



DEFENCE AND SPACE

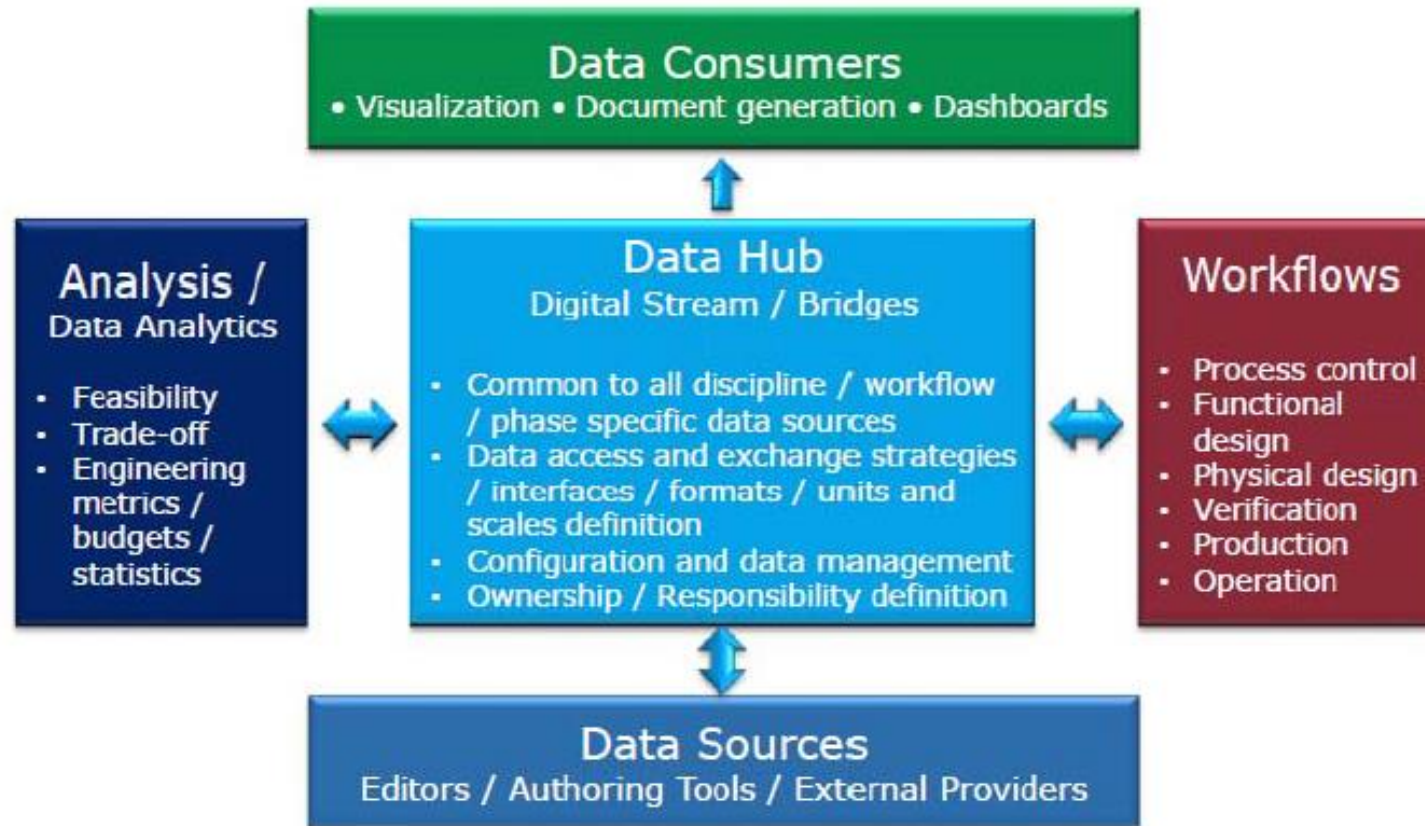
Model Based Engineering Hub

A firm foundation for a new generation
of MBSE exchange

3rd Model Based Space Systems and Software Engineering workshop
MBSE 2022 - 22.-24. November 2022
Tobias Hoppe, Colin Borrett, Todor Stoitsev

