ECSS Master Database
Call for Information

Industry Information Day
October 30th, 2018,
Noordwijk, The Netherlands

ECSS Master Database Task Force

Agenda

09:00	**Welcome**	**W. Knorr**
09:15	**Introduction**	**W. Knorr**
	➢ **Who, what is ECSS**	
	➢ **Why this call for information**	
09:45	**Programmatics**	**W. Knorr**
	➢ **Timetable of the RFI**	
	➢ **E-RMS development approach**	
10:00	**Documents**	
	➢ **Statement of Work**	**J. Fuchs**
	➢ **User Requirements Document**	**W. Knorr**
	➢ **Conceptual Data Model**	**S. Valera**
11:10	**ECSS eGlossary**	**A. Herd**
11:30	**Questions**	
13:00	**Close of Industry Information day**	

Note: meeting rooms will be available in the afternoon if required

ECSS Master DB Task Force

Industry (represented by Eurospace)

Airbus	Wolfram Knorr (convenor)	Damien de Paysac
Ariane Group	Jean-Philippe Deloison	
Thales Alenia Space	Gianni Crivellari	Michèle Crosnier

Space Agencies

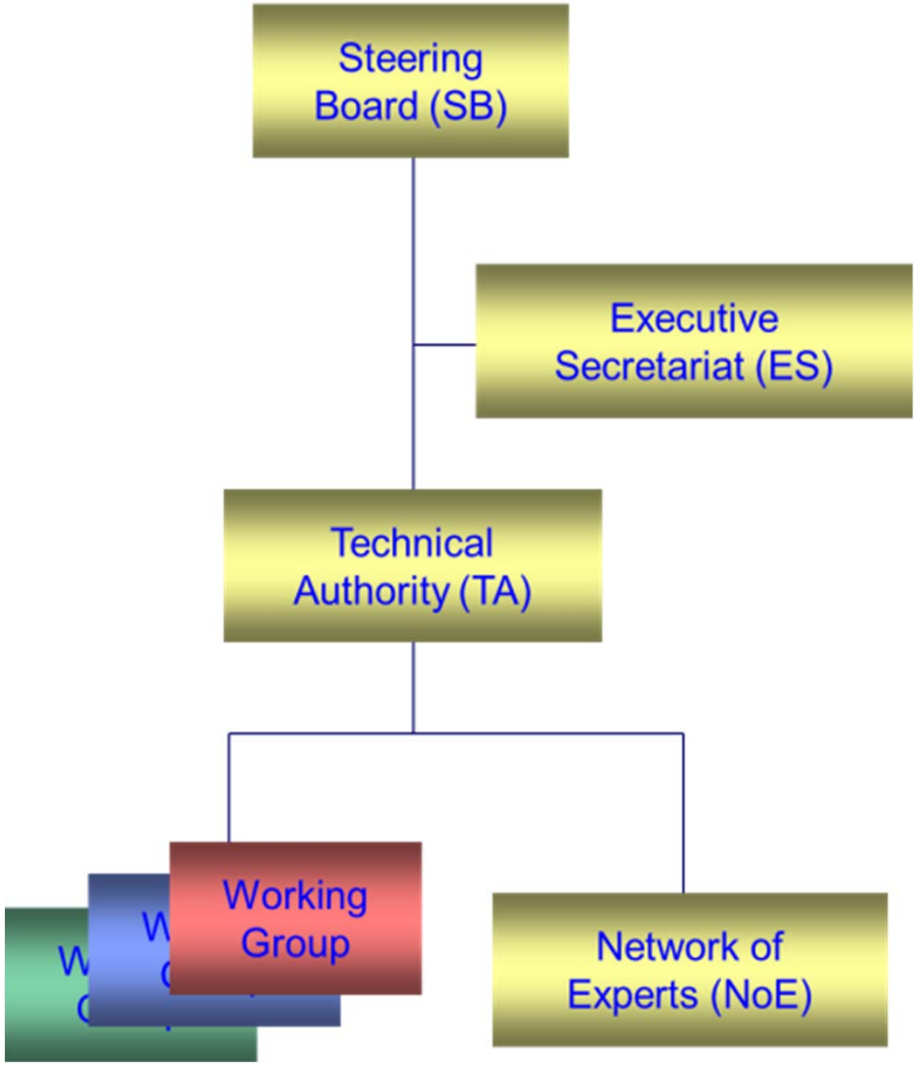
CNES	Sophie Mazeau	Nicolas Deslandres
DLR	Daniel Schiller Andreas Gibbesch	Carsten Dietrich
ESA	Joachim Fuchs Hans-Peter de Koning	Andrew Herd Serge Valera

Who / what is ECSS?

ECSS = European Cooperation for Space Standardization

- **founded in 1996**
- **to provide the European space community with an integrated set of space-specific standards that cover management, quality, engineering and sustainability disciplines**
- **Members:**
  - **ESA**
  - **National space agencies**
  - **Industry represented through ASD Eurospace**
  - **Associates, observers (e.g. CSA, EUMETSAT)**

