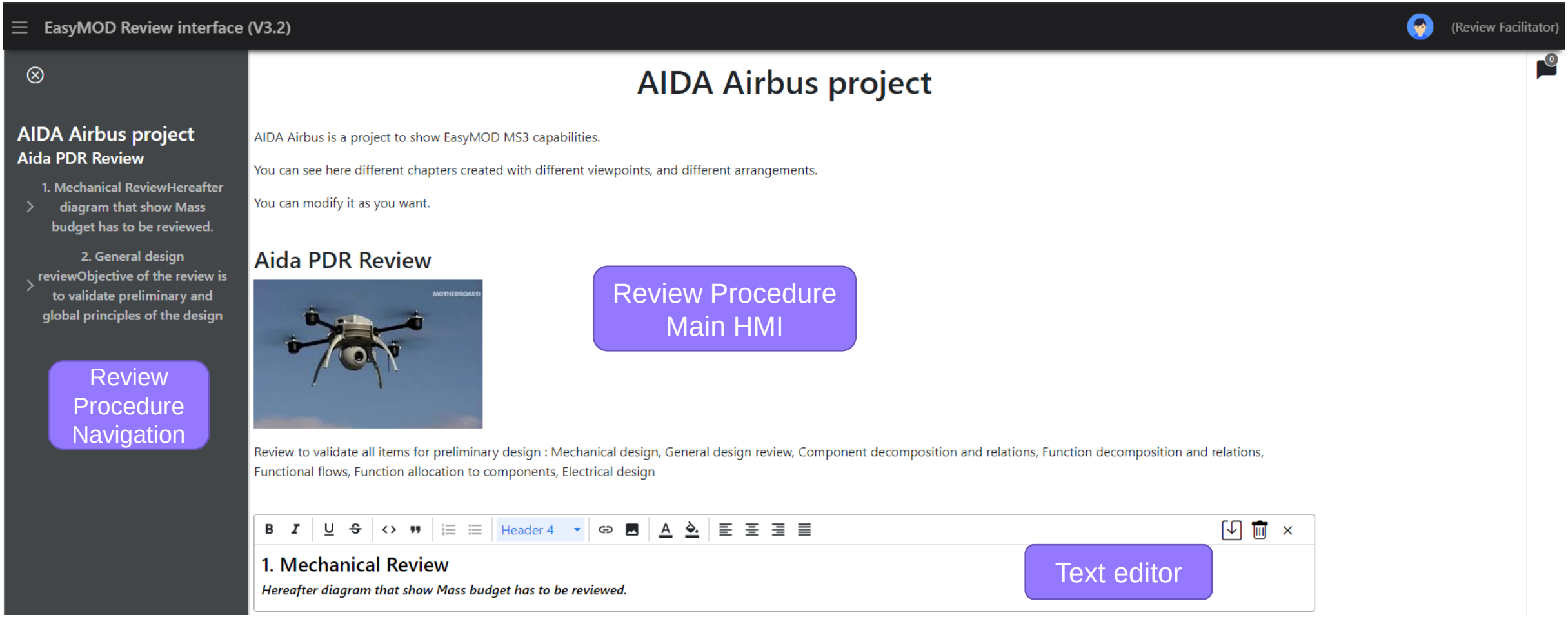


Implementation and Results

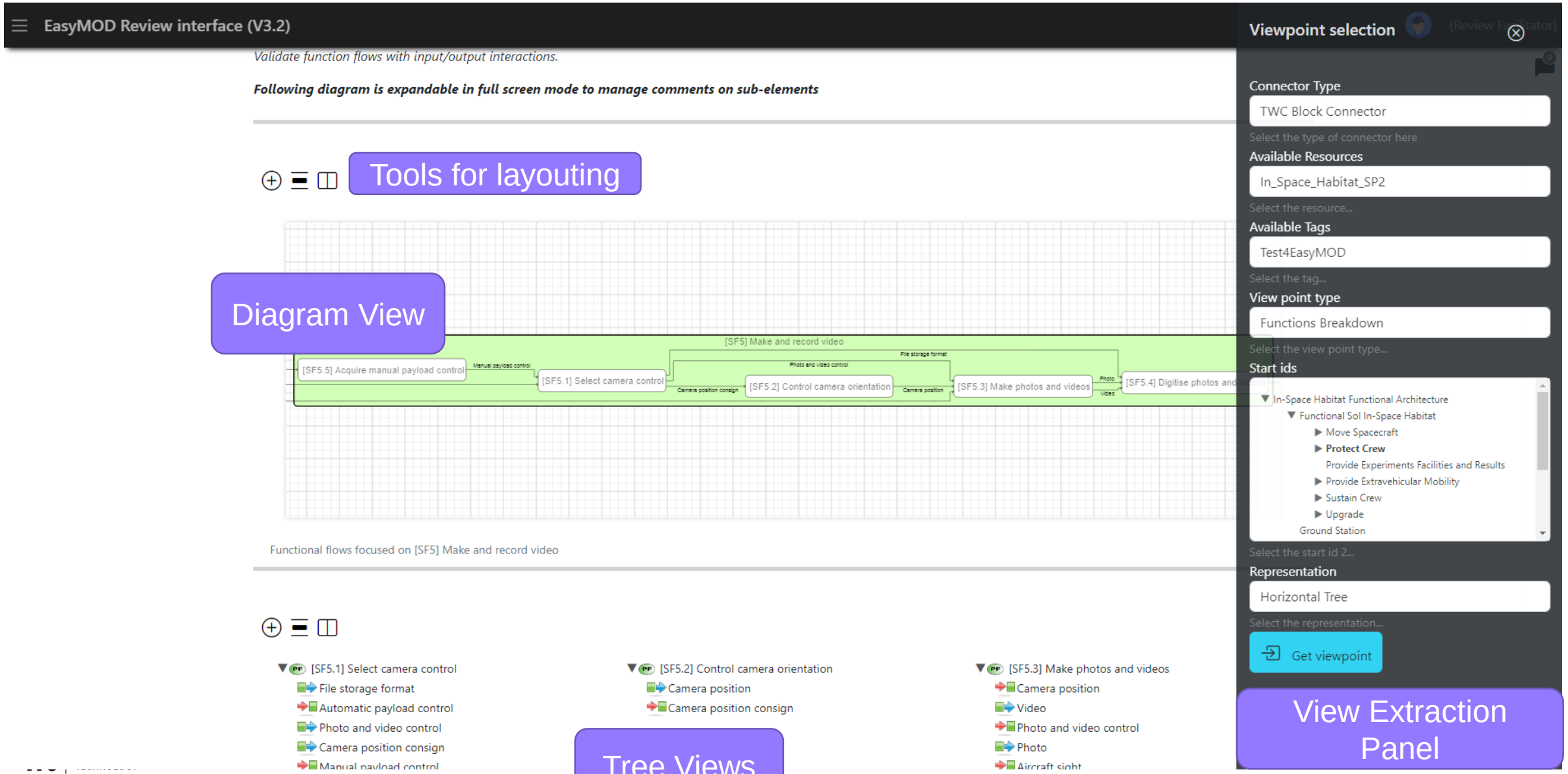
Global Software Architecture and Technologies



