

Collaborating with OpenMBEE as an Authoritative Source of Truth Environment

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Systems Engineering Research Center



Systems Engineering Research Center (SERC)

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Authoritative Source of Truth Environment**

By:

Benjamin Kruse, Sc.D.

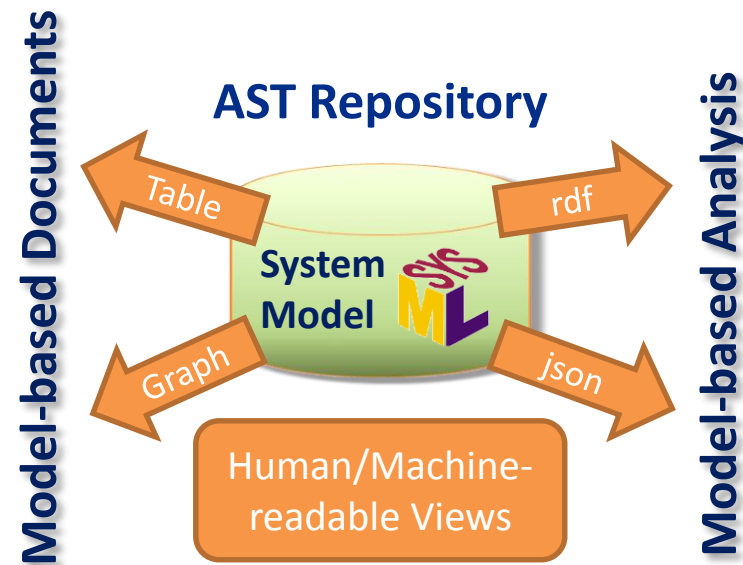
Mark Blackburn, Ph.D.

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- 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

- Authoritative Source of Truth (AST)

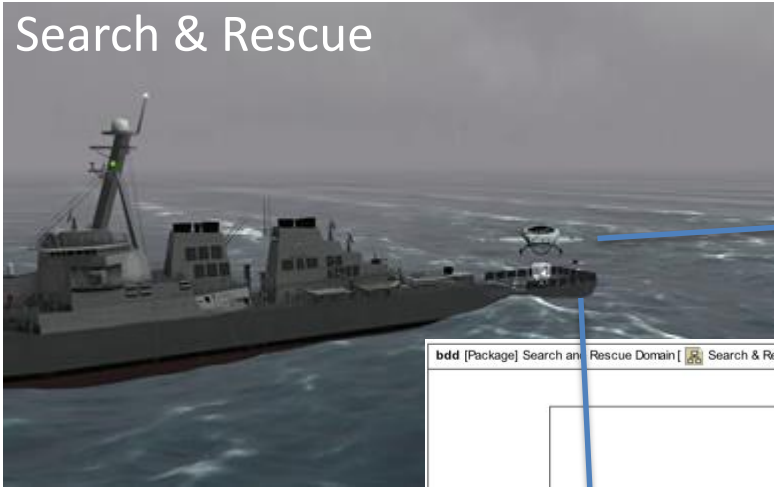
- To provide consistent data in the format necessary for the given task
- Implemented by **OpenMBEE** = Open Model Based Engineering Environment, developed by NASA/JPL



