Collaborating with OpenMBEE as an Authoritative Source of Truth Environment

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SYSTEMS ENGINEERING
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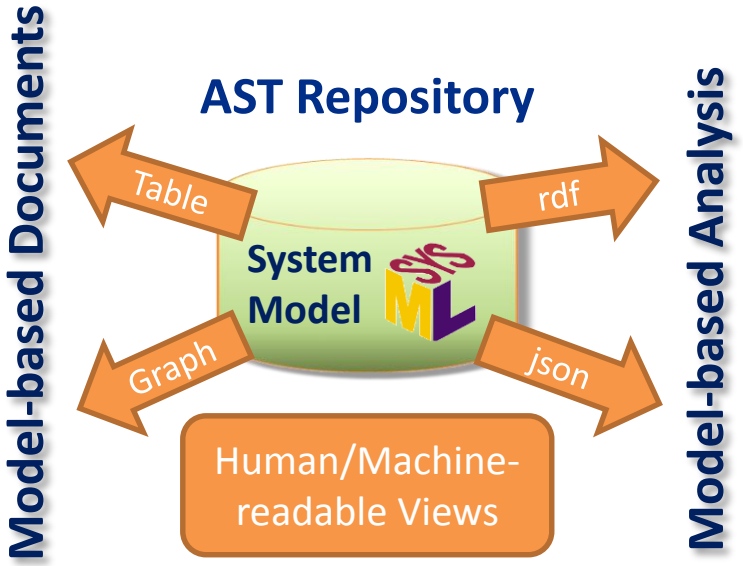
Agenda

- Authoritative Source of Truth & Surrogate Pilot
- OpenMBEE Overview
  - Model Development Kit (MDK) & DocGen
  - Model Management System (MMS)
  - View Editor
- Results
  - Digital Signoff Mechanism
  - Guidelines and Findings
    - Project Usage & User Permissions Example
  - Issues & Suggested Improvements

Introduction

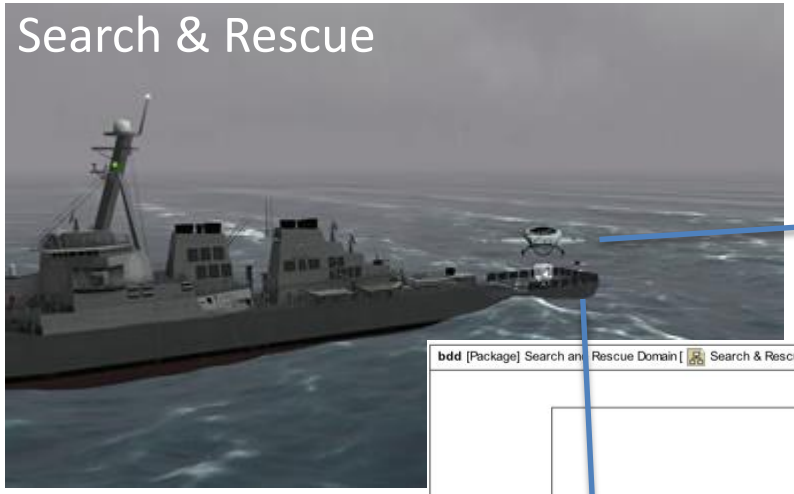
- Authoritative Source of Truth (AST)
  - To provide consistent data in the format necessary for the given task
  - Implemented by **OpenMBEE** = Open Model Based Engineering Environment, developed by NASA/JPL



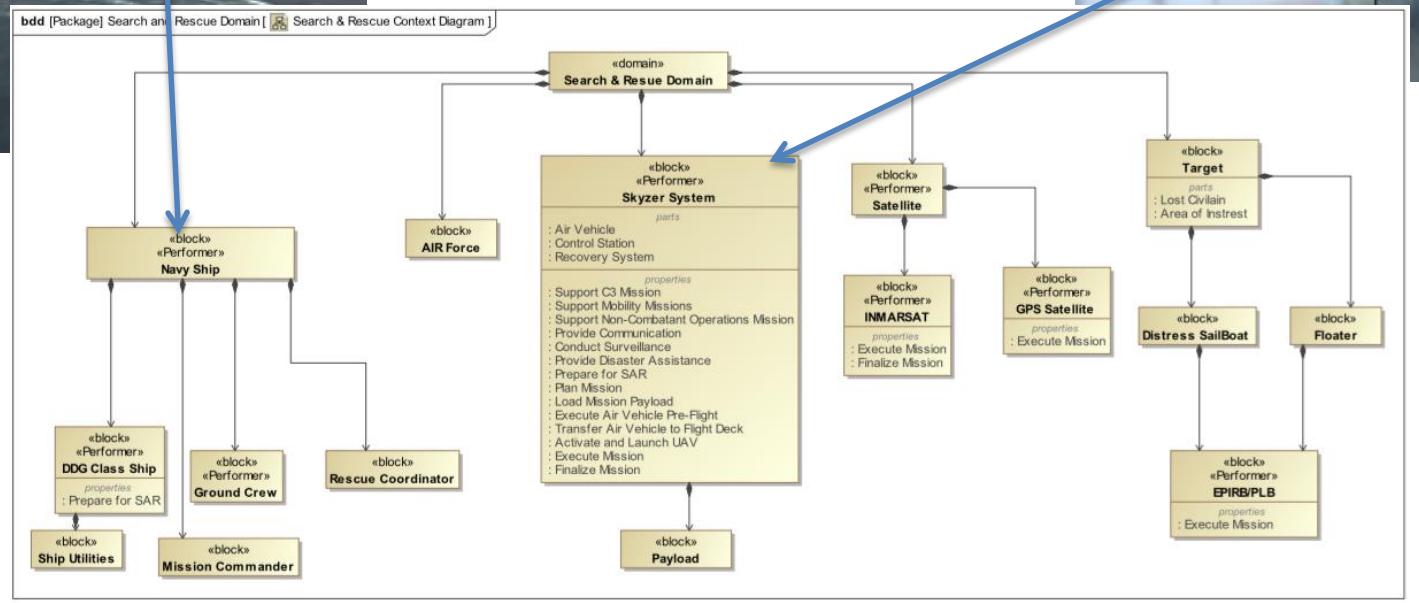
- Surrogate Pilot
  - Execution of NAVAIR's Systems Engineering Transformation (SET) Framework
  - To simulate collaboration in an AST
  - To support new operational paradigm between government and industry
    - By elimination of paper artifacts and large-scale design reviews in favor of continuous insight/oversight via the digital collaborative environment

