



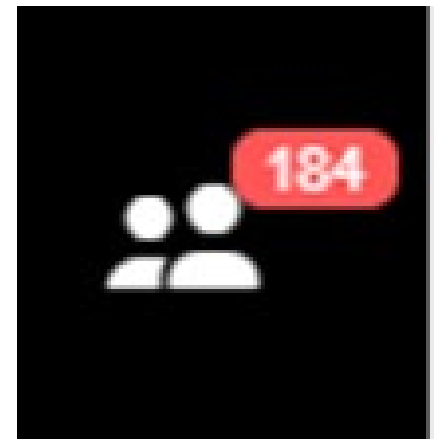
MBSE2021 WRAP UP

Jean-Loup TERRAILLON

ESA/TEC-S Software System Lead Engineer



- A two days workshop (29&30/09/2020)
- Virtual, supported by Let's Get Digital
- 300+ registered, range of 100 to 180 attendants in each session (120 in the ontology session)
- 7 sessions:
 - Modelling Techniques
 - Roll-Out Experiences
 - Model Verification and Validation
 - Avionics
 - Space Systems Ontology
 - Capita Selecta
 - Improving the Digital Workflow



MBSE Session 1 – Modelling Techniques Europe/Amsterdam
 Mr Hans Peter de Koning, Mr Joachin Fuchs, Ms Benedicte Grouart, Mr Alberto González Fernández, Mrs Agnes Mestreau, Mr Lorenzo Tarabini Castellani, Mr Jamie Whitehouse 09.04.35

Mod - Maxime Perrotin

Time left: 01:30:22

Session tools Stop Session

MBSE Session 2 – Roll-Out Experiences Europe/Amsterdam
 Mr Lorenz Affentranger, Mr Jean-Baptiste BERNAUDIN, Dr Cesar Coelho, Mr Gérald Garcia, Ms Belen Gonzalez Rodriguez, Ms Rhiannon Jenkins 13.02.07

Cesar Coelho

Mod - JL Terrillon

Time left: 00:02:51

Session tools Stop Session

Questions

Order by Upvotes

Question by Georg Söllinger 13:00
 Is this handbook available somewhere?

Being answered live

Question by David Jameau 13:00
 No question because we are just eager to read the handbook...

Question by Vito Fortunato 13:00
 Is the handbook available somewhere?

Question by Georg Söllinger is being answered live
 Is this handbook available somewhere?

Stop

Iulia Dragomir Mod - Maxime Perrotin

Questions

Order by Most recent

Question by Tiago da Silva Jorge 14:43
 On behalf of Dr Michal: "I am afraid I don't know how to ask a question as a presenter. But I will write it here: Do, and if so how, you handle the concept of time (and timers)?"

Answered live

Question by Stefano Tonetta 14:42
 will you consider real-time constraints on the scheduling of components?

Answered live

David Perillo Mod - Maxime Perrotin

Questions

Order by Most recent

Question by Stephane Duprat 17:46
 Have you evaluated OCL for the checks ?

Answered live

Question by Vito Fortunato 17:42
 Is this tool's plugin shared into ESSR and usable/customizable?

Answered live

Lukas Petersson Mod - Marcel Verhoef

Application Domains



- **Space projects**: Deorbit, Xpansion, Galileo, MSR-ERO, EnVision, Lunar Habitat.
- **Discipline** modelling (system design, software, avionics, ground segment, AIT, FDIR)
- Focus on model **verification** (TASTE & Co, JAXA, Perpetual Labs)
- **Techno consolidation**: ESA MBSE profile, Deorbit kit, SysMLv2, Best Practice.
- Focus on **tools**, specially data hub & exchanges (MODEX, SASyF, DEHP, TeePee, Eclipse)



From MB4SE to Digitalisation



- Modelling spreads beyond pure system engineering
- MBSE technology seeds are placed in strategic points of the disciplines and the life cycle (autocode, avionics, operation, AIT, dependability, verification, reviews).
- We need to connect the dots...



