



*Overall **S**emantic **M**odelling*

**OSMoSE**

*For **S**pace System **E**ngineering*

# MBSE-2021 – Space System Ontology Workshop

## Closing out the 2021 Space System Ontology Workshop

Quirien Wijnands, Serge Valera

ESA ESTEC

30/09/2021

# OSMoSE & the Space System Ontology, work done

## June 2019 Space System Ontology Brainstorming Workshop:

- the idea to develop a Space System Ontology for Europe was first discussed, refer to <https://indico.esa.int/event/310>

## From June 2019 to September 2021:

- The MB4SE project (including the OSMoSE group and the MB4SE Advisory Group) were established with participation of the main stakeholders, Agencies and Industry
- a first version of the MB4SE project plan, development plan and mitigation plan have been produced
- The OSMoSE Contributor Licence Agreement is under review by the Contract and Legal Departments of the organizations currently involved in the OSMoSE Governance
- The OSMoSE Product Licence Agreement is under drafting
- the development of the Space System Ontology has been initiated, focusing first on Requirement Management and MBSE

# OSMoSE & the Space System Ontology, NORMA

NORMA, developed by ORM Solutions, existing in 2 versions:

- a freeware version
- a professional version that is still under development

For OSMoSE, the professional version of NORMA is used.

ORM Solutions is enhancing the professional version of NORMA in line with the ECSS-E-TM-10-23A vision and OSMoSE needs

NORMA Pro provides means:

- to automate parts of the software required *technology dependent* *for example for:*
  - *mapping to some logical and physical models* *for the production of information systems*
  - *generating interface requirements and control documents* *for the exchanges*
- to support the reverse engineering of data models *technology dependent* *exposed by some tools*
  - *to ease the assessment of the level of compliance of these tools to the Space System Ontology*
  - *and as such, the identification of the work to be done to update these tools for compliance to OSMoSE*

# OSMoSE & the Space System Ontology, Status

- the ORM methodology is used and “suits” the purpose !
- Using NORMA Pro has demonstrated its ability:
  - to support the production of the Space System Ontology **a global data model** and means to specify at conceptual level:
    - the views of interest **the locals** of each stakeholder, and
    - the interface requirements for any exchange
- Guidelines / Rules are being created to explain how to best organize the ORM models and related ORM diagrams resulting from the conceptualization of a Universe of Discourse
  - to facilitate its communication,
  - to ease its integration, at later stage, to the Space System Ontology
- R&D activities are initiated to assess how to best verbalize the Space System Ontology and its constituting conceptualized Universes of Discourse for being shared with, and understood by the OSMoSE Community
- An end-to-end exercise has been initiating to demonstrate how one can use the Space System Ontology to exchange information the selected use case relates to the exchange of “requirements and requirement specifications”

# The Space System Ontology, Lessons Learned

Since ... decades: Many lessons learned applying MBSE, semantic modelling and semantic interoperability e.g. in the context of:

- Satellite Reference Data Bases (e.g. Herschel/Planck SRDB, ESA SCOS-EGSE DB)
- ECSS-E-70 Ground Segment & Operations:
  - ECSS-E-ST-70-31 Monitoring and Control Data
  - ECSS-E-ST-70-32 Test and Operations Procedures
  - ECSS-E-ST-70-41 TM & TC Packet Utilization Standard Space/Ground I/F

These lessons-learned :

- were used to produce the ECSS-E-TM-10-23A Space System Data Repository
- have been used in the transfer of worldwide academic knowledge related to semantic modelling using facts and fact types (ORM, NIAM, CogNIAM, DOGMA, FCO-IM,... ) to Industry
- are consistently transferred to OSMoSE for the development, maintenance and utilization of the ontology

# The Space System Ontology, Lessons Learned

2020 – 2021: Conceptualizing ECSS-E-10 & related MBSE

- A common understanding of the MBSE Universe of Discourse is essential to avoid miscommunication
- Modelling at conceptual level helps in achieving that common understanding
- Hence, training is essential to ensure that all participants understand what is meant by modelling at conceptual level
- Agreeing on the exact meaning of each term, each relation, each constraint and, for each stakeholder to map these concepts to their world (organization specific vocabulary, procedures, tools, ...) is time consuming
- Building an ontology is “exchanging knowledge” and “working together”, “being flexible” despite organization specific heritage is needed
- Establishing a Process and some Modelling Guidelines to support the above is mandatory



*Overall **S**emantic **M**odelling*

**OSMoSE**

*For **S**pace System **E**ngineering*

# MBSE-2021 – Space System Ontology Workshop

---

Closing out the 2021 Space System Ontology Workshop → Questions & Answers