Surrogate Pilot Scenario: Skyzer UAS

Graphical CONOPS Scenario:



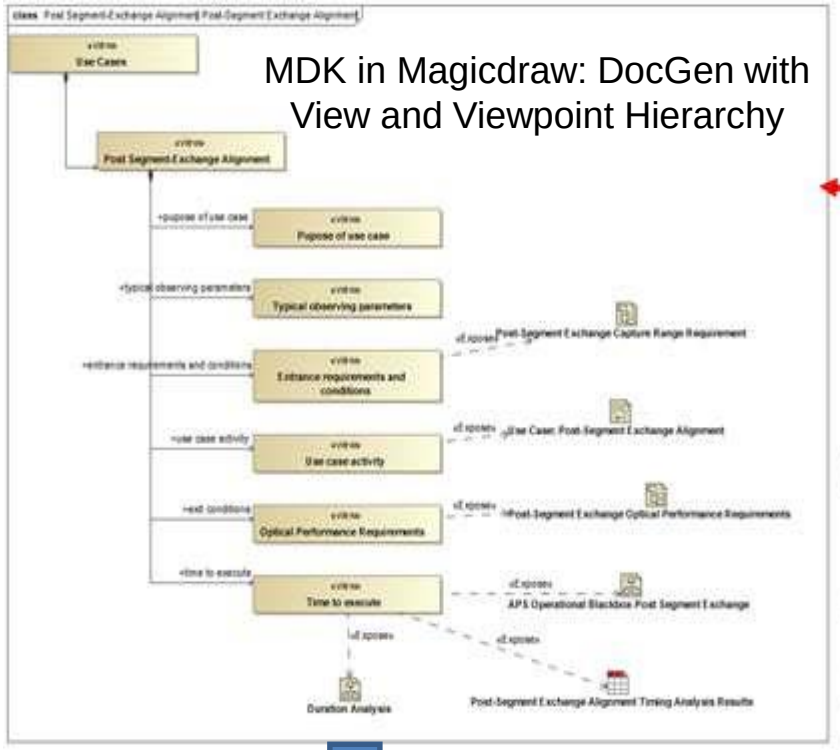
Airfoil designation for a similar Bell tilt-rotor (BA609)



