



VSD/MBSE Final Presentation

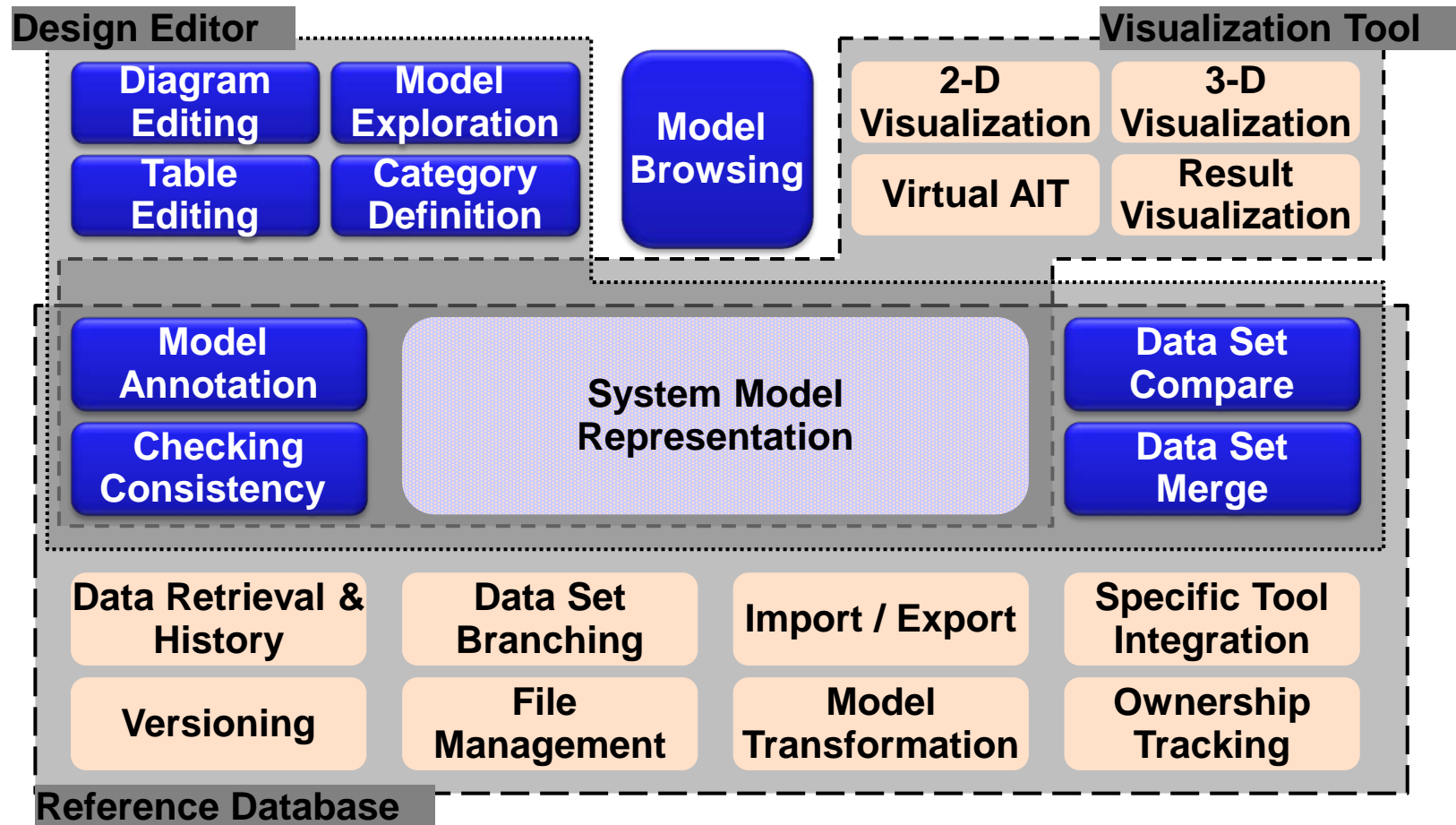
SSDE Key Functions

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Overview

- Let's have a look at some of the SSDE key aspects



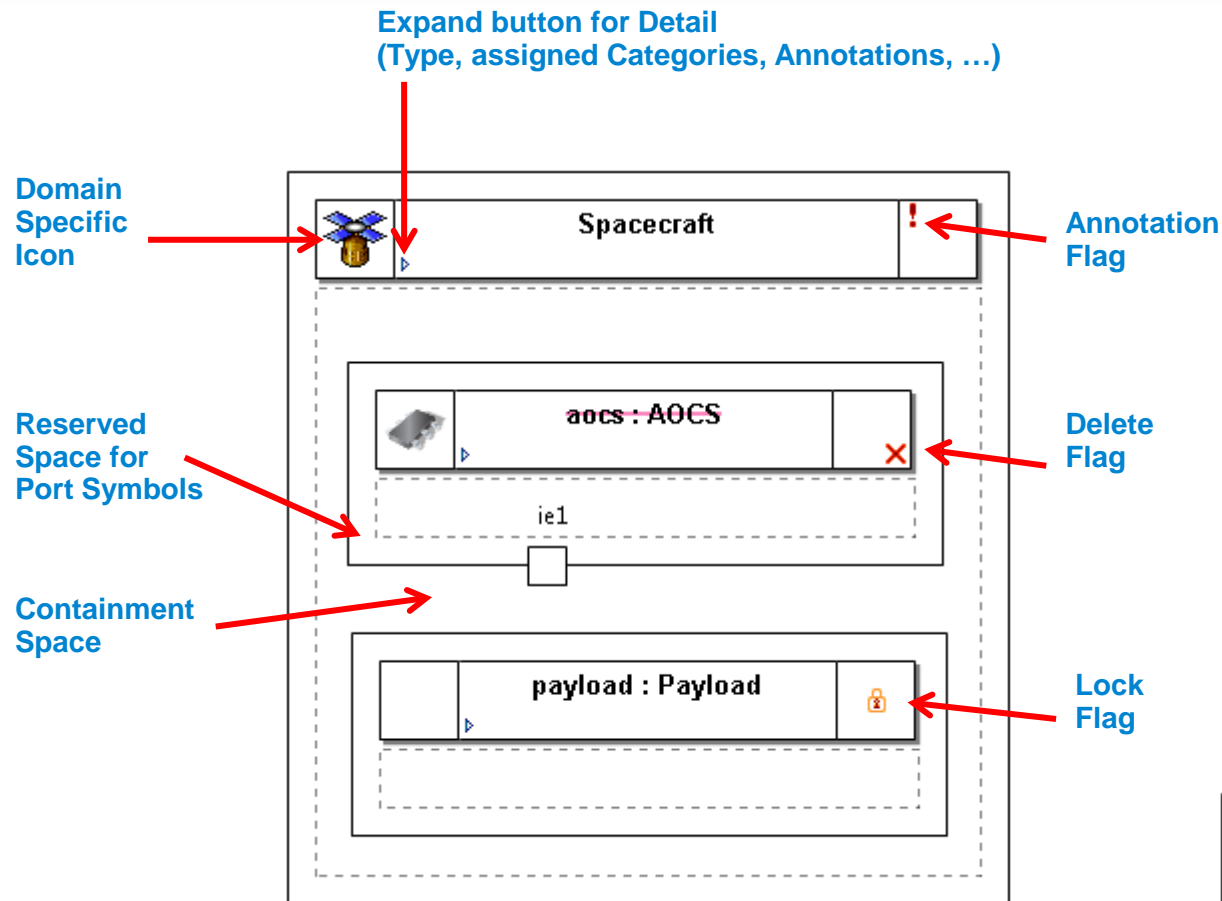
SSDE key aspects and functions

- Domain specific Metamodel and Notation
- Category Support
- Discipline specific views
- Efficient data-entry approach
- Model Exploration
- Impact analysis and consistency checks
- Integrated Model Review
- Multiuser/Multisite Support

Domain specific Metamodel

- ECSS 10-23 Metamodel as starting point
 - MDA approach to build the SSDE
 - Leveraging the Eclipse Framework and EMF
 - SSDE is ~ 350.00 Lines of Code, ~ 70% of which are generated
- Beyond the static nature of the Metamodel:
 - Categories - and shared QUDV-Model (including graphical editor support)
 - Common SI-Definitions