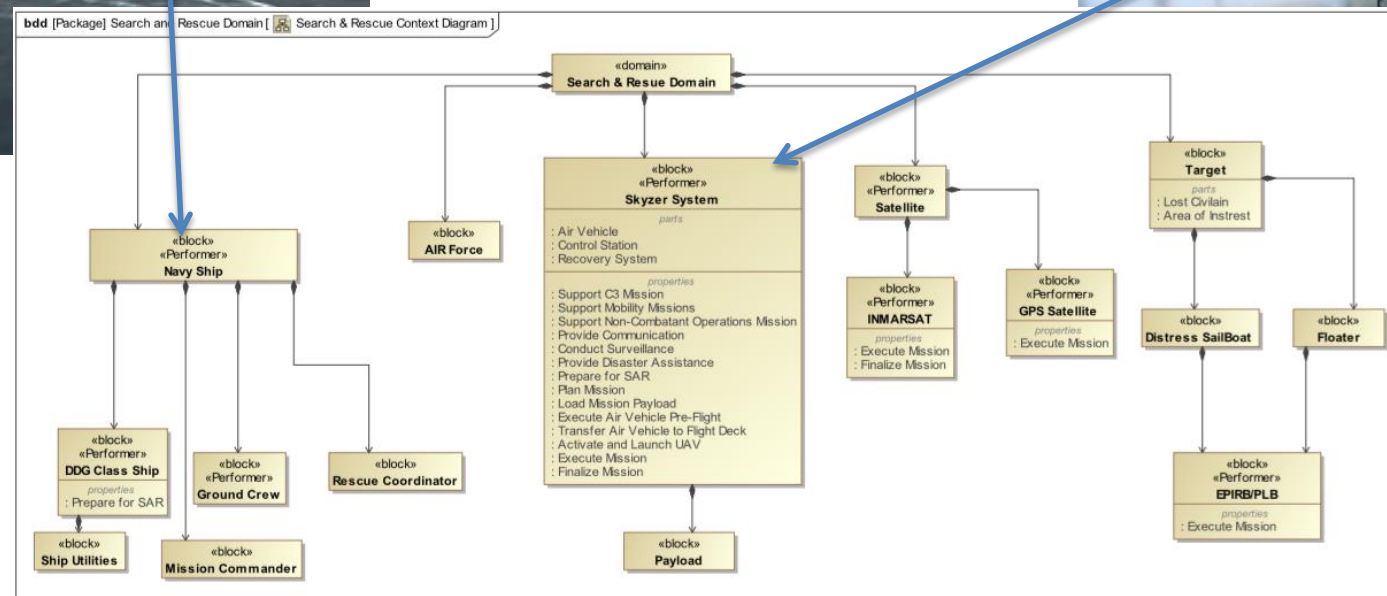
- Surrogate Pilot

- 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

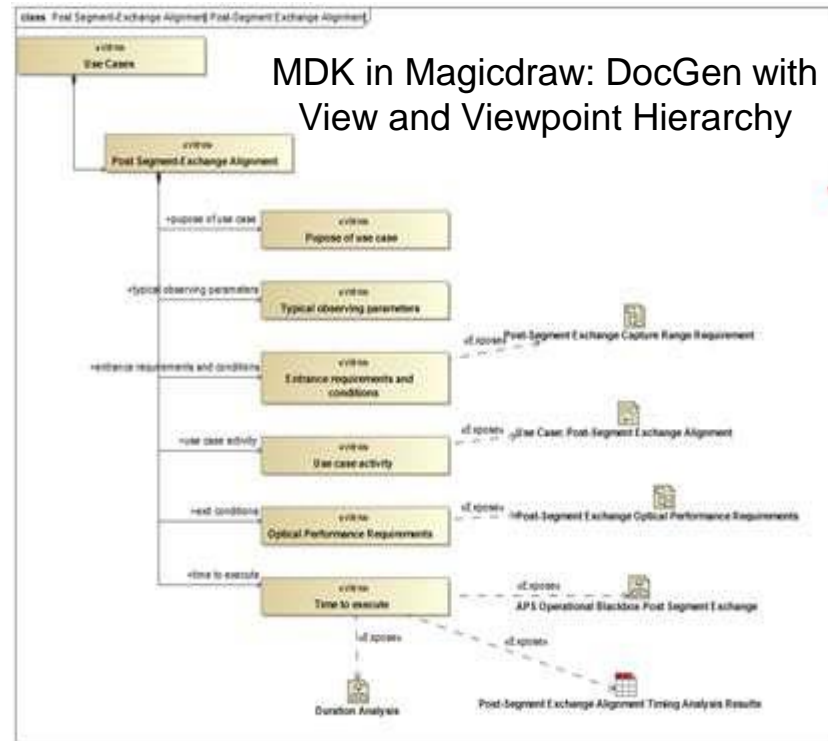
Graphical CONOPS Scenario: Search & Rescue