Skyzer System & Mission Models developed using SysML

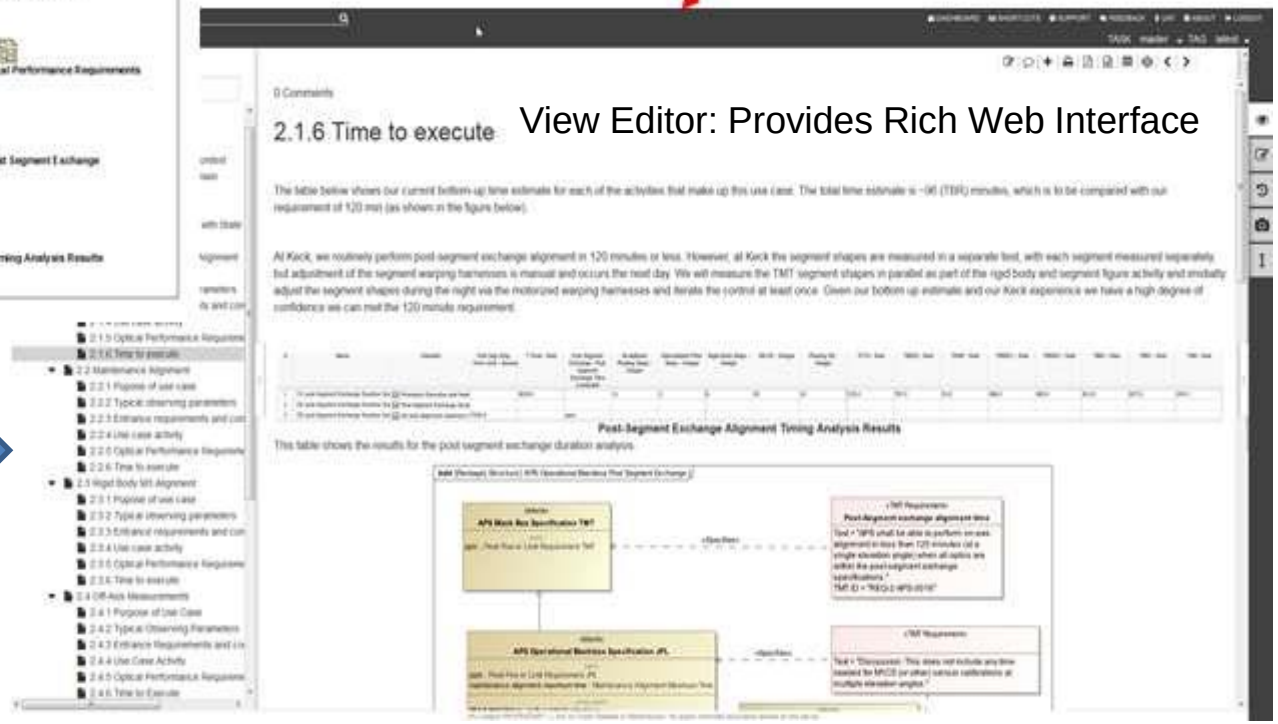
OpenMBEE: MDK, MMS & View Editor

MDK in Magicdraw: DocGen with View and Viewpoint Hierarchy



Model Management System (MMS)

Visualization in View Editor

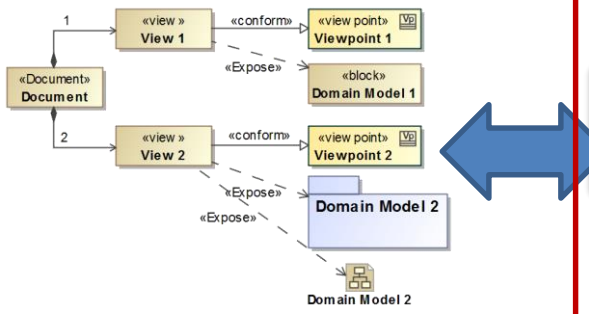


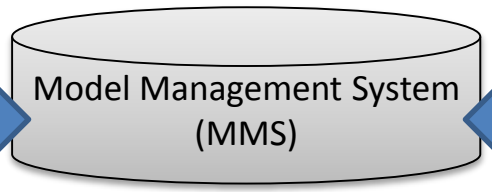
View Editor: Provides Rich Web Interface

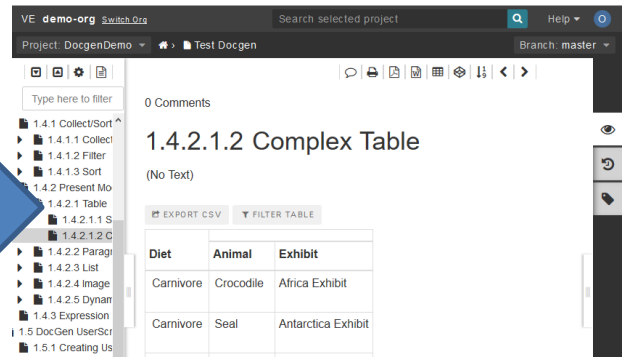
Model Development Kit (MDK)

- What is MDK?
  - Plugin for Magicdraw, to support building system assemblies through modeling augmentation and validation, enable syncing with MMS and using the DocGen language for model-based document creation using views and viewpoints
  - Content
    - Systems Reasoner
    - MMS Sync
    - DocGen