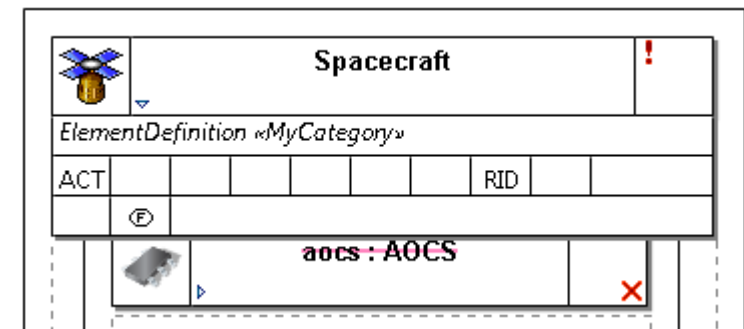
Domain specific Notation



Icon replacement and addons in non-diagram views

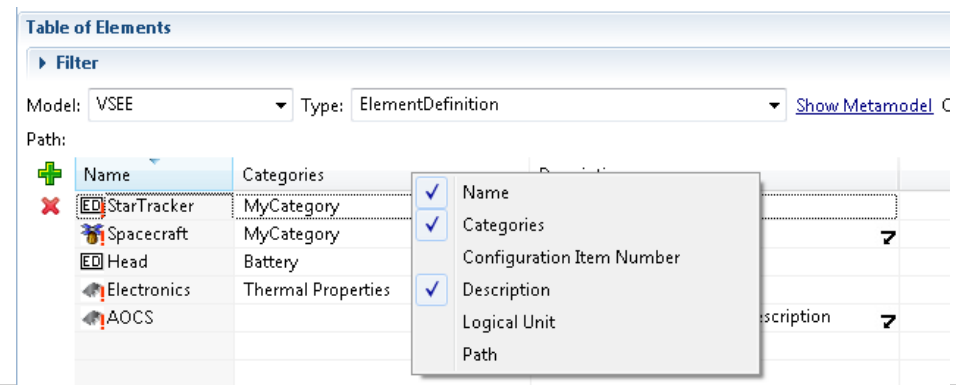
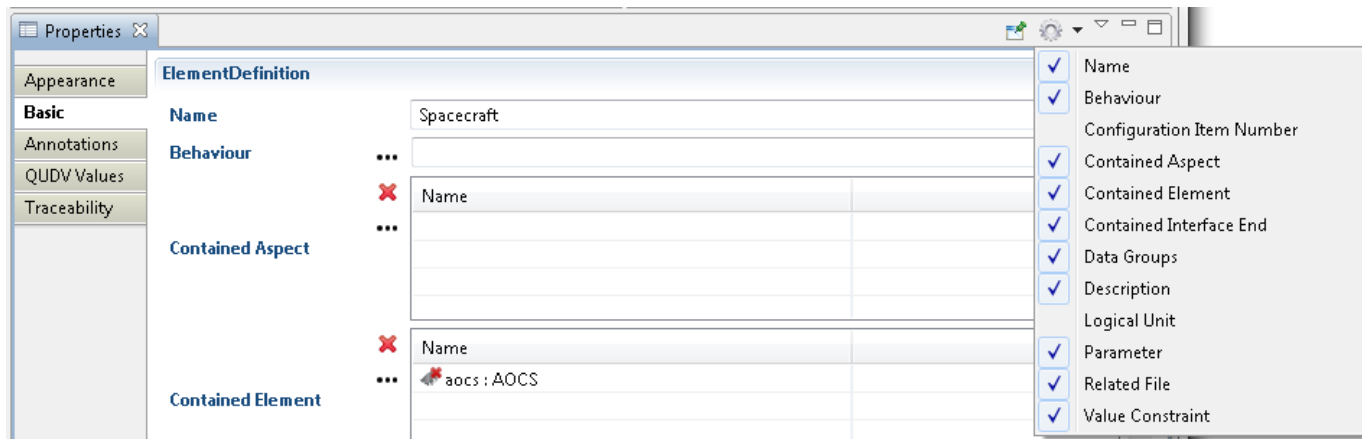
- Spacecraft
 - Functions
 - Operational Mode Definitions
 - Requirements
 - aocs : APCS
 - payload : Payload

Expanded symbol header



Discipline Specific Views

- All table and property views are fully customizable
- Order of properties/columns
- Hide/show of properties/columns



Video-Description: [1:05 minutes]

- Customizable property sheets
- Hide/show, drag&drop ordering

VSD SSDE Application

File Edit Refinement Actions Window Help

SSDE Navigator

- SIDefinitions
- StarTrackerCatia
- VSD_DS_DataSet_V1_7_7
 - Intro
 - Model
 - Diagrams
 - External files

RDE Editor

Refinement

Filter

Name	Title	Require...	Type
Level1: ESA System Requirements			
Configuration - Cross Section	Cross Section	8.1.1 - R3	Configuration
Configuration - Fields of Views	Fields of Views	8.1.1 - R2	Configuration
Configuration - Mass changes	Mass changes	8.1.1 - R4	Configuration
DFACS General - DFACS general functions	DFACS general function	8.5.1 - R1	Functional
DFACS General - DFACS and mission performance	DFACS and mission performance	8.5.1 - R2	Functional
DFACS General - minimized approach	Minimised approach	8.5.1 - R4	Functional
DFACS General - No disturbance on scientific observations	The DFACS shall not introduce disturbances that invalidate the scient	8.5.1 - R3	Functional
DFACS Performance - Accuracy of position and velocity estimation	Accuracy of position and velocity estimation	8.5.3 - R4	Functional
DFACS Performance - Compatibility to attitude motion after separation	Compatibility to attitude motion after separation	8.5.3 - R1	Functional
DFACS Performance - Compliance to angular rate and acceleration limitations	Compliance to angular rate and acceleration limitations	8.5.3 - R5	Functional
DFACS Performance - Compliance to payload measurement requirements	Compliance to payload measurement requirements	8.5.3 - R2	Functional
DFACS Performance - Orbit and Drag Free Control	Orbit and Drag Free Control	8.5.3 - R3	Functional
Electrical Power System - General Power Design	General Power Design	8.6.1 - R1	Design
Electrical Power System - Power Margin	Power Margin	8.6.1 - R3	Functional
Electrical Power System - Power System status	Power System status	8.6.2 - R2	Operational

Search: RE Elements: 96 Found: 0

☐ Refinement ☐ Derivation ☐ Containment

Properties Error Log

Basic

Annotations

QUOV Values

Traceability

Requirement

Name Configuration - Fields of Views

Comment ...

Criticality ...