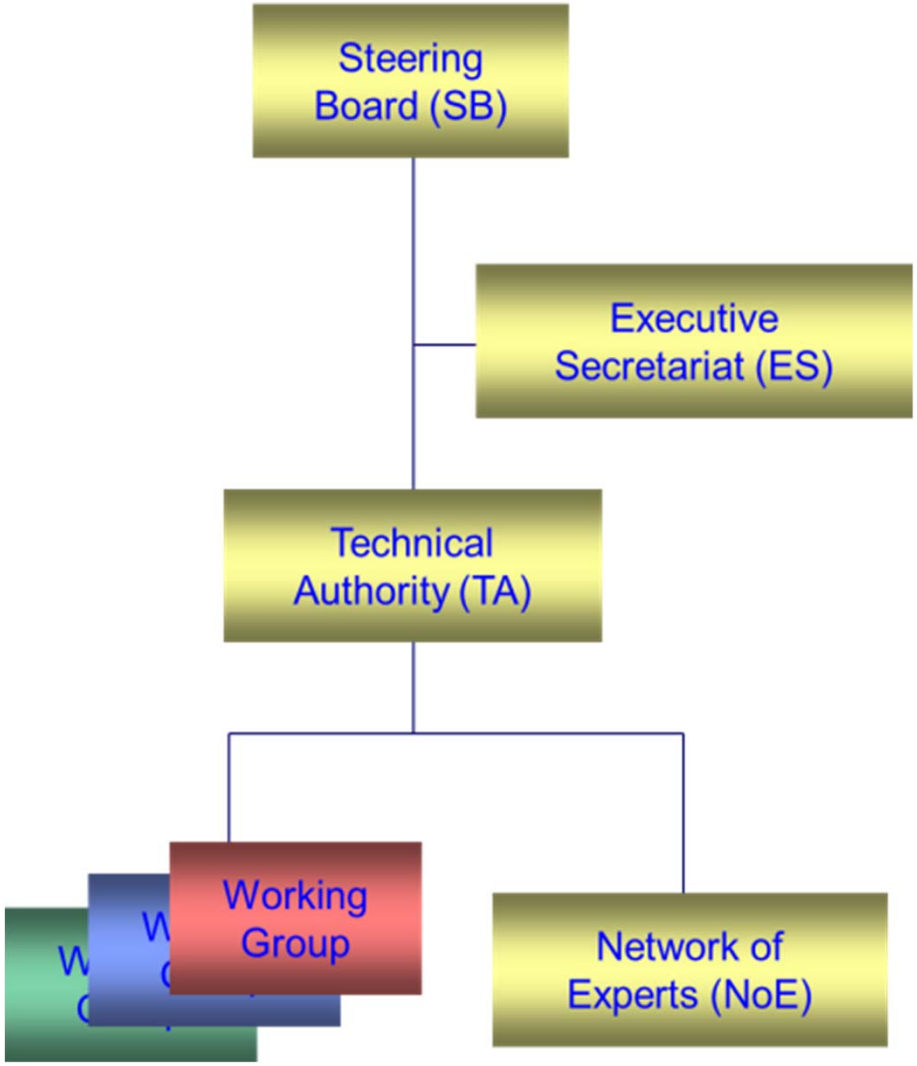
ECSS Bodies



Steering Board (SB)

- meets twice / year
- provides overall leadership of the ECSS bodies
- defines the objectives, policy and strategy for the ECSS system
- approves the annual work plan established by the Technical Authority (TA)
- decides whether ECSS shall cooperate with other SDOs, which type of cooperation, and endorses the cooperation agreement prepared by the TA

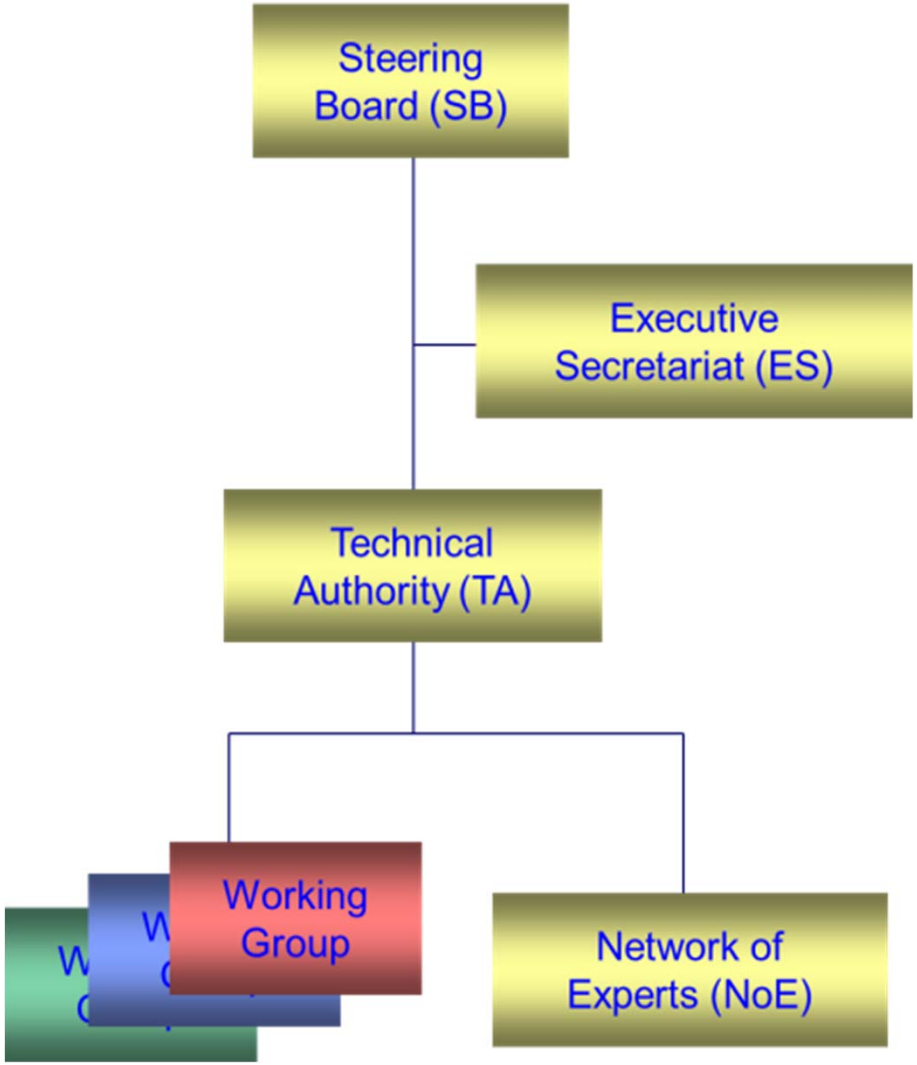
ECSS Bodies



Technical Authority (TA)

- meets quarterly
- is guided and monitored by the SB
- is the technical approval authority for the initiation and release of new ECSS documents and for all changes to existing ECSS documents
- is in charge to setup and implement the work-plan with the support of the ES. Furthermore, TA proposes the work-plan to SB for endorsement.

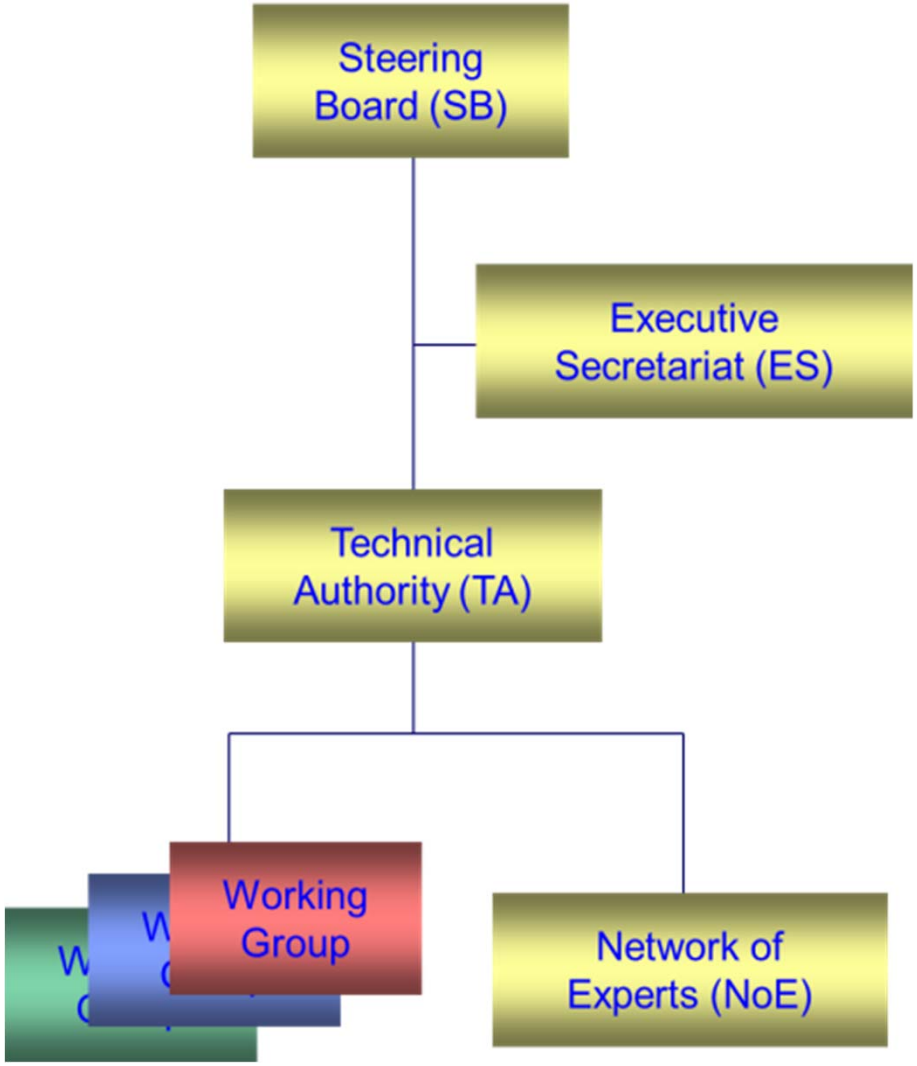
ECSS Bodies



Executive Secretariat (ES)