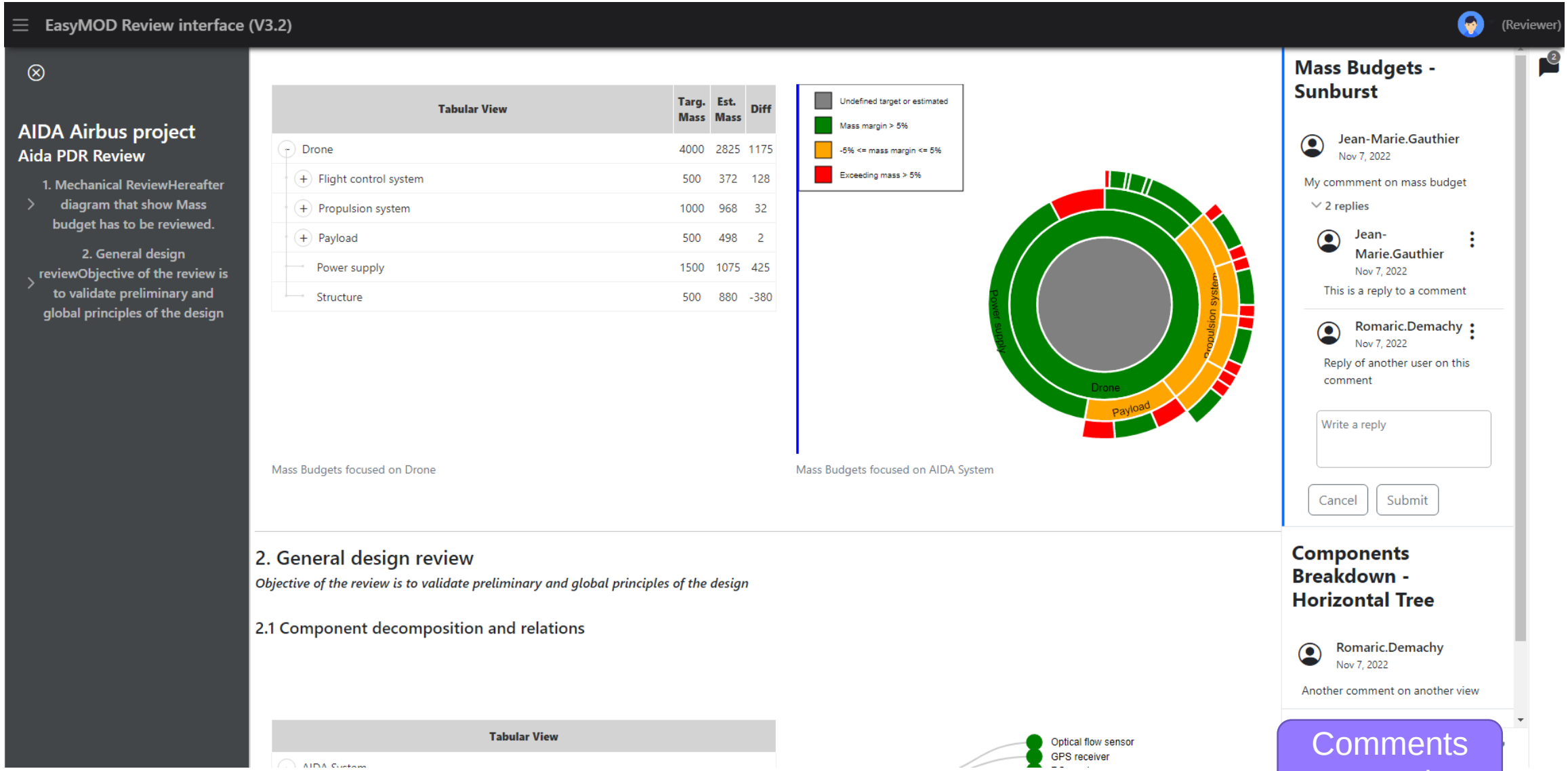
Resulting HMI (1/4) – Navigation and textual elements