MDK: View and Viewpoint Hierarchy



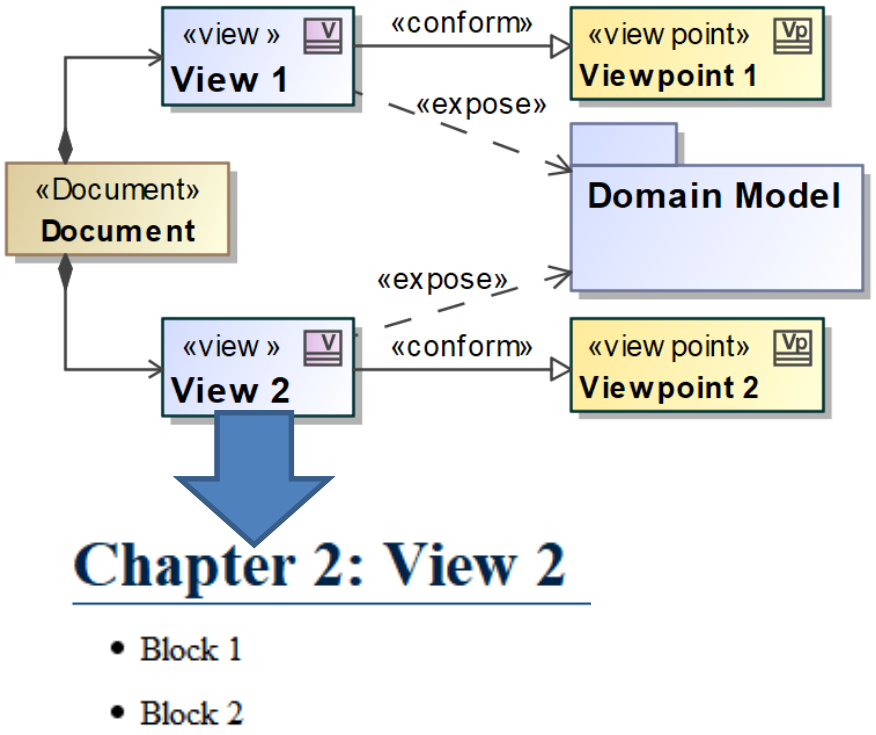


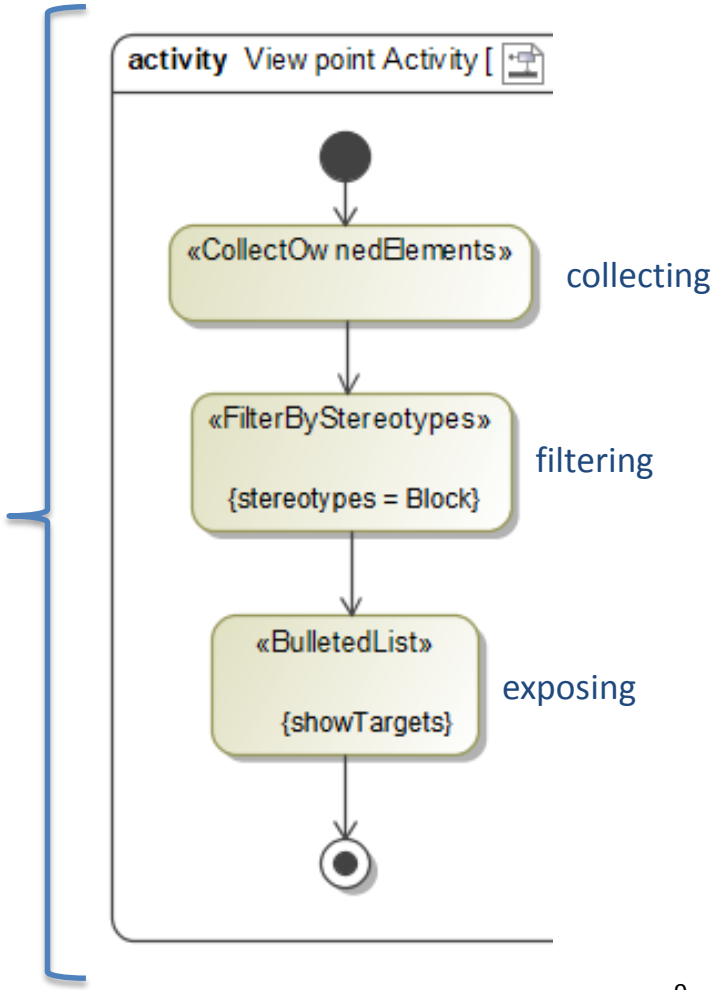


View Editor: Provides Rich Web Interface

MDK: DocGen

- DocGen
  - For model-based document creation based on Views and Viewpoints
    - To generate views for View Editor or pdfs
    - To guide modeling and development



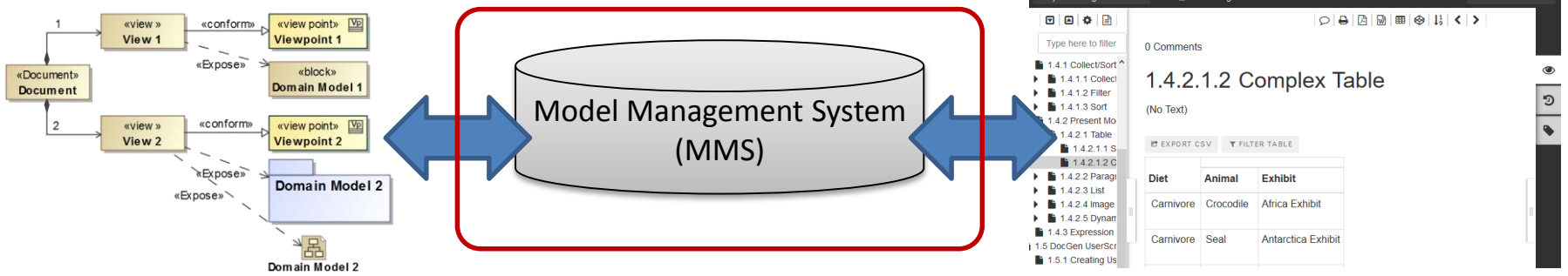


Model Management System (MMS)