AIRBUS

Central Data Hub for Information Exchange



System Factory

Data exchange

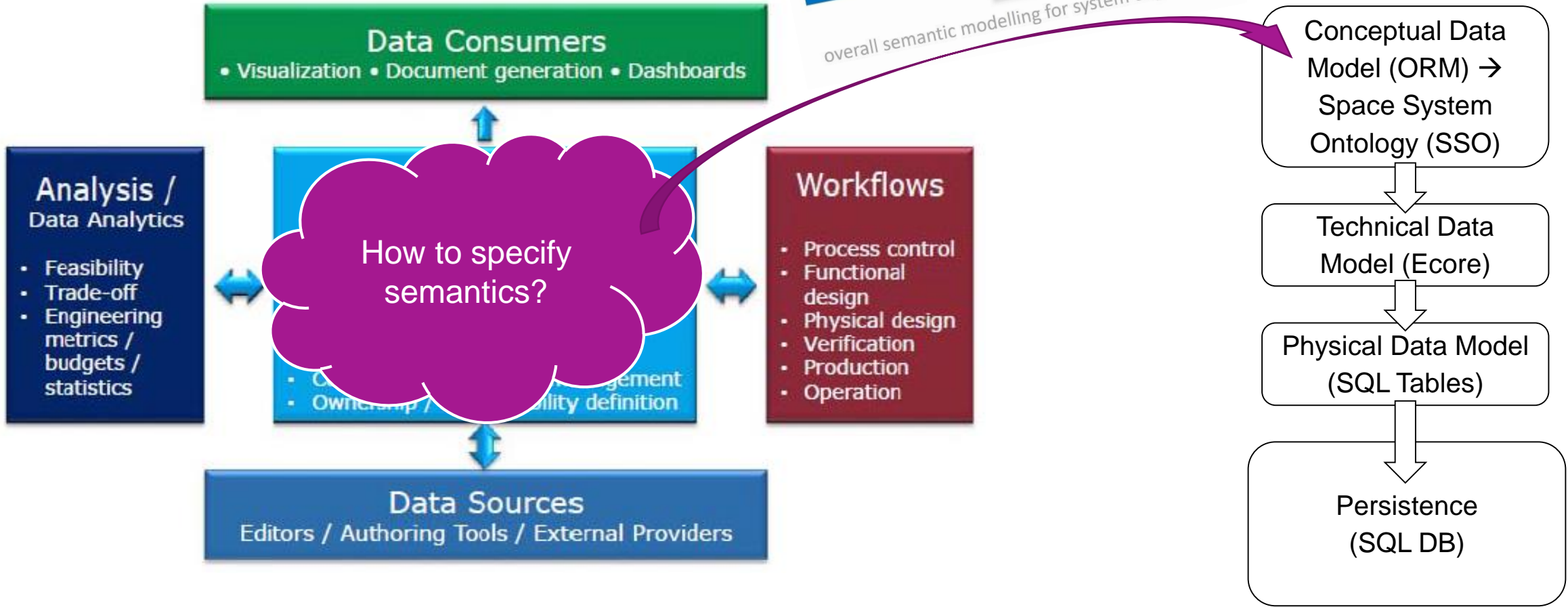
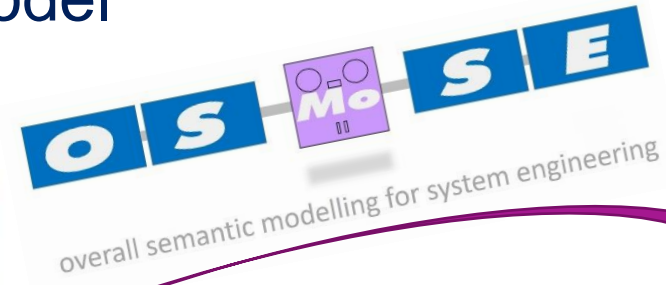
- Disciplines
- Project phases
- Stakeholders