Data Groups

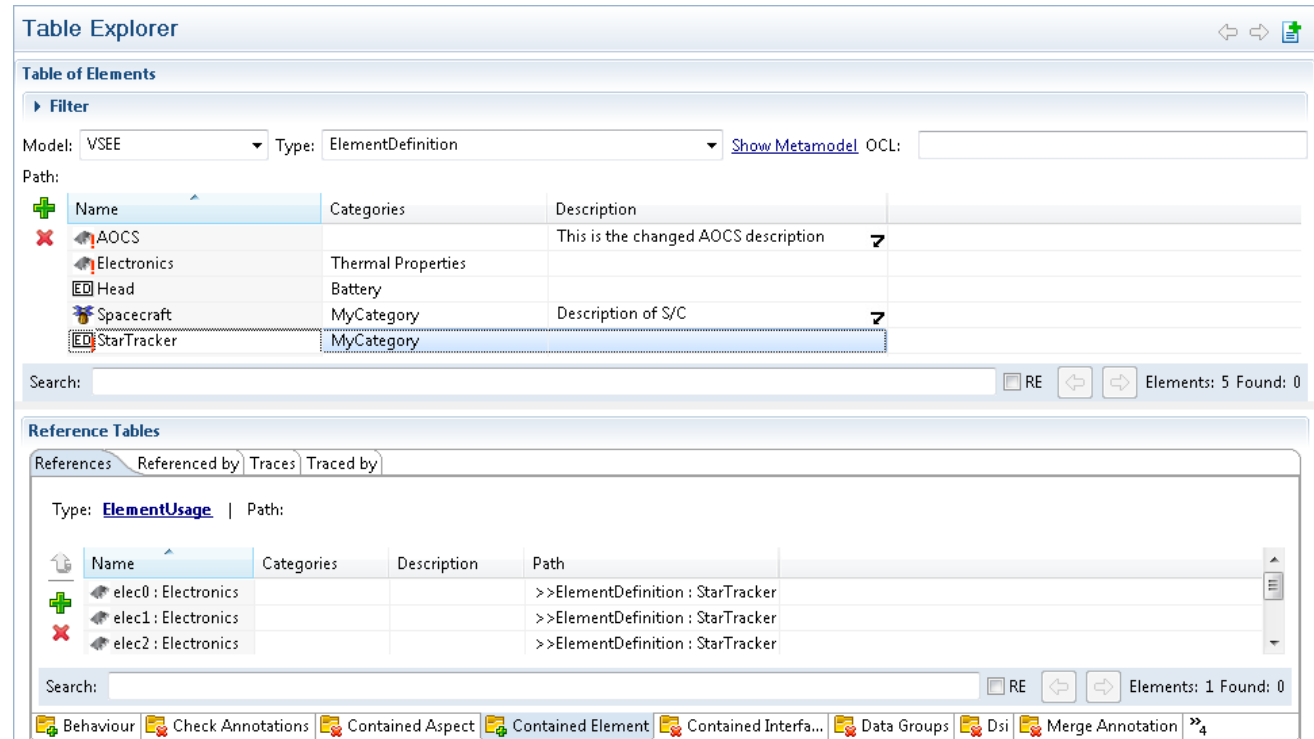
Definition ...

Search: RE

Configuration - Fields of Views object selected

Table Editor and Explorer

- Focus on efficient data entry
- No struggling with layout aspects
- Approach is similar to Excel or MS-Access based models
- Sorting, search, filter, etc. ...