- What is MMS?
  - —A version control system for structured data, including versioning, workflow management, and controlled access through RESTful web services
  - —Used as central data hub to facilitate multi-tool and multi-repository integration across engineering, computing, and management disciplines

- To store SysML model data
  - —Capturing all model elements (e.g. classes, instances, relations, but not: diagram layout), including their change history and views for View Editor

MDK: View and Viewpoint Hierarchy

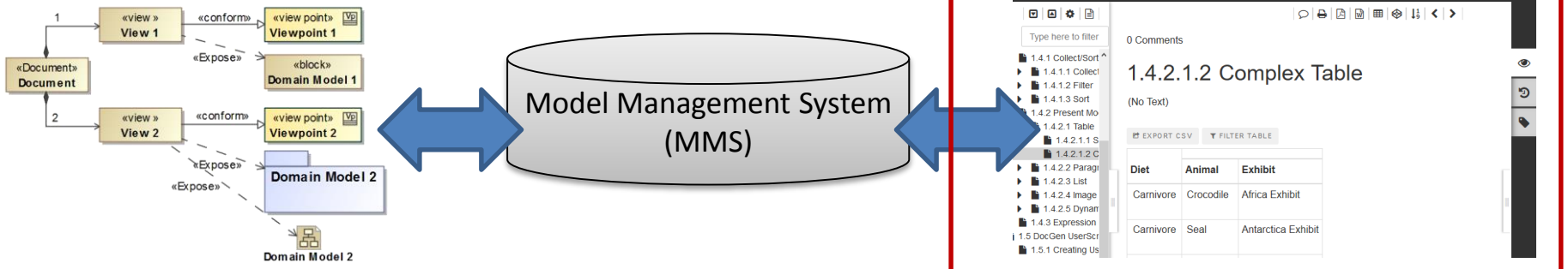


View Editor: Provides Rich Web Interface

View Editor

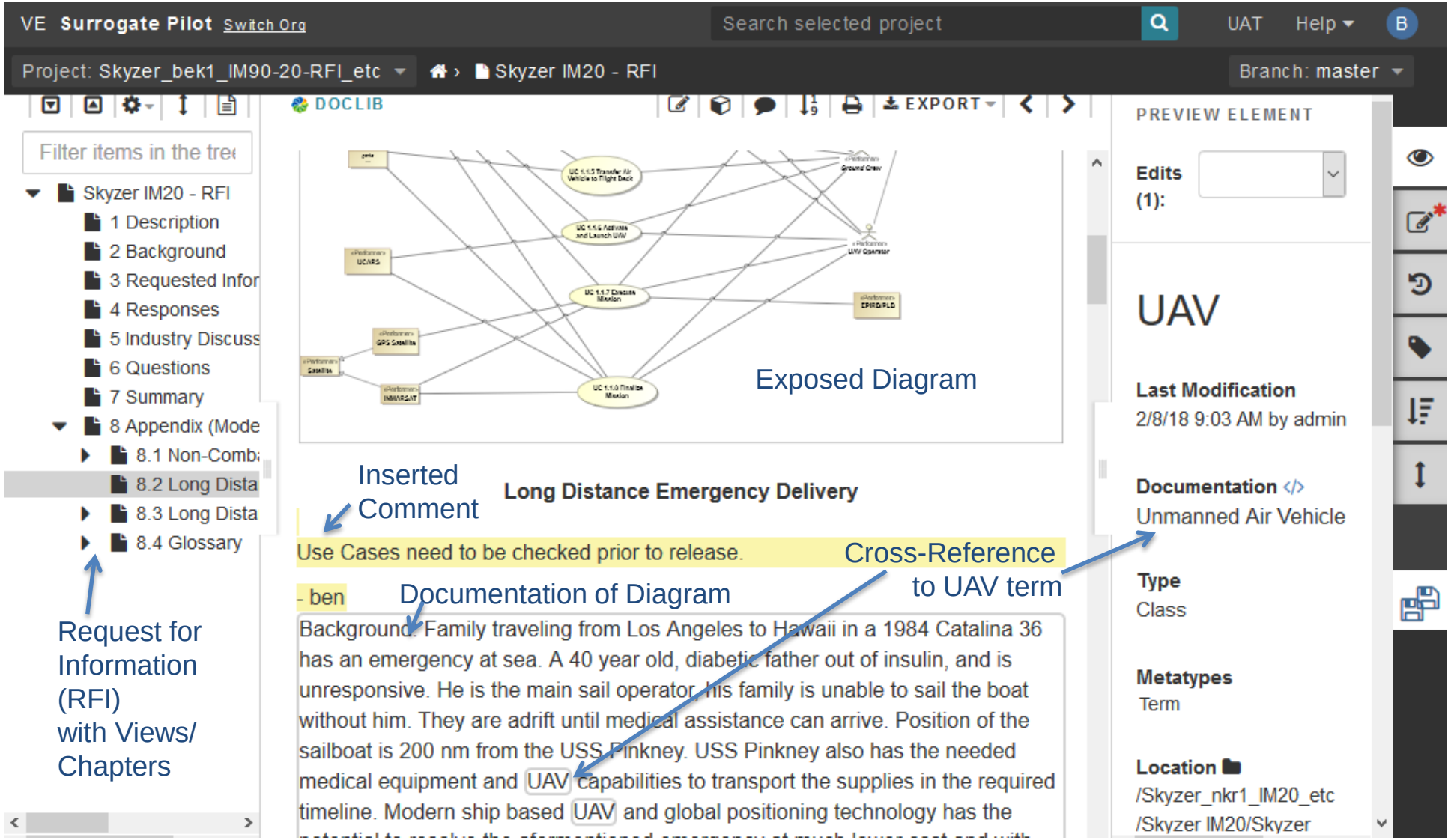
- What is the View Editor?
  - —A web app to provide consistent DocGen views on live SysML data, to allow interaction with model elements outside of the case tool
- To communicate through and edit model-derived documents
  - —Provide AST data access to non-modelers
  - —Editing of exposed model elements (e.g. placeholders for new elements) and addition of presentation elements (e.g. text, videos, etc.) and comments