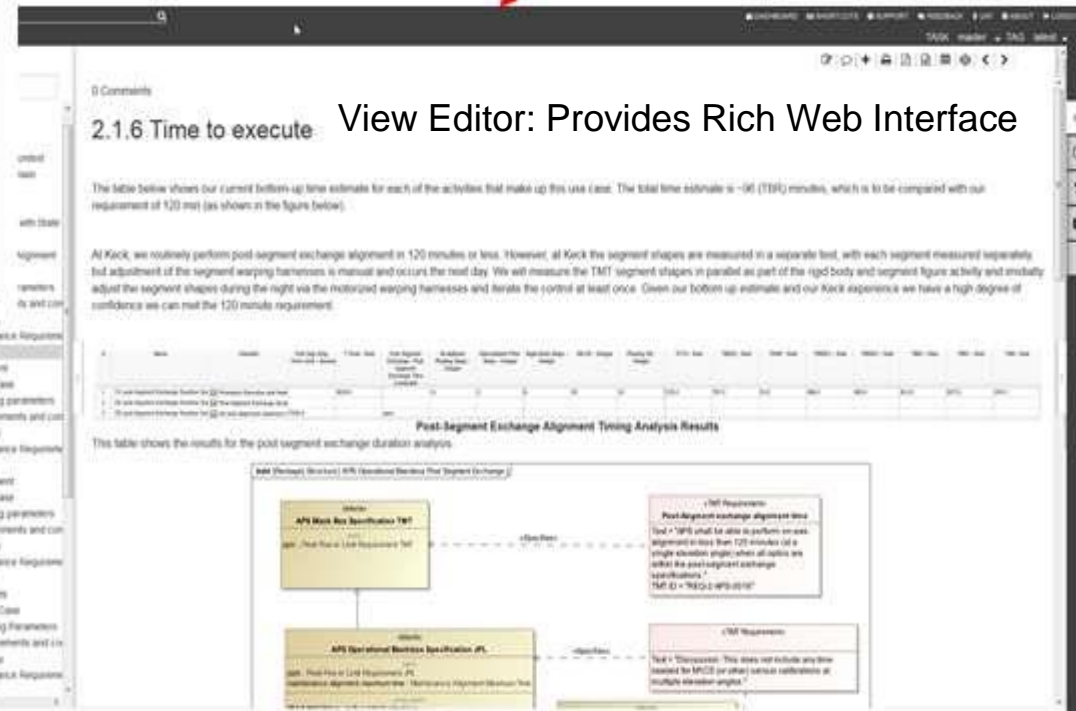
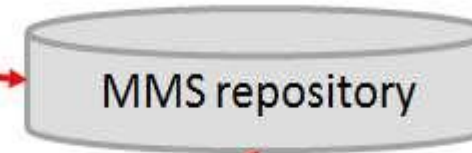
Airfoil designation for a similar Bell tilt-rotor (BA609)



Skyzer System & Mission Models developed using SysML



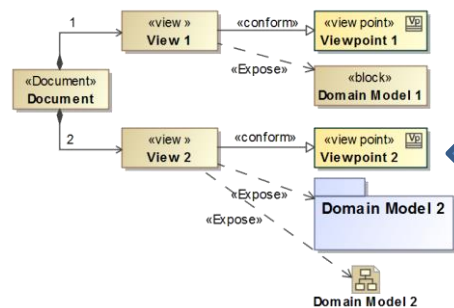
Model Management System (MMS)



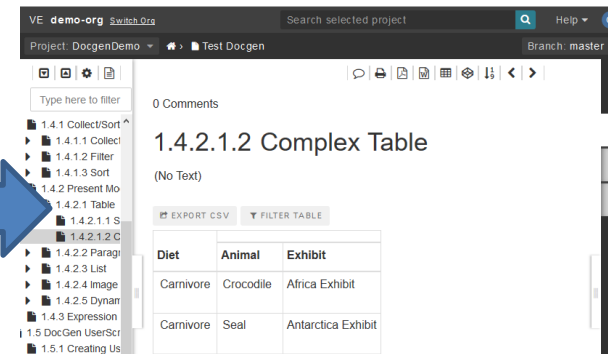
Visualization in
View Editor

- 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



Model Management System
(MMS)