- provides administrative support to SB and TA, in particular to prepare, maintain and supervise the work-plan
- ensures the promotion of ECSS and interface with other SDOs
- currently held by ESA/ESTEC

ECSS Bodies



Working Groups

- carry out the tasks necessary to draft or update an ECSS document in line with the Terms of Reference, against an agreed planning and schedule. They are built on a case by case basis, managed by the TA through a limited duration mandate.

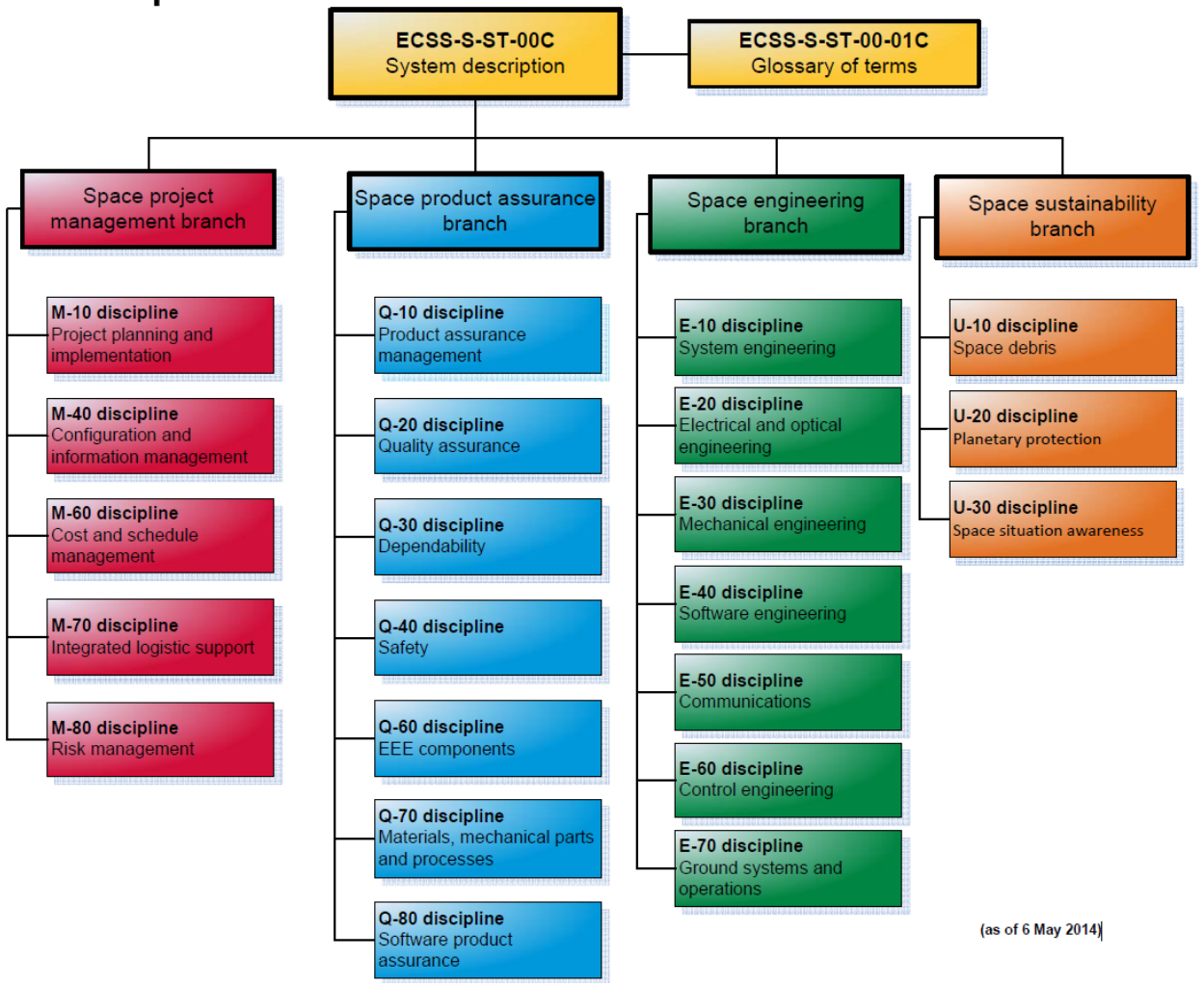
Network of Experts (NoE)

- pool of experts appointed by the TA and supported by the ECSS organizations nominating them. They act for specific mission / action through the sponsorship of the TA members or their nominating organization.

Structure of ECSS

- **Standards, Handbooks and TMs**
- **In 4 technical disciplines:**
  - Management
  - Engineering
  - Product Assurance
  - Sustainability

ECSS Disciplines



ECSS Requirements

ECSS holds today some 130 standards which contain some 25.000 requirements, mainly in the Q and E-branch

ECSS standards are made applicable in European spacecraft development programs by being called up in business agreements

They need to be tailored by the customer for the given mission and verified by the contractor

This is a typical requirements management function, therefore all ECSS standards are also available as DOORS modules

The complete set of ECSS DOORS modules is annually updated by the ECSS secretariat and distributed to the ECSS partners for further in-house use

Managing ECSS in DOORS

ECSS requirements are made applicable all along the industrial supply chain

Consequently, ECSS standards are maintained (developed and updated) by experts from all levels of the supply chain, who often (mostly) are not familiar with DOORS.

As therefore maintaining the ECSS standards directly in DOORS is not an option, the working groups of experts maintain them in MS Word ® and the ECSS secretariat imports them in to DOORS.

This way of processing yields many drawbacks compared to maintaining requirements in DOORS from the beginning.

Although a group of DOORS experts has recently improved this through dedicated scripts, some significant shortcomings remain.