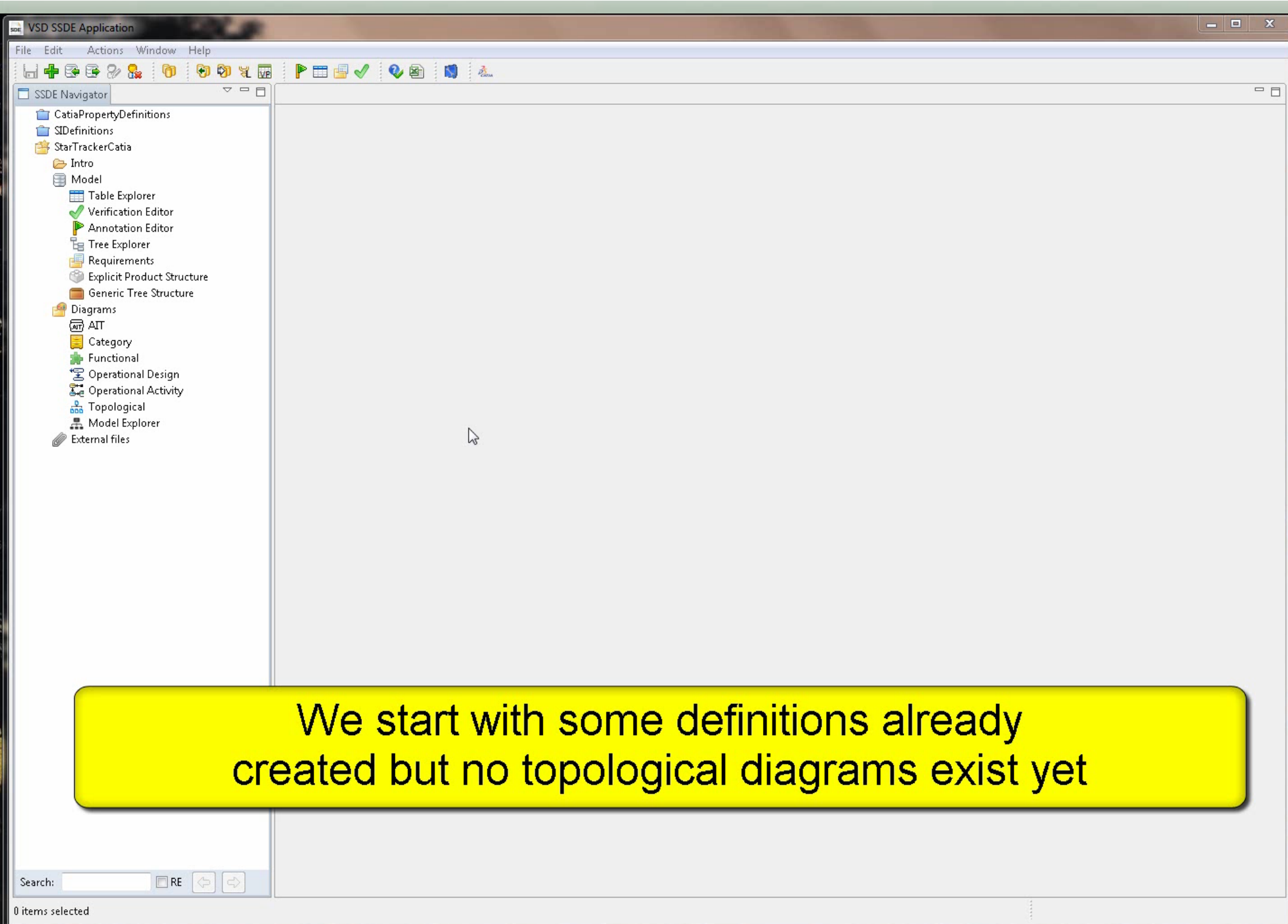
Autodrawing

- Diagrams can be built at any time by means of Autodrawing
 - Start from a given element, insert contained or connected elements
 - Changes to model are reflected across the board
-> diagrams are just views on the underlying model



Video-Description: [2:45 minutes]

- Start from an ElementDefintion
- Autocompletion for label editing