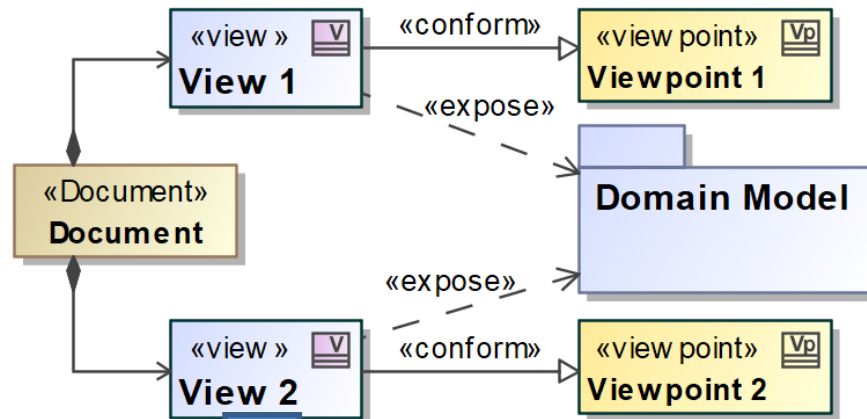


View Editor: Provides Rich Web Interface

- DocGen

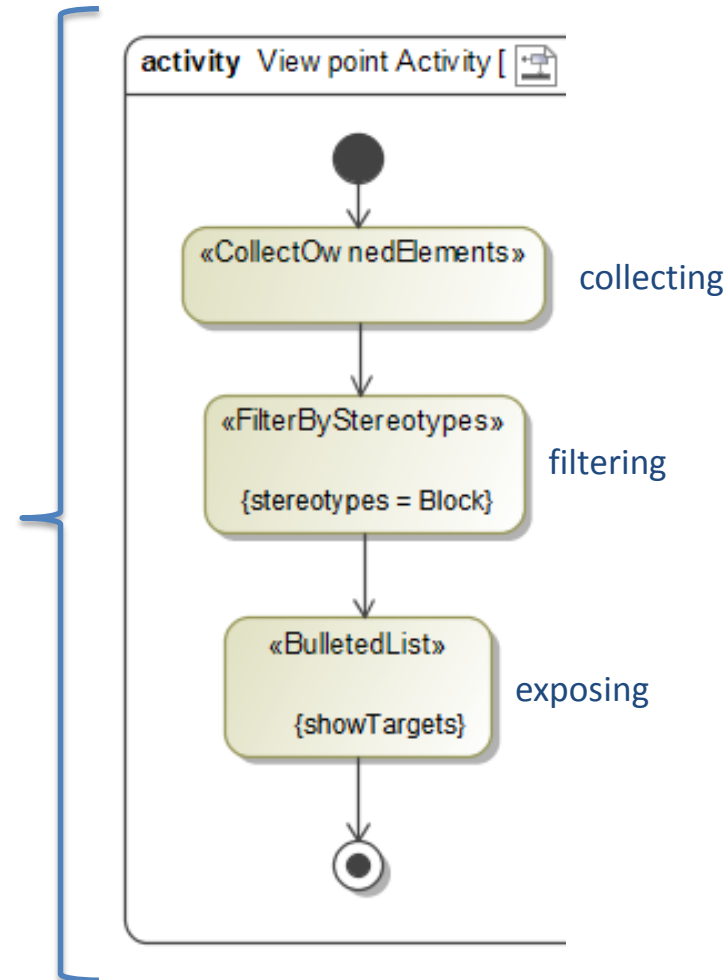
- For model-based document creation based on Views and Viewpoints

- To generate views for View Editor or pdfs
- To guide modeling and development



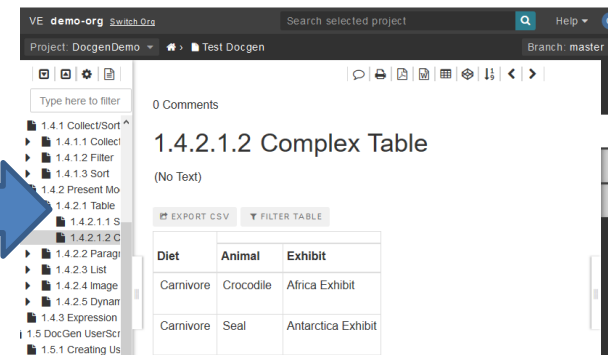
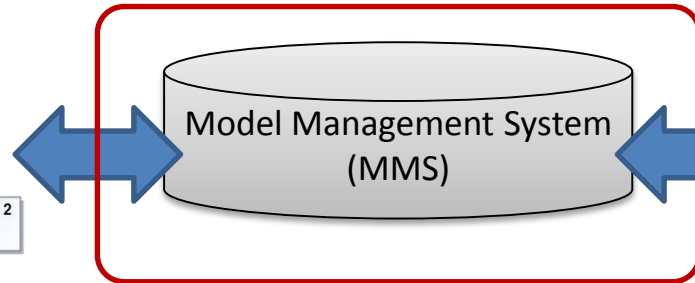
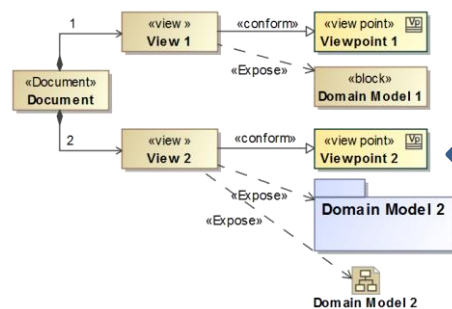
Chapter 2: View 2