The future Master Database

In 2016, the ECSS Technical Authority has therefore launched a dedicated task force to investigate on a future state-of-the-art "ECSS Requirements Management System" (E-RMS) to succeed the current DOORS solution and to overcome the a.m. problems

The Terms of Reference for the task force define 4 objectives:

1. Identify the stakeholder needs ☑
2. Establish a User Requirements Document for the E-RMS ☑

   ← This is where we stand today
3. Assess and propose candidate tool(s) for the E-RMS
4. Propose a roadmap for the development of the E-RMS (including estimation of the associated effort / cost)

Programmatics

Timetable:

12.10.18	Publication of the RFI via emits
30.10.18	Industry Information Day
19.11.18	Receipt of non-binding ROM proposals
→ Feb 19	Evaluation of the proposals by the TEB (run by the ECSS Master DB task force)
14.02.19	Discussion at TA # 65
14.03.19	Presentation of recommendation and roadmap to SB # 56

Start of E-RMS development activities depending on availability of the required budget

This development will follow the ESA contract policy

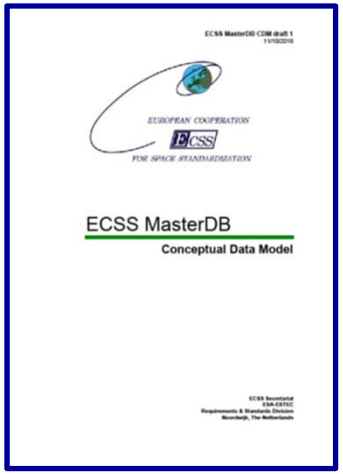
➔ invitation to tender

RFI documents

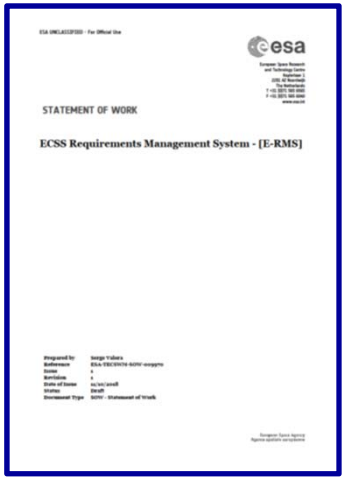
Besides the RFI cover letter, you have received 3 documents with the RFI:

User Requirements Document

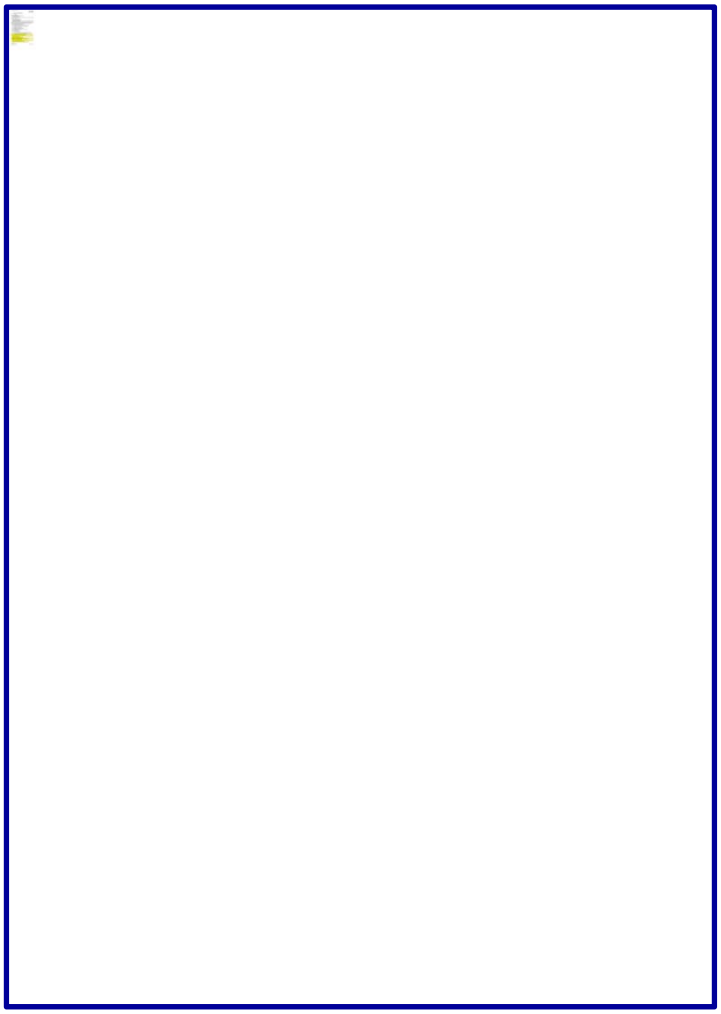
Conceptual Data Model (Draft)



Statement of Work (Draft)



E-RMS SoW



Programmatics / SoW

Development of the E-RMS:

It is planned to run the development of the E-RMS in co-operation with the selected vendor(s) in two phases (TBC):

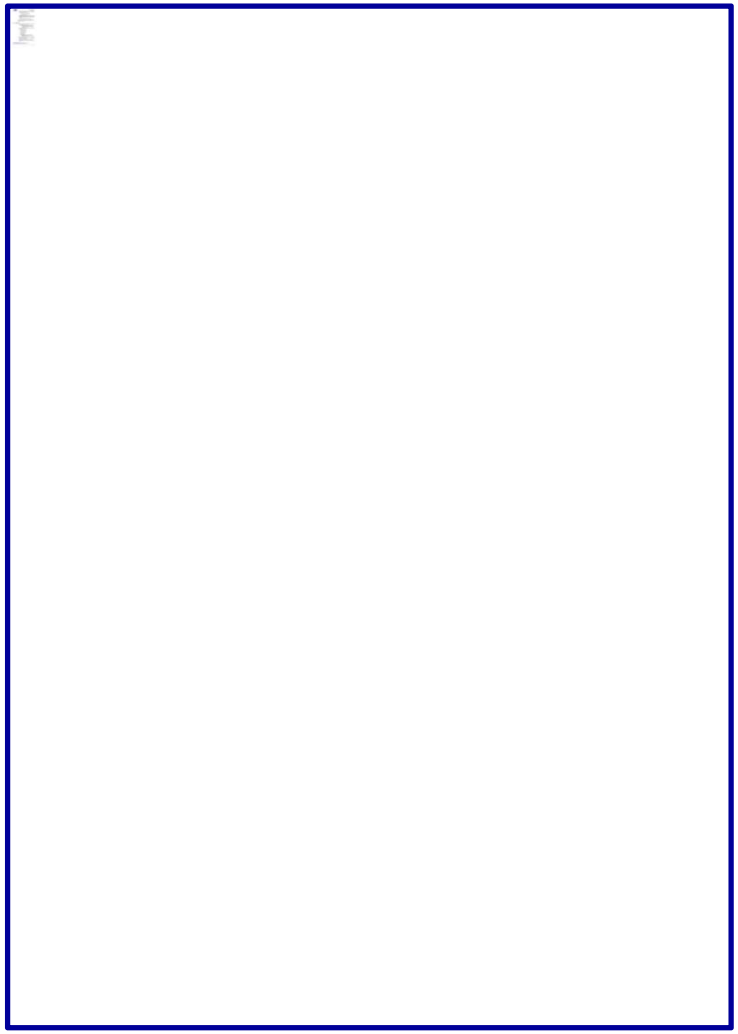
Phase 1: E-RMS Specification:

- Finalization of the E-RMS data and process requirements
- Validation of the specification
- Definition of the architecture, including Trade-off off-the-shelf products (with modifications) versus new development
- Prototyping of the E-RMS