Model Based Engineering Hub - MBEH

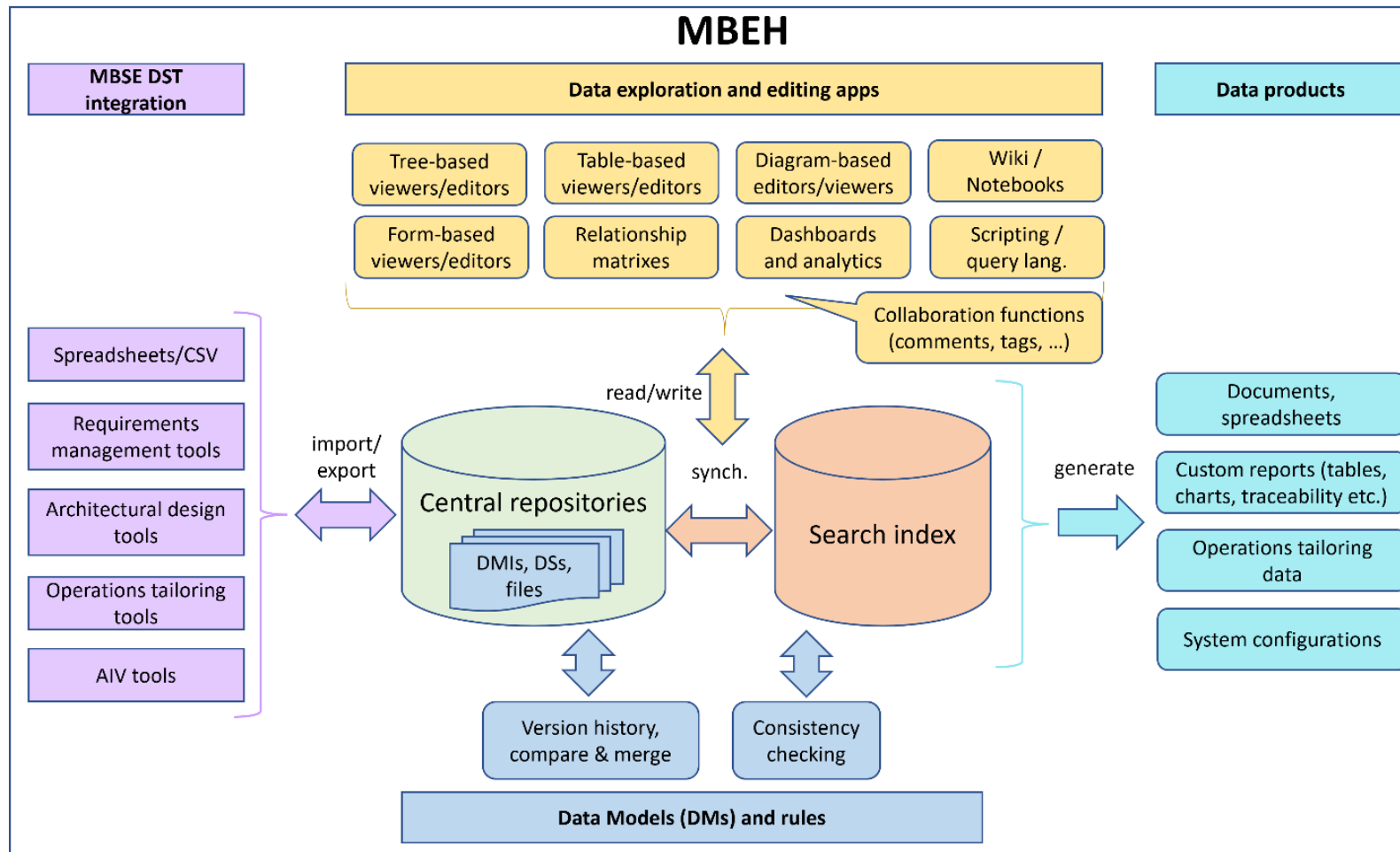
- ESA Study split into 2 Phases
- Phase 1: Scoping
 - Develop MBEH system architecture
 - Define scope of functionality
 - Define Interfaces with external Tools
 - Analyse Operation (OPS) Processes and data exchanges
 - Analyse Reliability, Availability, Maintainability and Safety, (RAMS) Processes and data exchanges
 - Specify demonstration scenarios for OPS and RAMS data exchanges
- Phase 2: Development and Demonstration
 - Implement MBEH as specified in Phase 1
 - Develop Space System Ontology (SSO) extension for OPS and RAMS
 - Implement demonstration scenarios