- Block 1
- Block 2



- 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

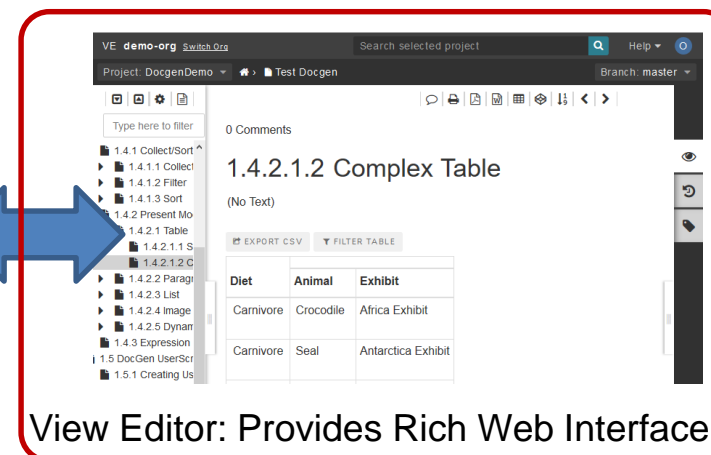
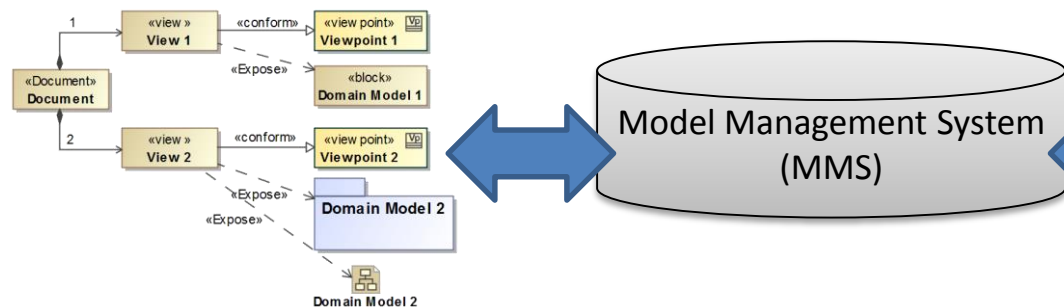
MDK: View and Viewpoint Hierarchy



View Editor: Provides Rich Web Interface

- 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

VE **Surrogate Pilot** [Switch Org](#) Search selected project UAT Help B

Project: Skyzer_bek1_IM90-20-RFI_etc Skyzer IM20 - RFI Branch: master

Filter items in the tree

- Skyzer IM20 - RFI
 - 1 Description
 - 2 Background
 - 3 Requested Information
 - 4 Responses
 - 5 Industry Discussion
 - 6 Questions
 - 7 Summary
 - 8 Appendix (Mode)
 - 8.1 Non-Comb
 - 8.2 Long Distance Emergency Delivery
 - 8.3 Long Distance Emergency Delivery
 - 8.4 Glossary

Exposed Diagram

Inserted Comment

Long Distance Emergency Delivery

Use Cases need to be checked prior to release.

Cross-Reference to UAV term

Documentation of Diagram

Background: Family traveling from Los Angeles to Hawaii in a 1984 Catalina 36 has an emergency at sea. A 40 year old, diabetic father out of insulin, and is unresponsive. He is the main sail operator, his family is unable to sail the boat without him. They are adrift until medical assistance can arrive. Position of the sailboat is 200 nm from the USS Pinkney. USS Pinkney also has the needed medical equipment and UAV capabilities to transport the supplies in the required timeline. Modern ship based UAV and global positioning technology has the potential to assist the aforementioned emergency of such lower cost and with

PREVIEW ELEMENT

Edits (1):