- insert contained Usages, ports and interfaces
- Proxy Ports



Model Exploration

- Dynamic Model Exploration
 - Exploration structures are not static but built on demand, based on all available paths in the Datamodel
 - Structures can start anywhere in the model
- Exploration via
 - Trees
 - Diagrams
 - Tables

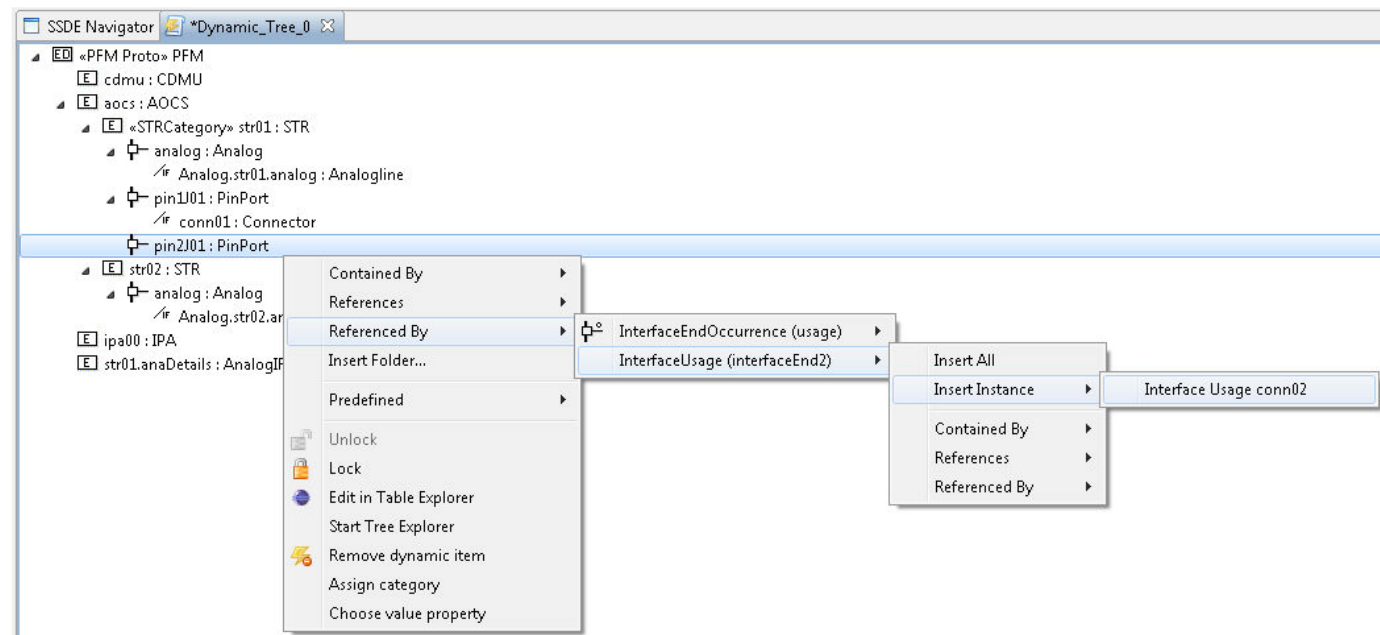
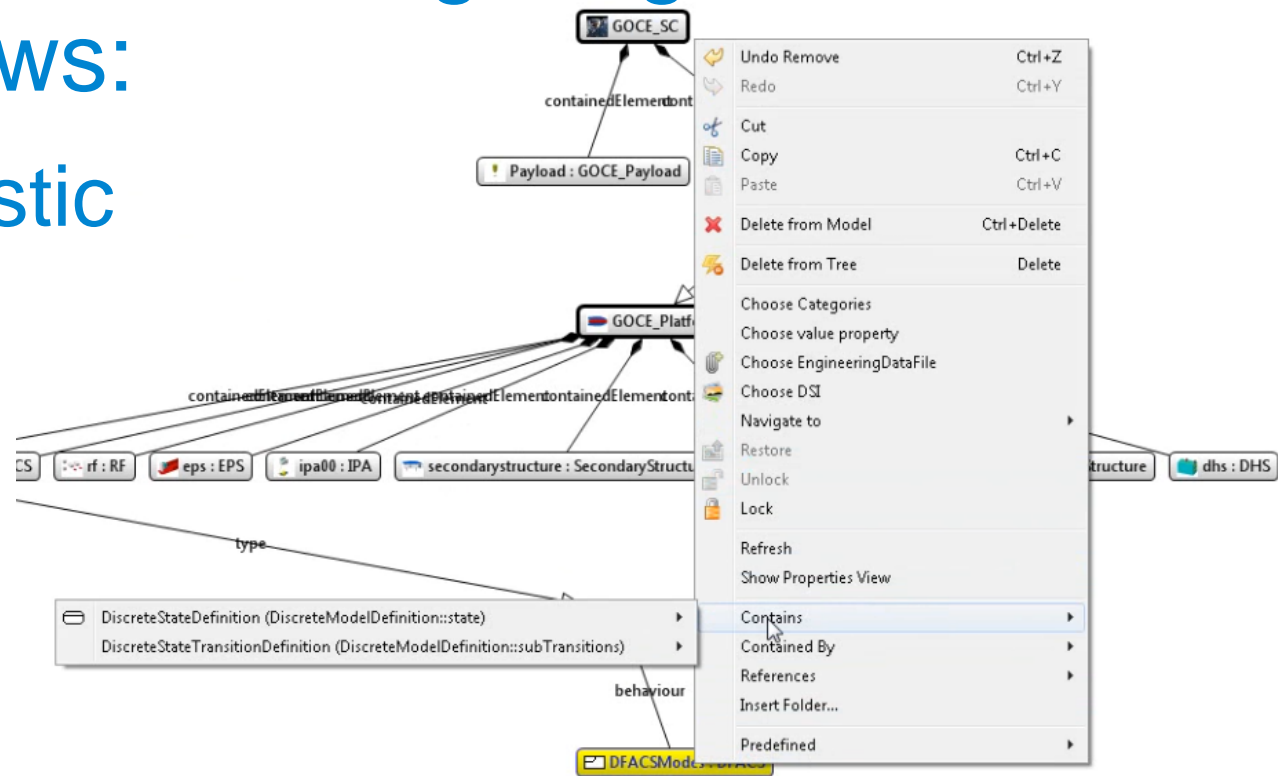