MDK: View and Viewpoint Hierarchy

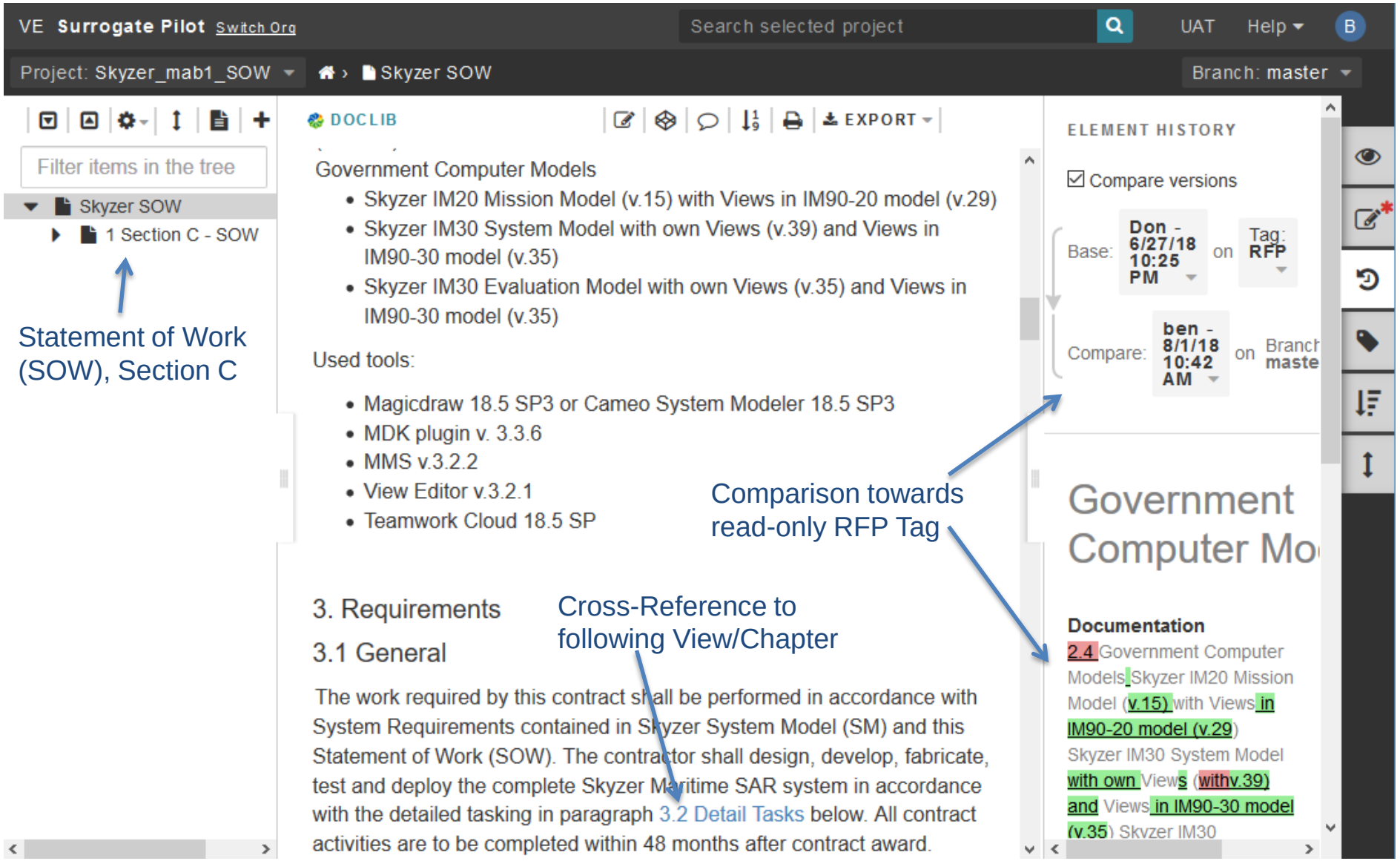


View Editor: Provides Rich Web Interface

View Editor: Commenting & Cross-Reference



View Editor: History Comparison

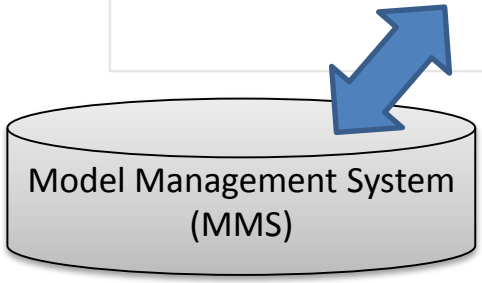


Digital Signoff

Digital Signoff for cross-referenced elements in View Editor, to support transition from document-based to model-based documents

General Performance SignOff

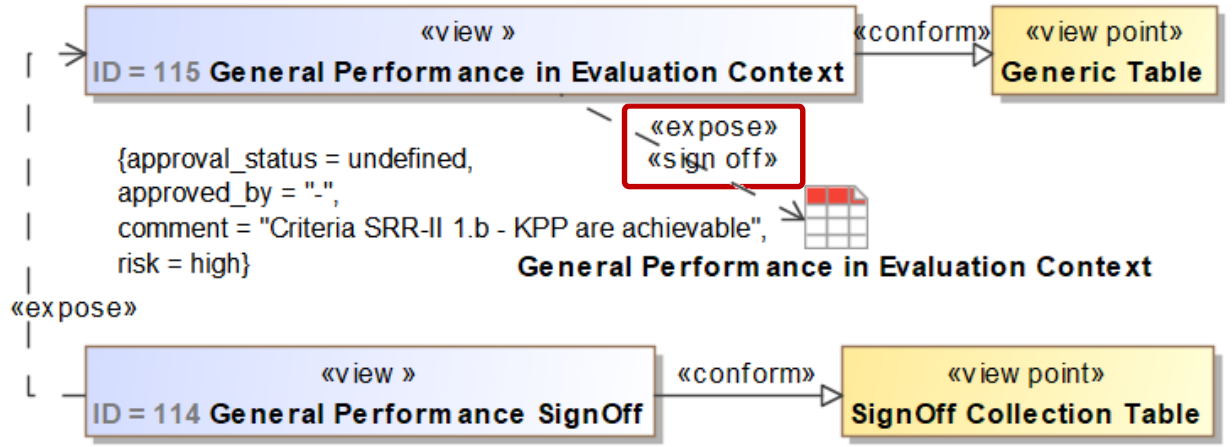
Approved Elements	Risk	Approval Status	Approved By	Comment
General Performance in Evaluation Context	high	Value : undefined (to be defined / undefined / approved / rejected)	-	Criteria SRR-II 1.b - KPP are achievable



Signoff target: General…
Approval status: undefined
Last changed by: Admin
Last changed at:
02/22/2019, 10:43:51

Captured signoff & model information in AST (including who and when)

Specification of model elements to be signed off in DocGen view hierarchy



Guidelines and Findings (1)

- View Editor offering views on consistent data from AST, improving communication between modelers and other stakeholders
  - —Through access on consistent AST data without SysML or tool knowledge
    - Enabling transition from document-based to model-based development
  - —Through central model-based data representation
    - Improving traceability by searching, comparing and cross-referencing of elements in MMS in the View Editor
  - —Adopted GitFlow[1] workflow for collaboration and reviews with branches and tags
  - —Implemented Digital Signoff mechanism
    - Supporting transition from static documents to live model-based views, by referencing model elements to be approved
  - —Implemented Issue Tracking with AST access, referencing model elements and comments in the View Editor