Phase 2: E-RMS Design, Production and deployment

- Full verification against all requirements
- Population with the current ECSS standards

E-RMS URD



User Requirements Document

The URD

- gives a general description of (our understanding of) the future E-RMS in clause 4
- defines the requirements for the E-RMS in clause 5

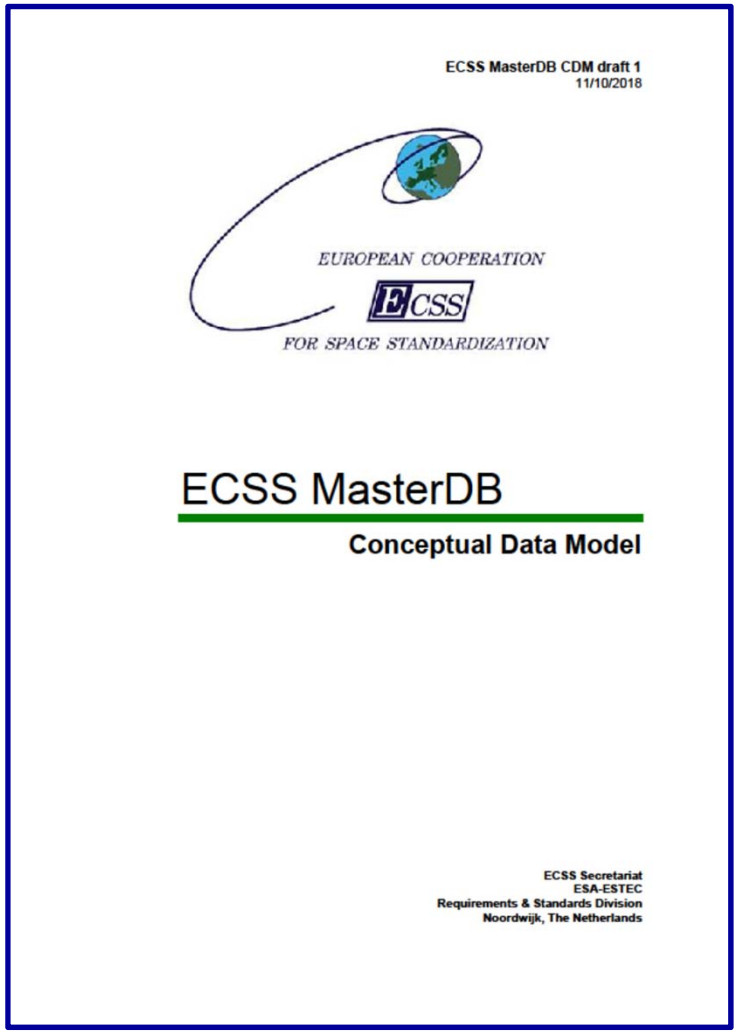
with high priority (cf. URD clause 5.1.3):

- of course to provide a state-of-the-art RM system with all “standard” features like access control, configuration control etc.
- to cover all existing non-administrative, i.e. “core” ECSS processes, ref: ECSS-D-00B
- to allow a smooth transition from the current DOORS-based solution, i.e. must haves are:
  - I/F to DOORS
  - I/F to MS-Office

with lower priority:

- to cover all administrative ECSS processes
- to cover all non-ECSS processes (mainly industry processes like product line management)

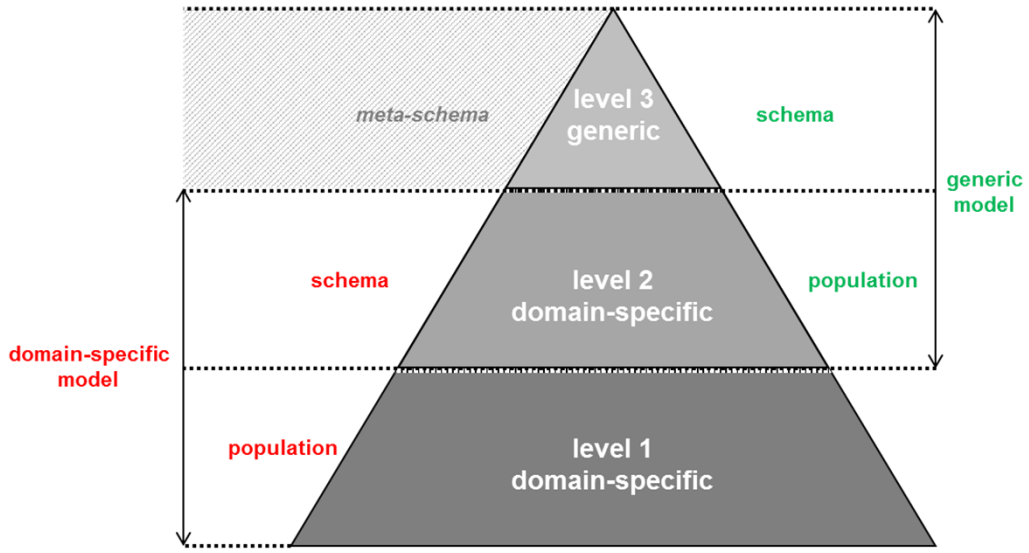
E-RMS CDM


ECSS MasterDB CDM draft 1
11/10/2018
EUROPEAN COOPERATION
ECSS
FOR SPACE STANDARDIZATION
ECSS MasterDB
Conceptual Data Model
ECSS Secretariat
ESA-ESTEC
Requirements & Standards Division
Noordwijk, The Netherlands

Modelling - Terms & Definitions

information → statement of fact or belief

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



model → combination of a schema and a population

domain-specific model → model that corresponds to the "Business"

generic model → model that corresponds to one of the many languages used to specify a domain specific model

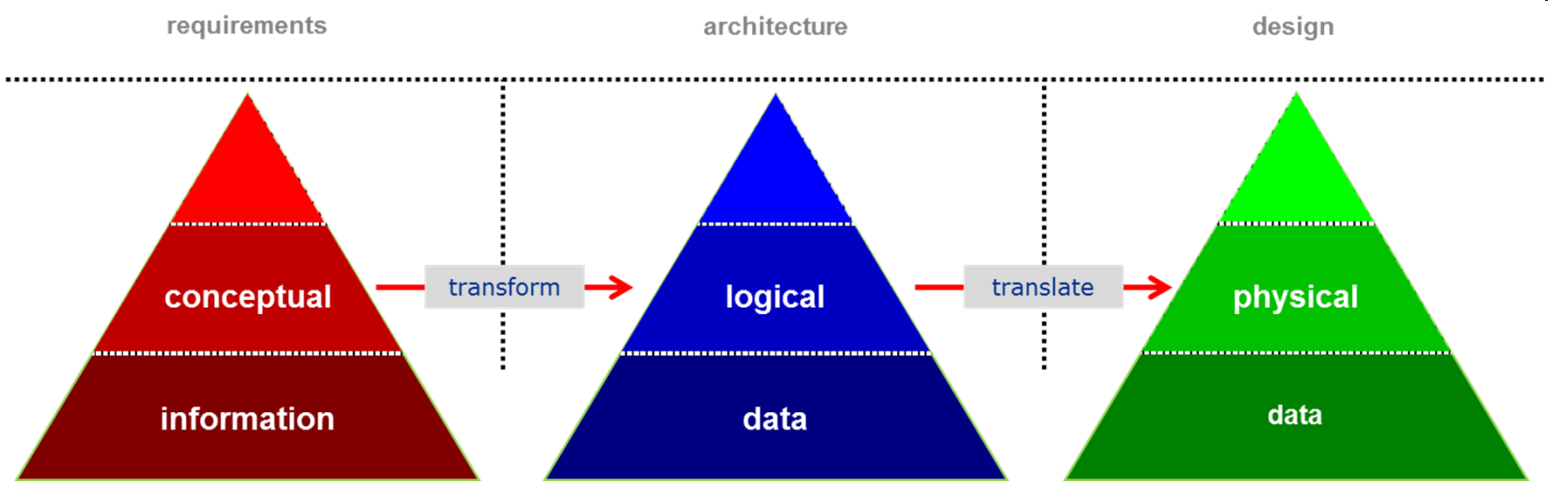
schema → structure that determines the regulations for a universe of discourse