Diagram Explorer

- Same concept for building diagram exploration views:
 - Notation agnostic
 - Can show every model element
 - Provide basic editing capabilities
 - Auto-layout



Video-Description: [5:57 minutes]

- Create a diagram explorer view from scratch
- Change auto layout
- Synchronized views with tree explorer
- Edit through diagram explorer view

VSD SSDE Application *

File Edit Table Explorer Actions Window Help

SSDE Navigator

- SIDefinitions
 - StarTrackerCatia_orig
 - StarTrackerCatia_v0
 - Test
 - VSD_DS_DataSet_V1_2
 - Model
 - Explorer
 - Dynamic Trees
 - Requirements
 - Explicit Product Structure
 - Generic Tree Structure
 - Diagrams
 - AIT
 - Category
 - Functional
 - Operational Design
 - Operational Activity
 - Topological
 - Model Explorer
 - Graph_0:DynamicTree_4
 - External files
 - VSD_GOCE_Step1_Prime_Definition
 - VSD_GOCE_Step1_Supplier_Definition
 - VSD_GOCE_Step2a_PrimeMerge
 - VSD_GOCE_Step2b_Prime_Integration
 - VSD_GOCE_Step3_Supplier_Definition
 - VSD_GOCE_Step4a_PrimeMerge
 - Validation_TAS-I_V1_v2_9

Table Explorer

Table of Elements

Filter

Model: VSEE Type: ElementDefinition Show Metamodel OCL:

Name	Categories	Configuration I...	Description
GOCE_Battery	Battery		The Battery, BATT, that is a Li-Ion Battery consisting of 8 cells in series and 52 strings in parallel which creates a battery of 78 Ah which, providing electrical power to GOCE EPCE during ecli
GOCE_EGG	EquipmentCatego		The Electrostatic Gravity Gradiometer (EGG) is configured as a self-standing payload, endowed of its own structure, thermal control and electronics, designed to provide to the accelerome
GOCE_ITA	Thruster		The T5 Mk5 thruster is proposed for the GOCE mission. It is ideally matched to the mission requirements and will require no modifications. The final variant of a family of 10 cm diameter k
GOCE_MLI	EquipmentCatego		In general one type of MLI blanket will be provided for use on external surfaces, and will possess
GOCE_Payload	EquipmentCatego		Subsumes the Palyoad instruments specific to the GOCE mission:
GOCE_Platform	EquipmentCatego		GOCE platform subsumes all subsystem and equipments that do support the mission. So all elements that are not payload related.
GOCE_SC	EquipmentCatego		The GOCE mission objective is to produce global and regional models of the Earth's gravity field and the geoid (reference equipotential surface) with high spatial resolution and accuracy. I
GOCE_SunSens	EquipmentCatego		On GOCE, the Coarse Earth and Sun Sensor (CESS) is used as the main attitude sensor for the
GPSAntenna	EquipmentCatego		GPC antenna used by the STTI.
ION_THRUSTER	EquipmentCatego		The dominant component of the drag is obviously the force along the flight direction of the satellite,
IPA	Mass Properties, Ei		The ion-propulsion sub-system will provide the necessary thrusting capability to perform:
IPCU	EquipmentCatego		Power conditioning unit and a controller to monitor the complete IPA.

