ECSS-E-TM-10-23A



Space System Ontology Brainstorming Workshop 25 & 26 June 2019



Space engineering

Space System Data Repository

Working Together – The Challenge !



Developing and Operating a Space System requires many actors "working together"

- actors who are geographically dispersed !
- actors who are participating at different points in time !
- Legacy/proprietary systems are often deployed !
- etc.

exchanged information frequently misinterpreted

➔ constant losses



The ECSS Vision



What is the ECSS vision?

means by which, we, in the European Space Business, can solve the "Working Together" problematic !



What is the ECSS-E-TM-10-23A vision?

a formalization of the ECSS vision focusing on semantics and semantic interoperability !







What does ECSS cover?

the WHAT !

i.e. the <u>System Requirements</u> with, beyond others, the objective to exclude any implementation specifics !

What does ECSS-E-TM-10-23A cover?

the formalization of the WHAT !

i.e. *means to formally model* the <u>System Requirements</u>, whether they are ECSS-, Mission- or Product-related,

in line with the tailoring concept introduced by ECSS !

The ECSS System





The ECSS Space System Model



ECSS-E-ST-10-23 addresses, at <u>global conceptual level</u>, the overall Space System lifecycle

including the life cycle of each of its composing system elements i.e. the segments, systems, subsystems, assemblies, etc.



The ECSS Space System Model



ECSS-E-ST-10-23 looks at standardizing the information model ensuring the overall consistency of the model through all phases ECSS-E-ST-10-23 scopes by tailoring the information model to the needs of each stakeholder involved in the customer/supplier chain





ECSS-E-ST-10-23 ensures the integrability of the information → by transfer or linking



ECSS-E-ST-10-23 supports each stakeholder by enabling the ability for that stakeholder to select, from the global conceptual model, his/her specific view of interest i.e. a "local" conceptual view



Semantic modelling using Global as a Whole locals as views is *highly ambitious* but potentially the only way to ensure Semantic Interoperability at System level !







ECSS-E-ST-10-23A identified the need to further investigate 2 modelling approaches to reach the required semantic interoperability



Since 2011, a lot of work has been done ! some are reported in the Workshop !

> 2010-2019 What did we learn?

2020 – 202x Are we ready for building the European Space System Ontology ?

let's brainstorm together...

Information Modelling...

One of the major problems in the collaboration between stakeholders is *achieving a common understanding*¹

ISO TR9007 Helsinki principle:

Any meaningful exchange of utterances depends on the prior existence of an <u>agreed set of semantics and syntactic</u> <u>rules</u>. The recipients of the utterances must use only these rules to interpret the received utterances, if it is to mean the same as that which was meant by the utterer².

[Oxford] utterance

noun a spoken word, statement, or vocal sound[mass noun]the action of saying or expressing something aloudLinguisticsan uninterrupted chain of spoken or written language

WHAT is DATA, WHAT is INFORMATION

• DATA

"data" on its own carries no meaning

Example: "Val Thorens", "2300"

INFORMATION

In order for "data" to become "information", it must be interpretable, that means *extended with Semantics*, e.g. "what the nouns refer to and what the verb means"

 Example:
 "Val Thorens" refers to the highest ski resort in Europe.

 "2300" is meant to be:
 "2300 meters above sea level"

 the missing verb is:
 "is located at"

WHAT is KNOWLEDGE

KNOWLEDGE

Knowledge is when we know everything about the validation associated with the information.

 Example:
 Val Thorens is a ski resort in Europe !

 True → Val Thorens is located in the Alps ...

 Val Thorens is the highest ski resort in Europe !

 True → If one populates → assertions all ski resorts located in Europe together with their altitude

 → one can derive → derivation and, as such, validate that Val Thorens is the highest ski resort in Europe

Knowledge is a set of beliefs stated with legitimate claims to truth or correctness at the present time

Modelling - Terms & Definitions

ECSS MasterDB glossary [draft under review]

information → statement of fact or belief

data → representation of the <u>information</u> in compliance with a <u>logical schema</u> and a <u>physical schema</u> used for its preservation within a <u>data repository</u>

model > combination of a <u>schema</u> and a <u>population</u>

- domain-specific model → model that corresponds to the "Business"
- generic model → model that corresponds to one of the many languages used to specify a <u>domain</u> <u>specific model</u>
- schema → structure that determines the regulations for a <u>universe of discourse</u>
- universe of discourse → aspects of the world that the related community wishes to talk about, is concerned about
- population → data captured according to a <u>schema</u> organization during the overall life-cycle of the related <u>data repository</u>
- data repository → data storage entity or entities into
 which data has been partitioned

Modelling - Terms & Definitions, 2

conceptual modelling language → language used during the requirements engineering process to express the semantics and to specify what information needs to be managed

- → when modelling is applied to the development of information systems or means to exchanges
- logical modelling language → language used during the architecture engineering process to represent how the required information is to be structured from a functional and technological viewpoint to satisfy the information system's performance requirements
- physical modelling language → language used during the design engineering process to translate the
 architectural models in the data definition languages exposed by the tools used to produce the data repositories
 required by the information system

a typical example

Knowledge Sharing ...

Supplier/Customer data exchange

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Semantic Modelling

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Questions?

Semantic Interoperability

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