How-to enable digital threads:

- Per discipline:
 - Formal process model with output of processes (confirmed by several presentations: ontology, FDIR, etc. BPMN?)
 - Digitalisation of the processes output; identification of data
 - Construction of the discipline data model
- Connection of the data models
 - Identification of overlaps
 - Resolution of conflicts
 - SEMANTIC INTEROPERABILITY



Space System Ontology



The essential session of this year's edition

- the root of interoperability, of data threads, of digital continuity

Digital engineers don't need to speak first order logic! 🙄

The ontology is used to configure the Digital Workflow tools.

→ see ESA Hubs, Exago, etc

Huge work!

- limitation to what we exchange → MODEX, SASyF
- Need to address many Universes Of Discourse



Towards a Digital Spacecraft



ESA Agenda 2025:

- *"ESA will therefore digitalise its full project management, enabling the development of digital twins, both for engineering by using Model Based System Engineering, and for procurement and finance, achieving full digital continuity with industry."*

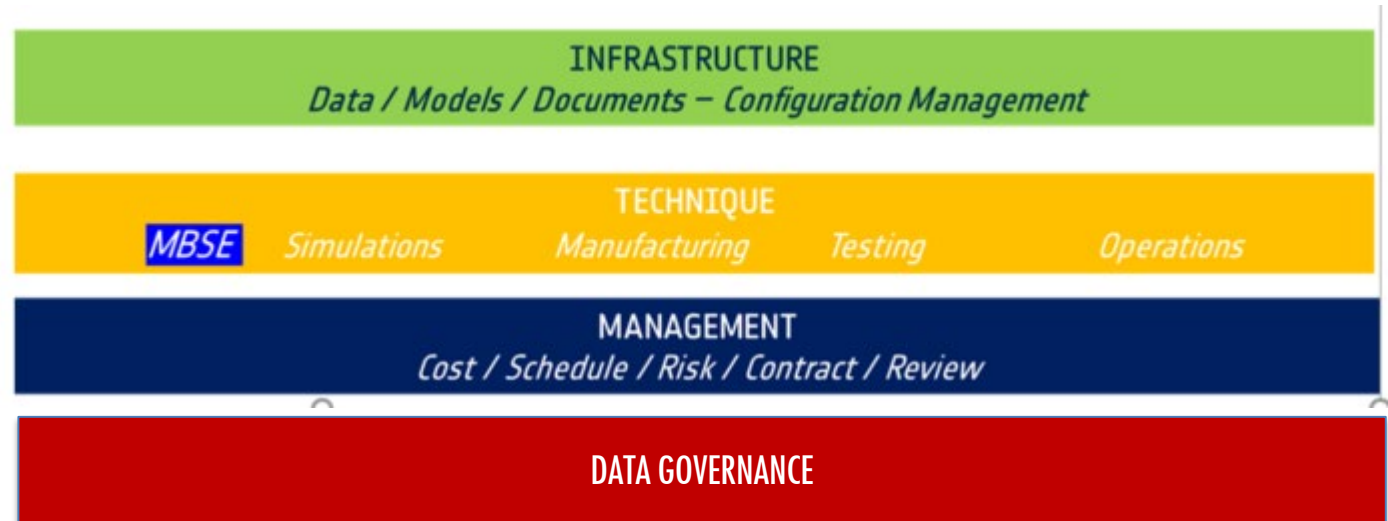
Several directions to work on:

Entreprise, Extended Entreprise

Engineering & Product Assurance

Model Based review in MSR-ERO

Data Management



→ MBSE is one of the enablers of a Digital Spacecraft



Conclusion



- The organizers thanks the authors of the papers for their enthusiastic contributions, as well as the audience, which happened to break records. Special thanks to our Conductors **Kathleen Gerlo** and **Marcel Verhoef!**
- All slides and pre-recorded talks are available at <https://indico.esa.int/event/386/timetable/>
- We give you rendezvous next year for **mbse2022** at around the same period. The organizer will soon be decided...

mbse2021@esa.int



Let's go on deploying MBSE in our Space projects!