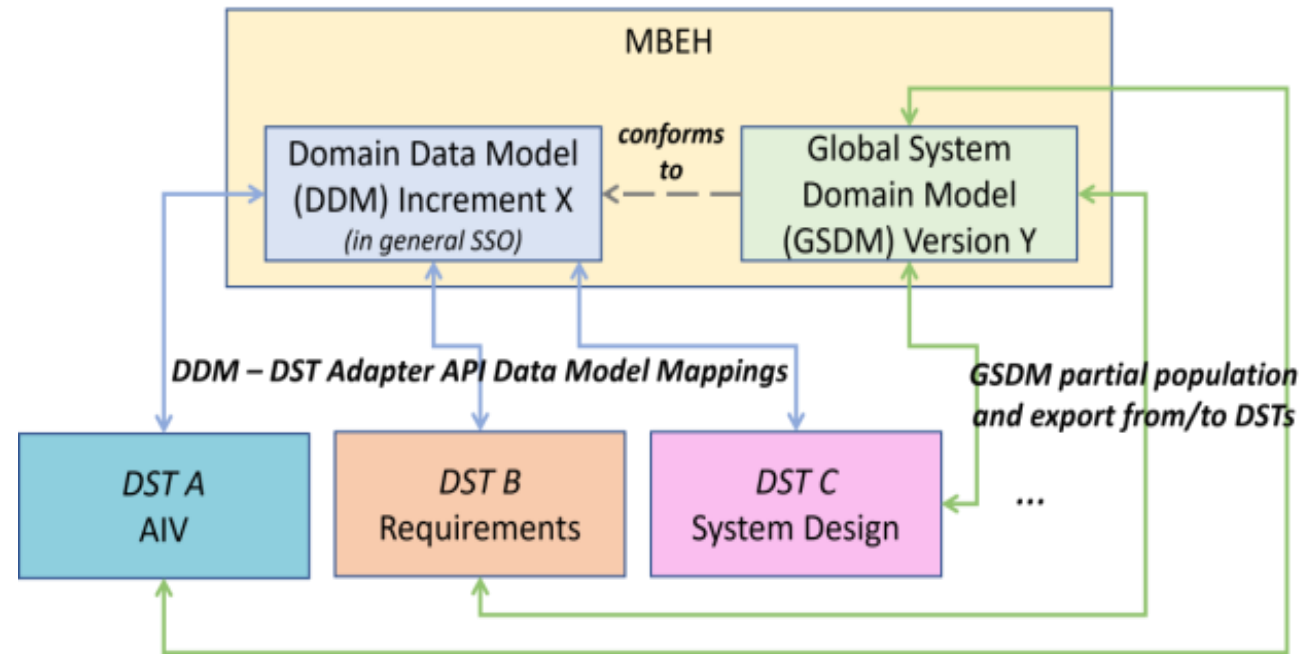
Semantics of MBEH Conceptual Data Model



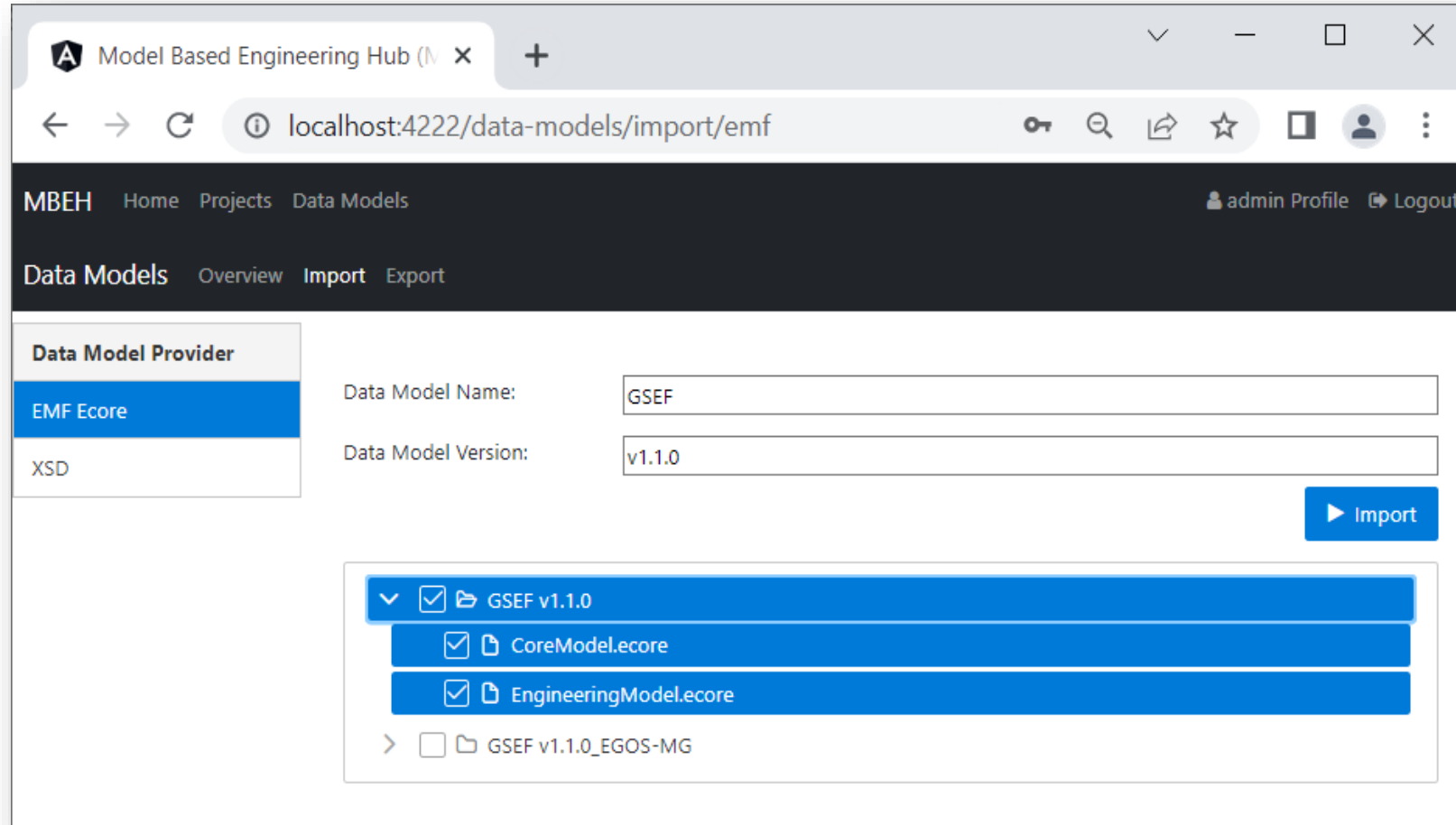
MBEH - Architecture



MBEH – Multiple Domain Data Models Handling



MBEH – Data Model Import



The screenshot shows a web browser window with the URL `localhost:4222/data-models/import/emf`. The page title is "Model Based Engineering Hub (M x)". The navigation bar includes "MBEH", "Home", "Projects", "Data Models", "admin Profile", and "Logout". The "Data Models" section has sub-tabs for "Overview", "Import", and "Export".

On the left, a "Data Model Provider" sidebar lists "EMF Ecore" (selected) and "XSD". The main form contains:

- Data Model Name:
- Data Model Version:
-

Below the form, a file selection area shows a tree view:

- GSEF v1.1.0
 - CoreModel.ecore
 - EngineeringModel.ecore
- GSEF v1.1.0_EGOS-MG

MBEH – Data Model Exploration

The screenshot displays the MBEH web application interface. The browser address bar shows the URL: localhost:4222/data-models/ba531a57-e0a7-4a09-850b-ac06b3957401/details/dm-package-details?pa... The application header includes navigation links for Home, Projects, and Data Models, along with user profile and Logout options. The main content area is titled 'Data Model Increment Details' and shows the following information:

- Name: GSEF
- Version: v1.1.0
- Admin link

A sidebar on the left shows a tree view of packages: core (selected), ecore, and engineeringmodel. The main content area displays 'Package Details' for the 'core' package:

- Name: core
- NsUrl: http://www.esa.int/gsef/core/1.0
- Position: 0
- NsPrefix: core

Below the package details, there are tabs for 'Sub-packages', 'Classes', 'Enums', and 'Data types'. The 'Sub-packages' tab is active, showing a table of sub-packages with a search filter and a table with the following data:

	Name ↑↓	NsUri ↑↓	NsPrefix ↑↓	Position ↑↓
<input type="checkbox"/>	qudv	http://www.esa.int/gsef/core/qudv/	qudv_extModel	0
<input type="checkbox"/>	datatypes	http://www.esa.int/gsef/core/datat	datatypes	1

MBEH – CSV Data Import 1/3

1 **Select Target** 2 File Upload 3 Mapping 4 Summary

Data Set: X v

Data Model Increment: GSEF (v1.1.0)