UAV

Last Modification
2/8/18 9:03 AM by admin

Documentation </>
Unmanned Air Vehicle

Type
Class

Metatypes
Term

Location
/Skyzer_nkr1_IM20_etc
/Skyzer IM20/Skyzer

Request for Information (RFI) with Views/ Chapters

VE **Surrogate Pilot** [Switch Org](#) Search selected project UAT Help B

Project: Skyzer_mab1_SOW Branch: master

Filter items in the tree

- Skyzer SOW
 - 1 Section C - SOW

Statement of Work (SOW), Section C

DOCLIB

Government Computer Models

- Skyzer IM20 Mission Model (v.15) with Views in IM90-20 model (v.29)
- Skyzer IM30 System Model with own Views (v.39) and Views in IM90-30 model (v.35)
- Skyzer IM30 Evaluation Model with own Views (v.35) and Views in IM90-30 model (v.35)

Used tools:

- Magicdraw 18.5 SP3 or Cameo System Modeler 18.5 SP3
- MDK plugin v. 3.3.6
- MMS v.3.2.2
- View Editor v.3.2.1
- Teamwork Cloud 18.5 SP

3. Requirements

3.1 General

The work required by this contract shall be performed in accordance with System Requirements contained in Skyzer System Model (SM) and this Statement of Work (SOW). The contractor shall design, develop, fabricate, test and deploy the complete Skyzer Maritime SAR system in accordance with the detailed tasking in paragraph 3.2 Detail Tasks below. All contract activities are to be completed within 48 months after contract award.

Comparison towards read-only RFP Tag

Cross-Reference to following View/Chapter

ELEMENT HISTORY

☒ Compare versions

Base: Don - 6/27/18 10:25 PM on Tag: RFP

Compare: ben - 8/1/18 10:42 AM on Branch: master

Government Computer Mo

Documentation

2.4 Government Computer Models





Skyzer IM20 Mission Model (v.15) with Views in IM90-20 model (v.29)

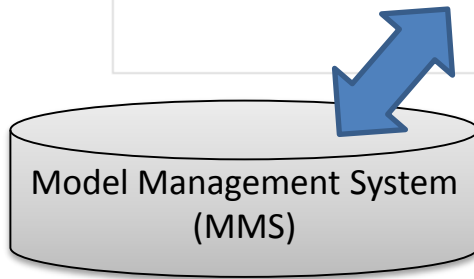
Skyzer IM30 System Model with own Views (v.39) and Views in IM90-30 model (v.35)

Skyzer IM30

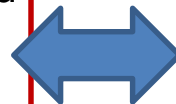
Digital Signoff for cross-referenced elements in View Editor, to support transition from document-based to model-based documents

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

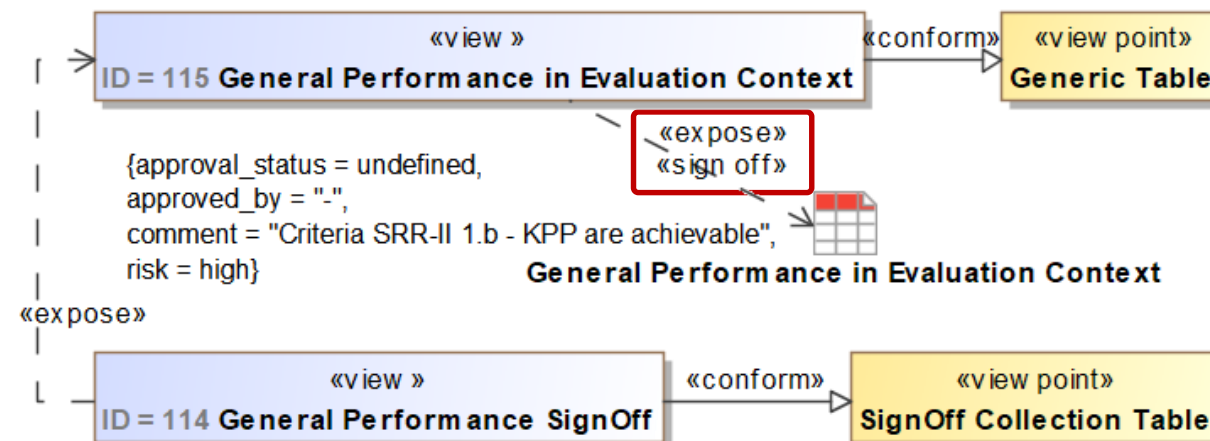


Signoff target: General...
Approval status: undefined
Last changed by: Admin
Last changed at:
02/22/2019, 10:43:51