Search: RE Elements: 74 Found: 16

Reference Tables

References Referenced by Traces Traced by

Type: DiscreteModelDefinition

Name	Categories	Description	Path
SystemModes:		As a basis the GOC >>ElementDefiniti	

Search: RE Elements: 1 Found: 0

Behaviour Check Annotations Contained Aspect Contained Element Contained Interfa... Data Groups Dsi Func Trace Merge Annotation Parameter Related Element D... Related File 2

Properties Error Log

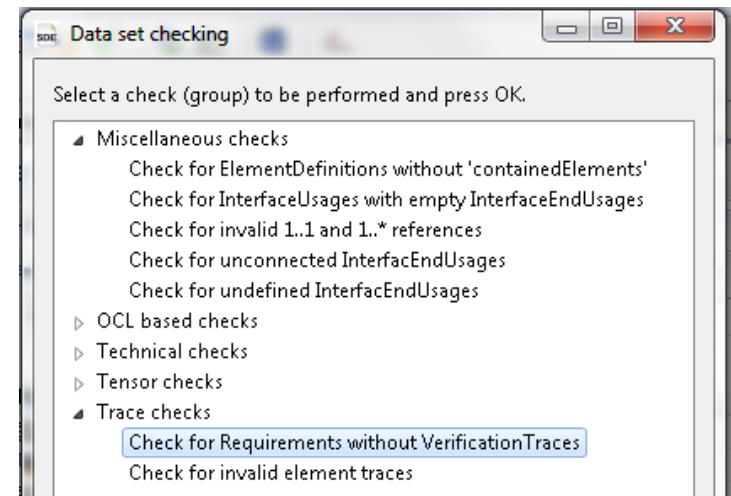
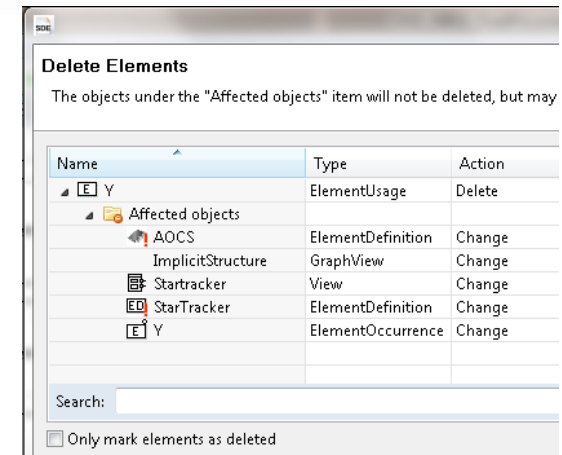
Basic

Property	Value
Data Groups	
Description	
Layout	SPRING
Name	Graph_0
Type	MEDE

Search: RE 1 items selected

Impact Analysis and Checking

- Impact Analysis
 - Delete and lock flags (with propagation)
 - Check impact for element delete operations
- Consistency checking
 - Common framework with SSRDB (i.e. checks can be exchanged)
 - Checks for
 - Traces between disciplines (e.g. requirements and model)
 - ValueProperties
 - (OCL) Constraints (on the datamodel or on the system model)



Integrated Model Reviews

- Metamodel contains a powerful Model Annotation concept
 - For manual reviews, e.g. RIDs, PRs, Actions
 - For automated reviews, e.g. Consistency Checks
 - For Model comparison
 - Differences to another model are presented as annotations
- Homogeneous process and user interface for all model reviews
- Annotations are accessible
 - in the context sensitive properties
 - In a dedicated annotation table editor