Type: v

[Next >](#)

1 Select Target 2 **File Upload** 3 Mapping 4 Summary

File Format: v

Delimiter: v

[+ Choose](#)

MRD_obfuscated_extended.csv	9.231 KB	X
-----------------------------	----------	-------------------

[< Previous](#) [Next >](#)

MBEH – CSV Data Import 2/3

1 Select Target 2 File Upload **3 Mapping** 4 Summary

Save Mapping Load Mapping

CSV Column	Model Feature	ID	Unique	Ref
ID	Requirement reqIdentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Title	Requirement title	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Requirement	Requirement text	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comment	Requirement comment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

< Previous Next >

MBEH – CSV Data Import 3/3

General Configuration

Tagret Data Model: GSEF

Target Model: Requirement

Source File: MRD_obfuscated_extended.csv - 9231 bytes

Configured Mapping

ID: reqIdentifier ID

Title: title

Requirement: text

Comment: comment

Topic: topics name Unique

Requirements Specifications: requirementsSpecification name Unique

Report

Created Items:

Requirement	140
RequirementsSpecification	1
Topic	36
Created References:	280

Updated Items:

Updated Domain Model Objects:

Created Attributes:	0
Updated Attributes:	0

Messages:

< Previous Import

MBEH – EMF Data Import

Data Set Provider Name:

Data Set Provider Description:

Data Set Name:

Data Set Description:

EMF Data Import Resources:

- Test data set 1
 - aliases.gsef
 - components.gsef
 - definitions.gsef
 - documents.gsef
 - interfaces.gsef
 - personnel.gsef
 - processes.gsef
 - requirements.gsef
 - tests.gsef
 - topics.gsef

Data Model Increment:

Select Existing:

- GSEF v1.1.0
 - CoreModel.ecore
 - EngineeringModel.ecore

MBEH – EMF Data Export

Data Set 1

Select Root Level Data Model Type:

New Export Directory Name:

Select Data Export Directory:

GSEF_v1.1.0_DS-1

Select Data Model Increment:

GSEF_v1.1.0

gsef-aaa.ecore.ecore

gsef_v1.1.0.ecore.ecore

Data File Name:

Data File Extension:

MBEH – Data Exploration based on Configured Views

EMF Data Set 1 [main]

- RequirementsSpecification
- Component**
 - Interface
 - Process
 - Test
 - Folder
 - Topic

Component objects

Wrap Cells 8 columns selected

Global Filter

Loaded Items: 5 of 5

ID	Name	Description	Children	Target Interface Li	Tested By	Process Steps	Satisfies
C1	Component 1		Component 1.1 Component 1.2				R1
C1.1	Component 1.1		Component 1.1.1				R1.1 R1
C1.1.1	Component 1.1.1						R1.1.1 R1 R1.1
C1.2	Component 1.2						R2 R3

EMF Data Set 1 [main]

- RequirementsSpecification
- Requirements Specification 1
- Component 1**
 - Component 2
 - Interface
 - Process
 - Test
 - Folder
 - Topic

Component Details Compare Select a Version

Id: C1

Name: Component 1

Description:

Children **Attachments**

Component objects

Recursive

Wrap Cells 8 columns selected

Global Filter

Loaded Items: 3 of 3

ID	Name	Description	Children	Target Interface Li	Tested By	Process Steps	Satisfies
C1.1	Component 1.1		Component 1.1.1				R1.1 R1
C1.1.1	Component 1.1.1						R1.1.1 R1 R1.1
C1.2	Component 1.2						

MBEH – Data Versioning in History View

Test Project > EMF Data Set 1 > History (main)