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

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



- 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 GitFlow¹ 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

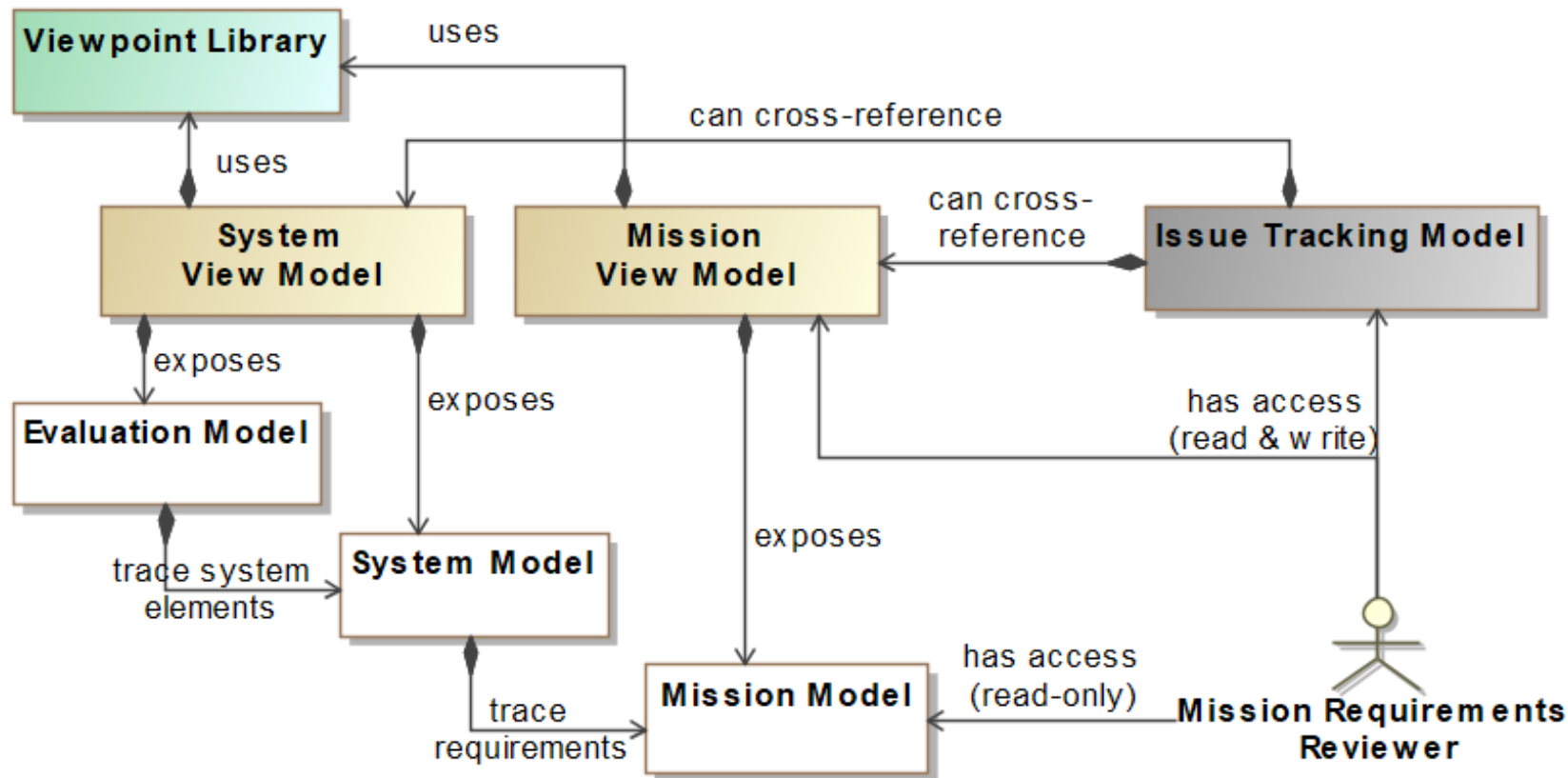
1) <https://www.atlassian.com/git/tutorials/comparing-workflows/gitflow-workflow>

- 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 OCL¹ 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 \triangleq Project Usage

- 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

- 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!

Dr. Benjamin Kruse
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School of Systems & Enterprises
Systems Engineering Research Center
Stevens Institute of Technology