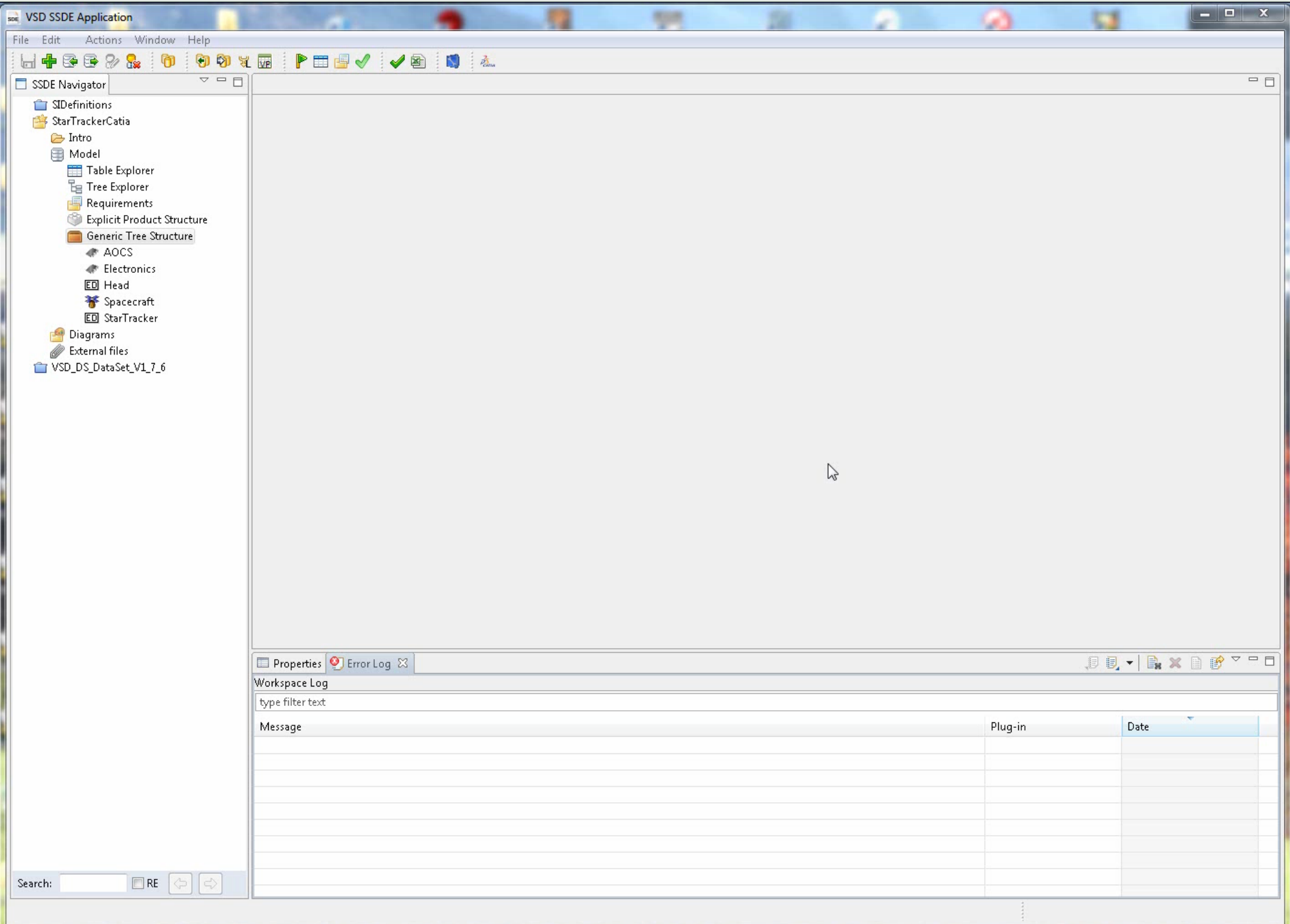
Web based model review

- Any model can be exported to be reviewed in a web browser
 - Text and navigable diagrams
 - Reviewer does not need the VSEE tool chain
- All pages can be annotated inside the browser (in Wiki-style)
 - Annotations can be imported back into the originating model



Video-Description: [3:08 minutes]

- **Export Model to Wiki**
- **Browse and annotate Wiki**
- **Import Wiki annotations back into model**



Cross-Domain Integrations

- Doors
 - Iterative import of Doors requirements
 - Doors requirements are locked in the SSDE Requirements Editor
 - Tracing of requirements to Model Elements (including checks and visual indicators)
- Catia
 - Mapping of Catia Products to Model Elements
 - Import of physical properties

Multuser/Multisite support

- Key aspects
 - Full integration with central SSRDB repository
 - Branch based approach
 - Support for semi-automated model merges
 - i.e. for different versions from different branches
- Prime/Supplier scenario is one of the key demonstration scenarios

SSRDB User Interface in SSDE

The screenshot displays the 'SSRDB Manager' window. The left pane shows the 'SSRDB (amueller@localhost:20026)' tree structure:

- Branch 0 (System Branch)
 - Reference area dataset 'VSD_GOCE_Step2_PrimeMerge' (0.3)
 - ↑ Merged dataset (0.1.1.1) from MTQ Integration Branch
 - Archive area dataset 'VSD_GOCE' (0.1)
 - Archive area dataset 'VSD_GOCE' (0.2)
 - Sub-branch MTQ Integration Branch
 - Reference area dataset 'VSD_GOCE' (0.1.1.2)
 - Archive area dataset 'VSD_GOCE' (0.1.1.1)

The right pane contains a list of actions:

- ▶ Import baseline into SSRDB
- ▶ Export baseline from SSRDB
- ▶ Create trunk
- ▶ Split branch
- ▼ Merge branch
 - Master dataset version:
 - Slave dataset version:
 - Merged dataset description:
 -
- ▶ Run dataset checks
- ▶ Import dataset
- ▶ Check-out dataset
- ▶ Check-in dataset
- ▶ Release dataset
- ▶ Discard dataset
- ▶ Remove branch

Thank you

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