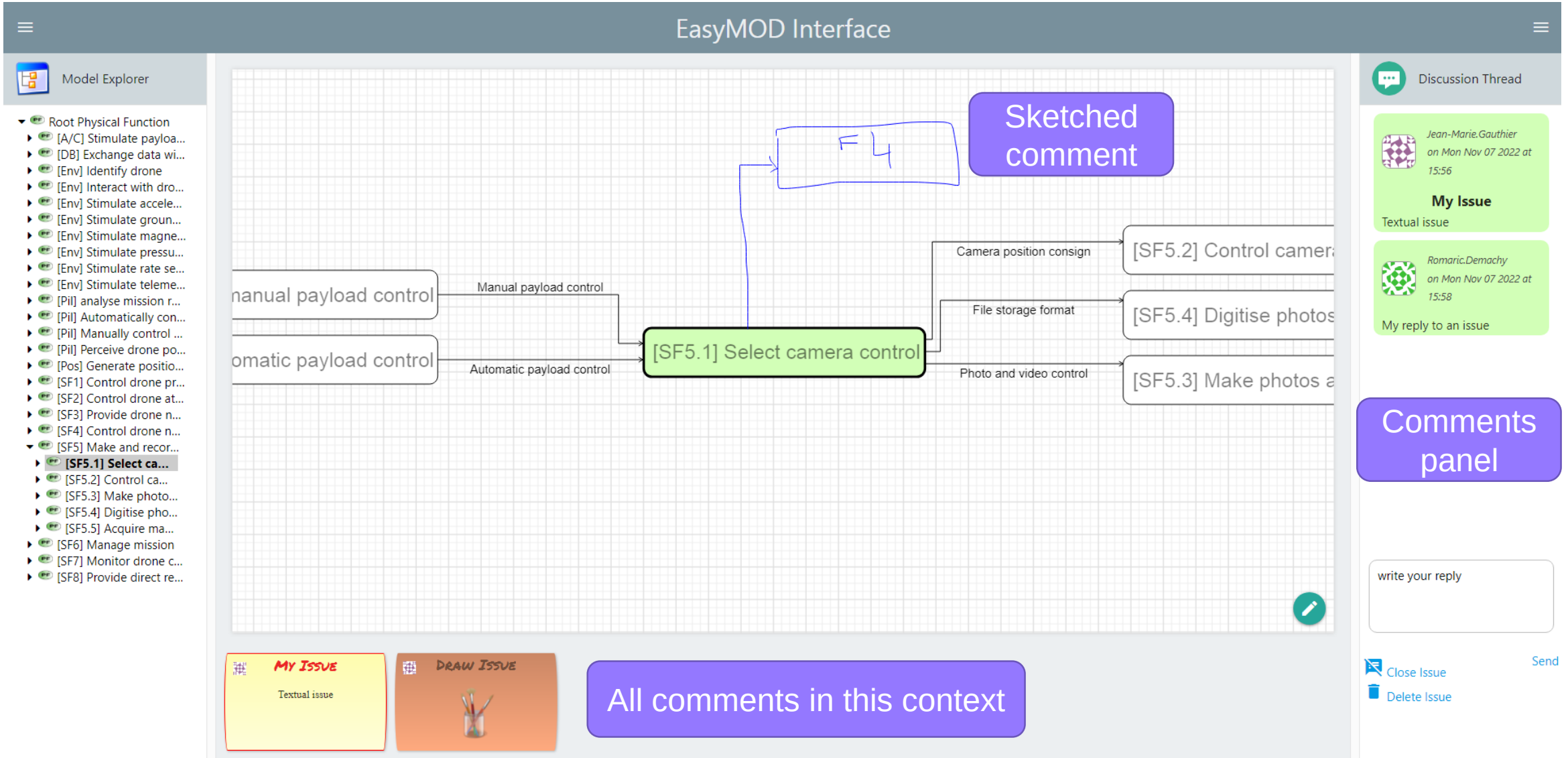
Resulting HMI (2/4) – View extraction feature