universe of discourse → aspects of the world that the related community wishes to talk about, is concerned about

population → data captured according to a schema organization during the overall life-cycle of the related data repository

data repository → data storage entity or entities into which data has been partitioned

Modelling - Terms & Definitions



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

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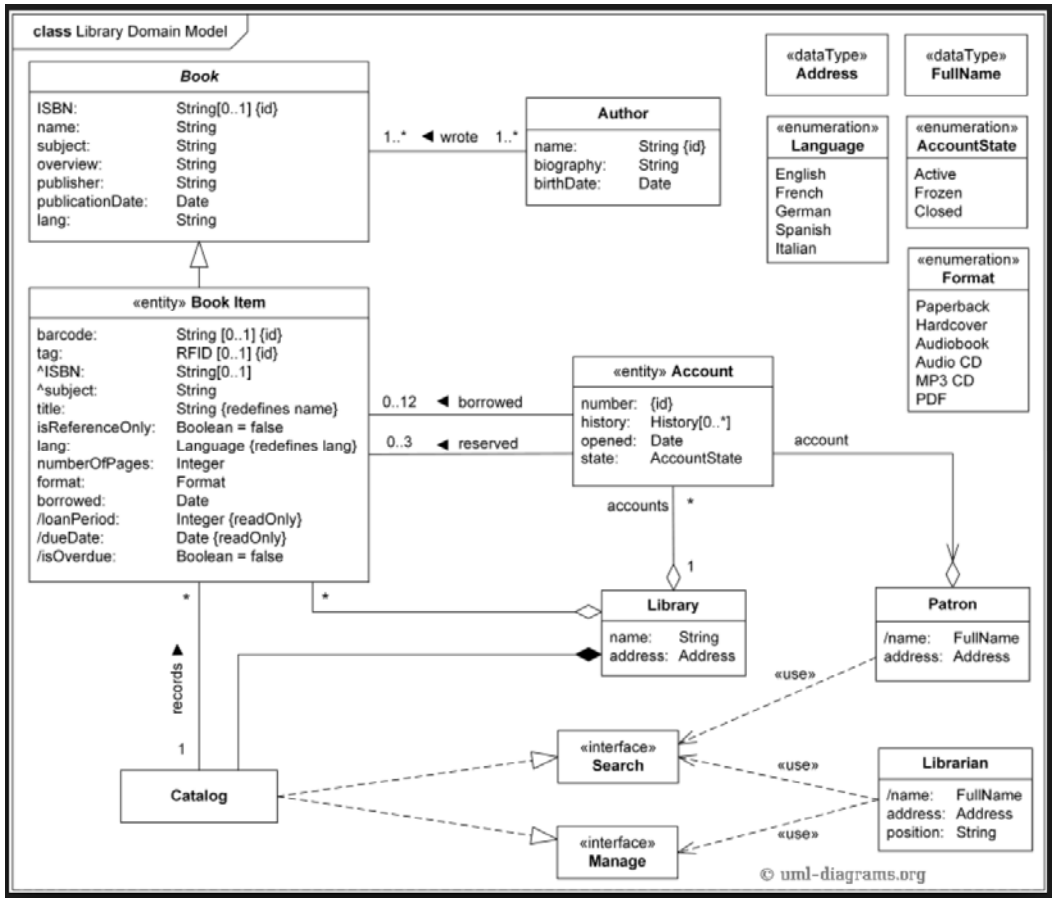
when modelling is applied to the development of information systems or information exchanges

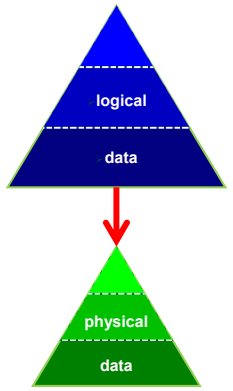
logical modelling language → language used during the architecture engineering process to represent how the required information is to be structured from a functional and technological viewpoint to satisfy the information system's performance requirements

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

Conceptual Data Model

Conceptual data modelling is first: “communicating”



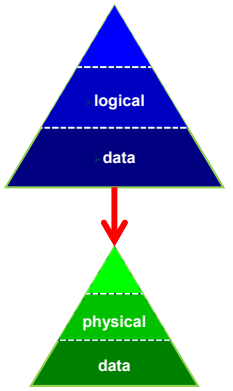


Conceptual Data Model

Conceptual data modelling is first: “communicating”