Commit Hash	Author	Date	Tag	Action	Description
iev152gggq07clf6ibcp7okrbes42btu	FIRST LAST	2022-10-27T21:03:19.328	tag_m_1	Reset	First commit on main.
n34c95ukt8hc9h0u2gp6i77m6j1br94m	FIRST LAST	2022-10-27T18:05:11.555		Reset	Commit after EMF data import
ketclm1uj8vp12rr8tqobev3tfk7dde0	FIRST LAST	2022-10-27T18:05:05.212		Reset	Created data set with id: cf1dfcf0-b66e-41ba-9e69-3139599f1535, name: EMF Data Set 1, for project id: 9a9672f6-3df8-4c90-b101-bb94ad58c7a9.
n69vsكدt24jb0bmm8rsmki86huukm025	FIRST LAST	2022-10-27T18:03:58.496		Reset	Create Project Test Project
ancmfb9vv8krSCO0pdnat1i2g232gq0t	FIRST LAST	2022-10-27T18:03:25.126		Reset	Create user 4256c235-d2ae-4f35-9d34-a81254037fff
g1m8r7ikd086ei7ilriv49mg2f51qil5	FIRST LAST	2022-10-27T18:03:18.467		Reset	Created Data Model Increment with id: ee37f104-78fd-4555-87c9-ea1c8377f094.
itutm01671o70aqv5o9olhp9b1io3sma3	FIRST LAST	2022-10-27T18:01:41.254		Reset	Initialize Tables
hu6s290a87q6esc5p7qskeaudir76j6k	FIRST LAST	2022-10-27T18:00:02.3		Reset	Initialize data repository

Test Project > EMF Data Set 1 > Tags (main)

Tag Name	Commit Hash	Author	Date	Action	Description
tag_m_1	iev152gggq07clf6ibcp7okrbes42btu	FIRST LAST	FIRST@LAST.com 2022-10-27T19:06:33.441+00:00	Reset Delete	First baseline after initial data import
tag_m_2	u45nvnkpvI91jfajtne33trdsodh9d	FIRST LAST	FIRST@LAST.com 2022-10-27T19:21:18.022+00:00	Reset Delete	Baselined customizations at RS level.

MBEH – Data Object Comparison

Select Source Select a Version ▼

Type: Component
 Path: Component -> Component 1

Select Target Select a Version ▼

Type: Component
 Path: Component -> Component 1 -> Component 1.1

Source ↕

Uid: _WrXVYGi4EeyZl8rF0HX2mA

Description: <p>
</p>

Name: Component 1

Id: C1

Target

Uid: _fRtGIGi4EeyZl8rF0HX2mA

Description:

Name: Component 1.1

Id: C1.1

References

Line By Line Select Same Tab

satisfies children

Id
- _89J4Gi4EeyZl8rF0HX2mA

satisfies parent children

Id
+ _5bZMGi4EeyZl8rF0HX2mA
+ _GcbMIGi5EeyZl8rF0HX2mA

MBEH – Open Search Interface

▼ Consistency-check definition

Name:

Description:

Query:

```
{
  "bool": {
    "must_not": {
      "exists": {
        "field": "satisfyingItems"
      }
    }
  }
}
```

Data Sets:

Position:

Language:

Save

▶ Execute

▶ Execute

9 columns selected
Global Filter

Loaded Items: 10 of 131

Identifier	Title	Text	Comment	Type	Compliance Status	Compliance Statement	Derived Requirements	Topics
MRD-DAT-005		Requirement text 1						Data products definition
MRD-DAT-010		Requirement text 2						Data products definition
MRD-DAT-100		Requirement text 11						Data products release requirements
MRD-OPS-240		Requirement text 101						Nominal science operations phase
MRD-OPS-250		Requirement text 102						Nominal science operations phase
MRD-OPS-260		Requirement text 103						Extended science operations phase
MRD-OPS-270		Requirement text 104						Extended science operations phase
MRD-OPS-280		Requirement text 105						Debris mitigation and decommissioning
MRD-OPS-290		Requirement text 106						Debris mitigation and decommissioning
MRD-OPS-300		Requirement text 107						Debris mitigation and decommissioning

MBEH – Matrix View

Matrix definition

Name:

Description:

Data Model Increment:

Types: Row: Column:

Reference source:

Reference:

Scopes (optional - defaults to all items):
 Recursive row scope
 Recursive column scope

Rows: 1-5 of 5 Rows for columns: ALL 1 of 1 << < 1 > >> 10

Columns: 1-5 of 5 Columns for rows: ALL 1 of 1 << < 1 > >> 10

Show all versions


	Component 1	Component 1.1	Component 1.1.1	Component 1.2	Component 2
<input type="checkbox"/> R1	↑	↑	↑		
<input type="checkbox"/> R1.1		↑	↑		
<input type="checkbox"/> R1.1.1			↑		
<input type="checkbox"/> R2					↑
<input type="checkbox"/> R3					↑

Points of Contact

ESA Contact

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- Airbus Technical Lead
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C U B E
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Thank you for your attention