1) https://www.atlassian.com/git/tutorials/comparing-workflows/gitflow-workflow

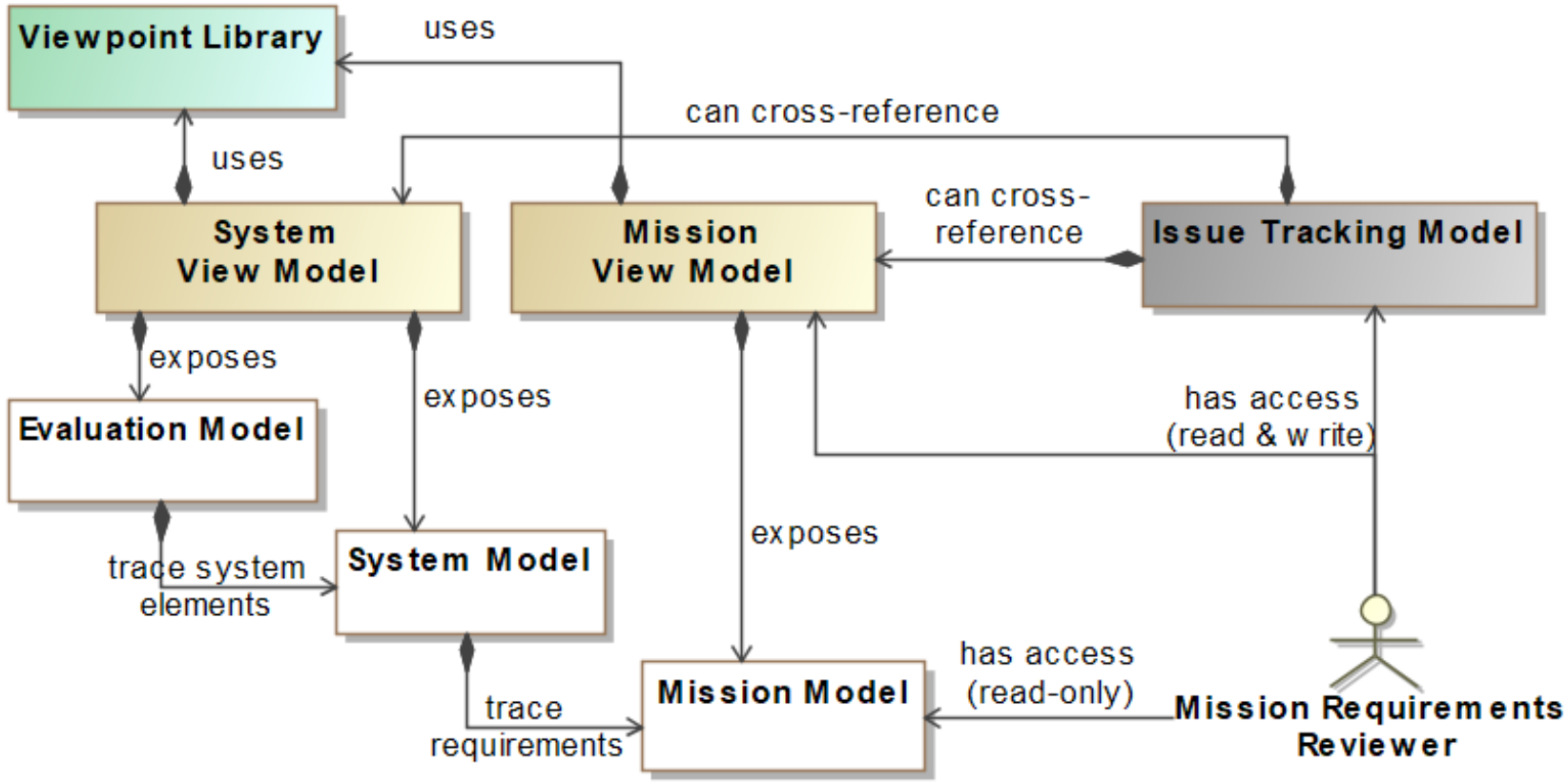
Guidelines and Findings (2)

- Use of DocGen & Viewpoint Library
  - —Model-based document generation using DocGen, enabling fast and useful design iterations
  - —Providing standardized viewpoints to quickly create consistent documents
    - Most viewpoint needs covered by the provided elements and OCL[1] constraints
    - Few modelers need to be familiar with DocGen
    - Allowing pre-planned view hierarchies to guide modeling by defining model structure and required content
- Required Modeling Considerations
  - —Consistent model structure to ensure viewpoints finding model elements
  - —Keeping document creation in mind while modeling
    - E.g. limiting diagram size and adding documentation
  - —Project usage mechanism for modularization, reuse, partitioning, traceability and user access

1) OCL = Object Constraint Language

Project Usage & User Permissions: Example

- Editing & commenting in the Mission View Model, without permission to directly change exposed requirements from Mission Model
- Creating issues in Issue Tracking Model, e.g. using prior comments



Composition ≙ Project Usage

Issues & Suggested Improvements

- Issues
  - —Errors preventing project usages in Teamwork Cloud
  - —Inconsistent document representation between SysML tool and View Editor
  - —View Editor creating names for elements unable to have a name in SysML (fixed)
- Suggested Improvements
  - —Utilizing open access to AST data, e.g. for ontological reasoning
  - —Augmented cross referencing in View Editor, e.g. for SysML term elements
  - —Improved creation of model elements in View Editor, e.g. using MapleMBSE
  - —Improved reviewing in View Editor, e.g. with a change request process involving tracked issues and signoffs that may prevent changes without an reversed approval status and notifications

Further Information

- OpenMBEE http://www.openmbee.org/
  - —GitHub: https://github.com/Open-MBEE
  - —OpenMBEE Public Server Information: https://github.com/Open-MBEE/open-mbee.github.io/wiki/OpenMBEE-public-server-information
- Surrogate Pilot
  - —Apan SET Surrogate Pilot Group: https://community.apan.org/wg/navair-set/set-surrogate-pilot/
  - —View Editor: http://ime.sercuarc.org/alfresco/mmsapp/mms.html (Login instructions available on Apan)

Thank you!

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