Resulting HMI (3/4) – Commenting feature



Resulting HMI (4/4) – Full screen mode for Diagram



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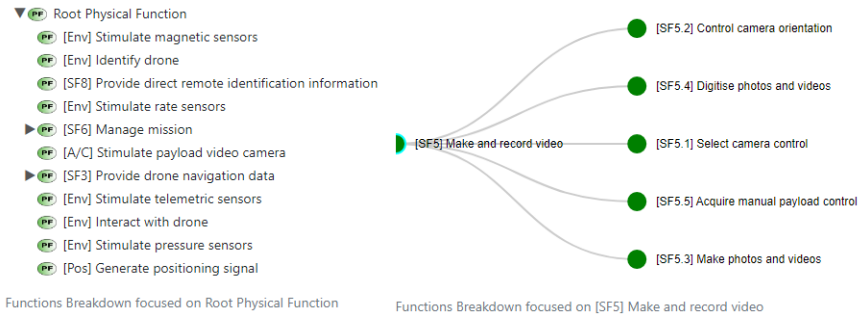
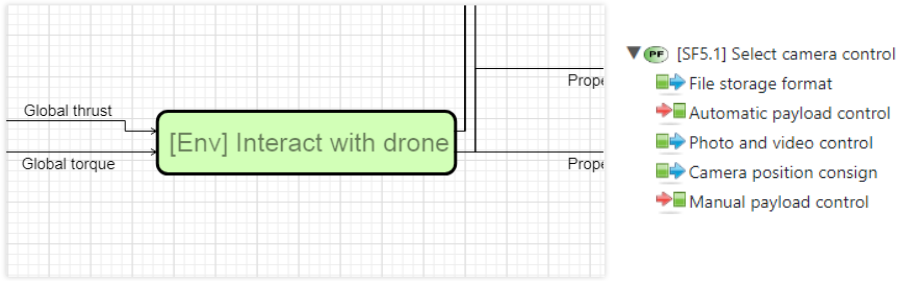
Implemented Viewpoints & Interactive Representations

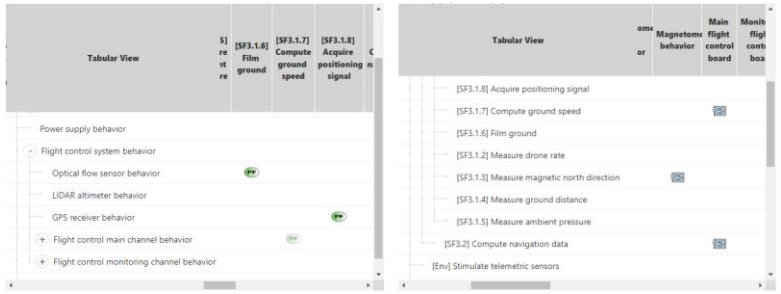


Functions Breakdown - Vertical & horizontal tree

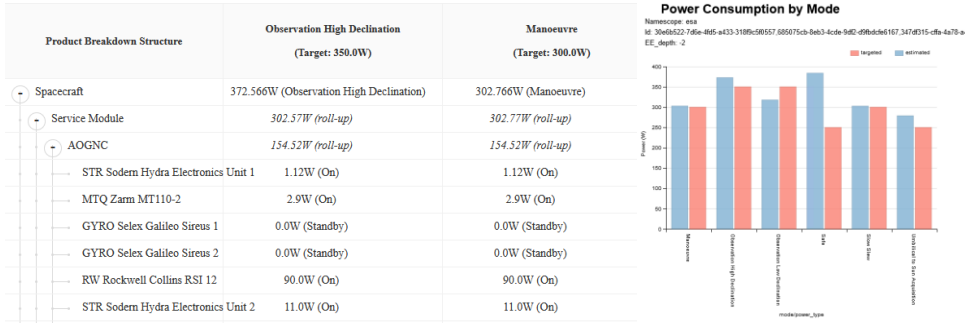
Components Breakdown - Tabular & horizontal tree



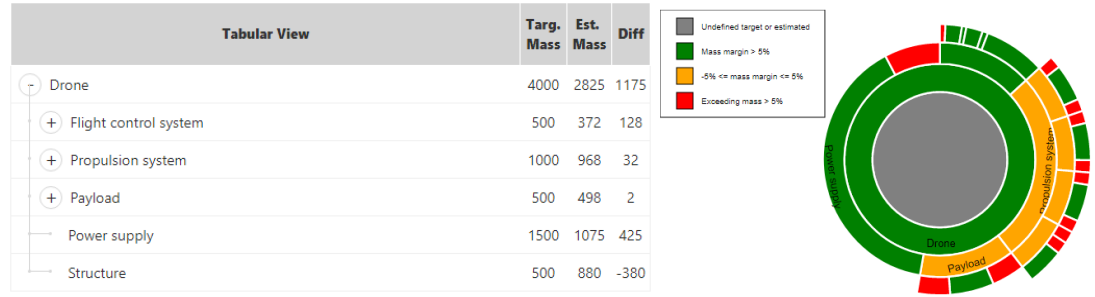
Functional Flows - Diagram & vertical tree



Allocation – Matrix from FBS or PBS



Power Consumption by Mode – Tabular & Bar Chart



Mass Budget – Tabular & Sunburst

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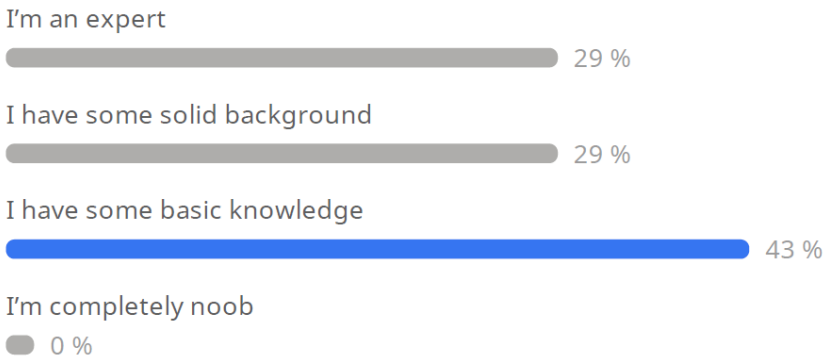
Practices at the ESA's CDF

Validation at ESA

- 7 participants
- Two exercises: prepare a review procedure and performing the review

How familiar are you with the MBSE topic? 0 0 7



Did you find easily the elements you wanted when you added a view ? 0 0 6

Did you find the views self-explanatory ? 0 0 7

Conclusion and Perspectives

Conclusion & Perspectives

Achievements

- Creation & edition of a review procedure
  - Review objectives
  - Textual elements
  - Chart based and diagram based interactive views from heterogeneous MBSE data
- Comments and discussion threads
  - At review procedure level
  - At diagram element level
  - Assessment of graphical comments
- Validation at ESA's CDF

Long-term perspectives :

- Integration of Extended Enterprise TeePee features
  - Review of unified aggregated models
- Edition of models
  - Personal Assistant
  - Sketch recognition integration from BabyMOD
- Integrate other viewpoints
  - Physical Archi. & Interfaces, functional chains, …
  - Other viewpoints defined directly by end-users
- Ontology definition as pivot metamodel
  - OSMOSE, SECAM, OpenCAESAR, …
- Partnerships with tool vendors to mature TRL

Thank you for you attention.

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