XML

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <xsd:element name="catalog">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element name="book"
                     minOccurs="0"
                     maxOccurs="unbounded">
          <xsd:complexType>
            <xsd:sequence>
              <xsd:element name="author" type="xsd:string"/>
              <xsd:element name="title" type="xsd:string"/>
              <xsd:element name="genre" type="xsd:string"/>
              <xsd:element name="price" type="xsd:float"/>
              <xsd:element name="publish_date" type="xsd:date"/>
              <xsd:element name="description" type="xsd:string"/>
              </xsd:sequence>
            <xsd:attribute name="id" type="xsd:string"/>
          </xsd:complexType>
        </xsd:element>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
</xsd:schema>
```



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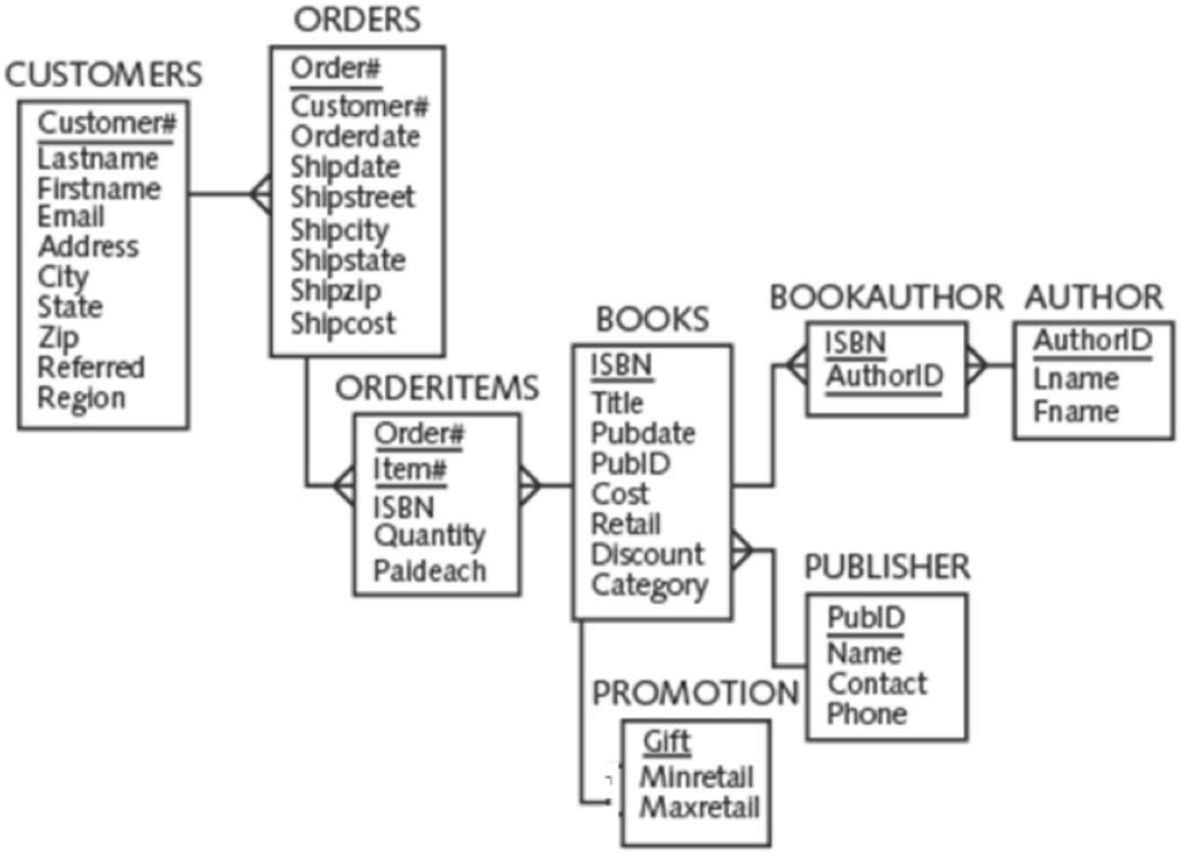

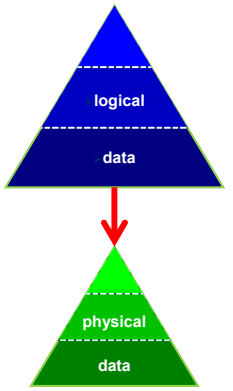

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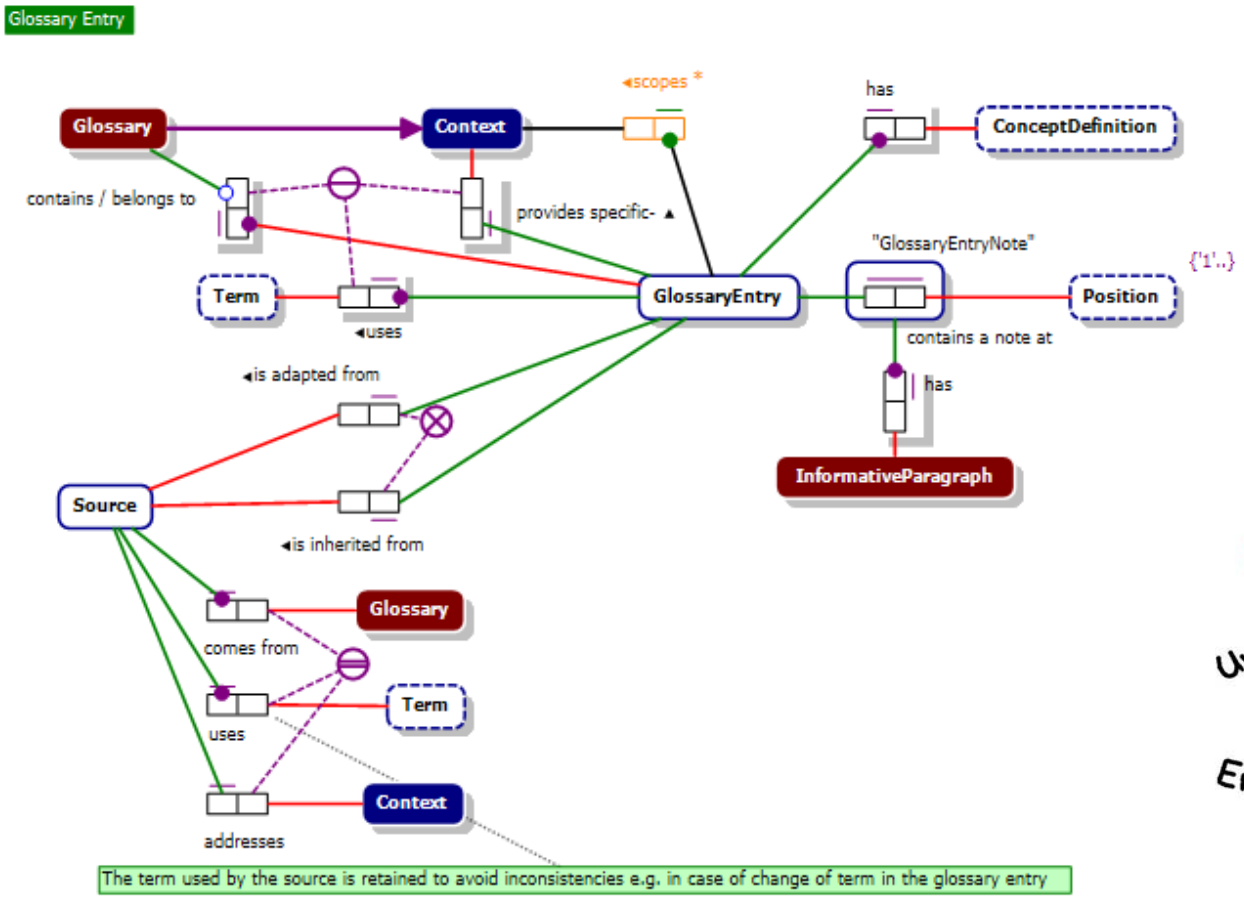
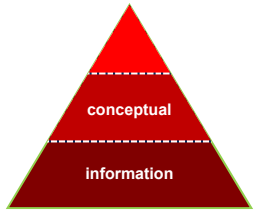




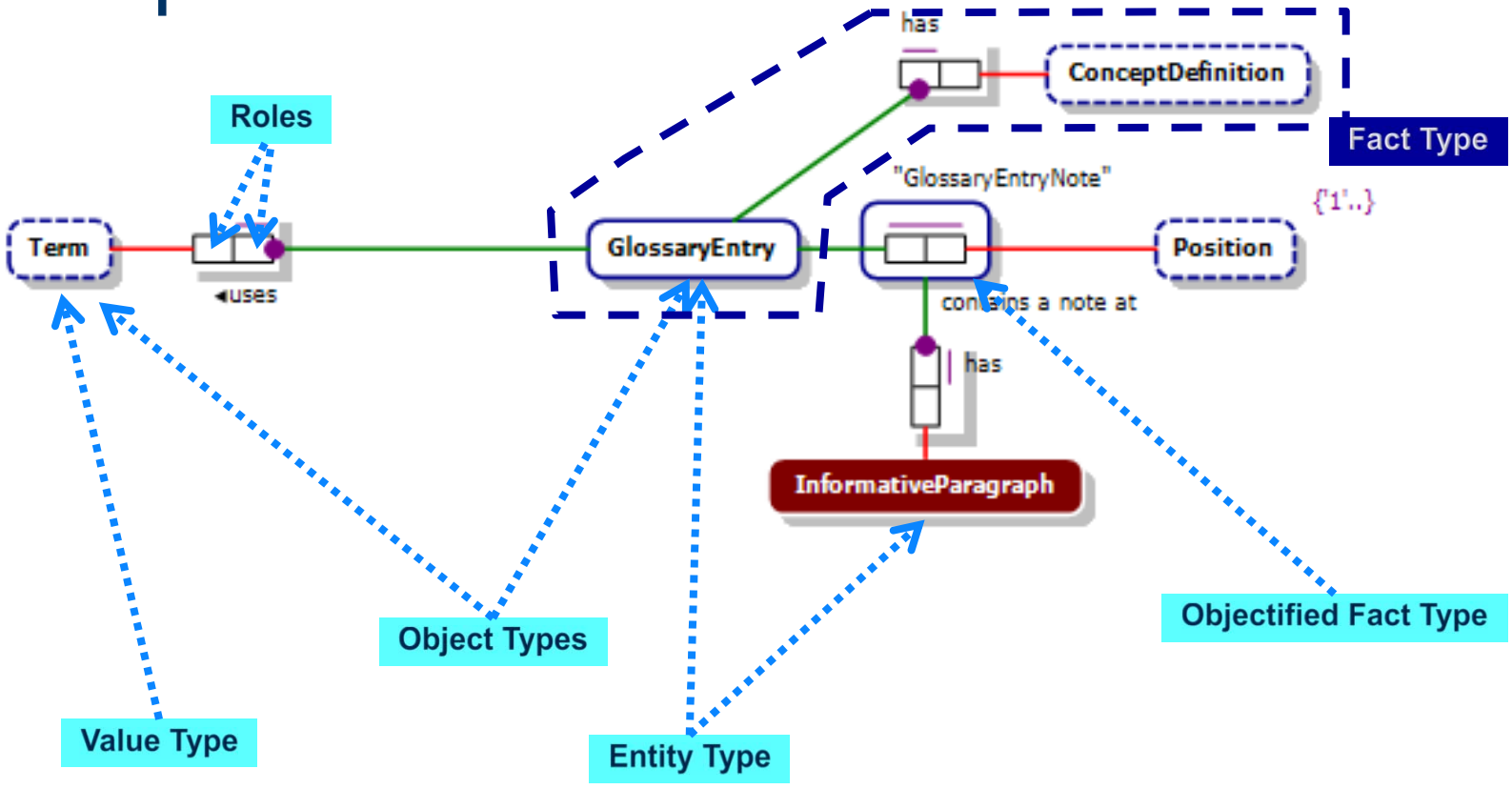
Conceptual Data Model

The E-RMS Conceptual Data Model:

- captures the *semantics*, i.e. the "WHAT"
- *integrates* each stakeholder's semantics in a global conceptual model solution
- supports the exchange between stakeholders by
  - sub-setting the global conceptual model with the needs of each stakeholder, i.e. producing local views
  - enabling exchanges of shared semantics by mapping the stakeholder-specific conceptual views

Fact based Modelling

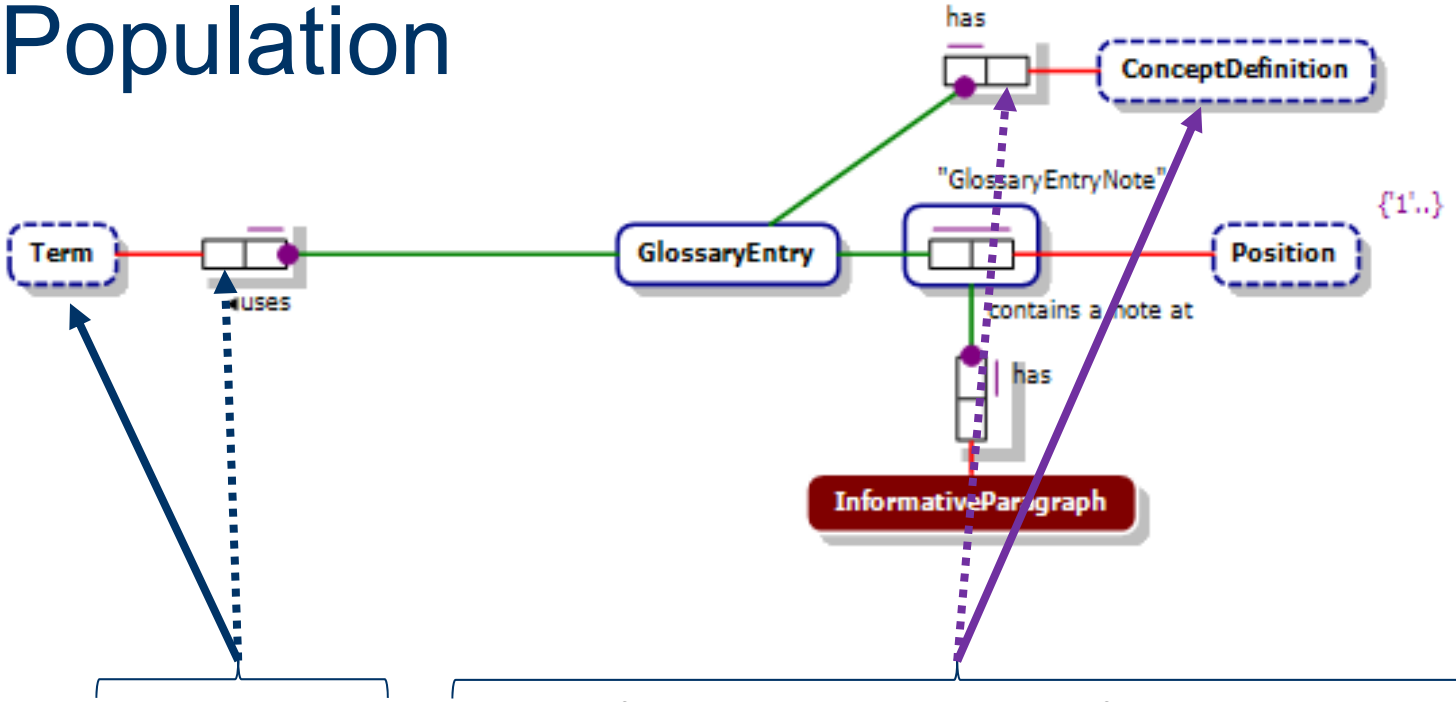
Graphical notation



ORM – Object Role Modelling

Fact based Modelling

Population

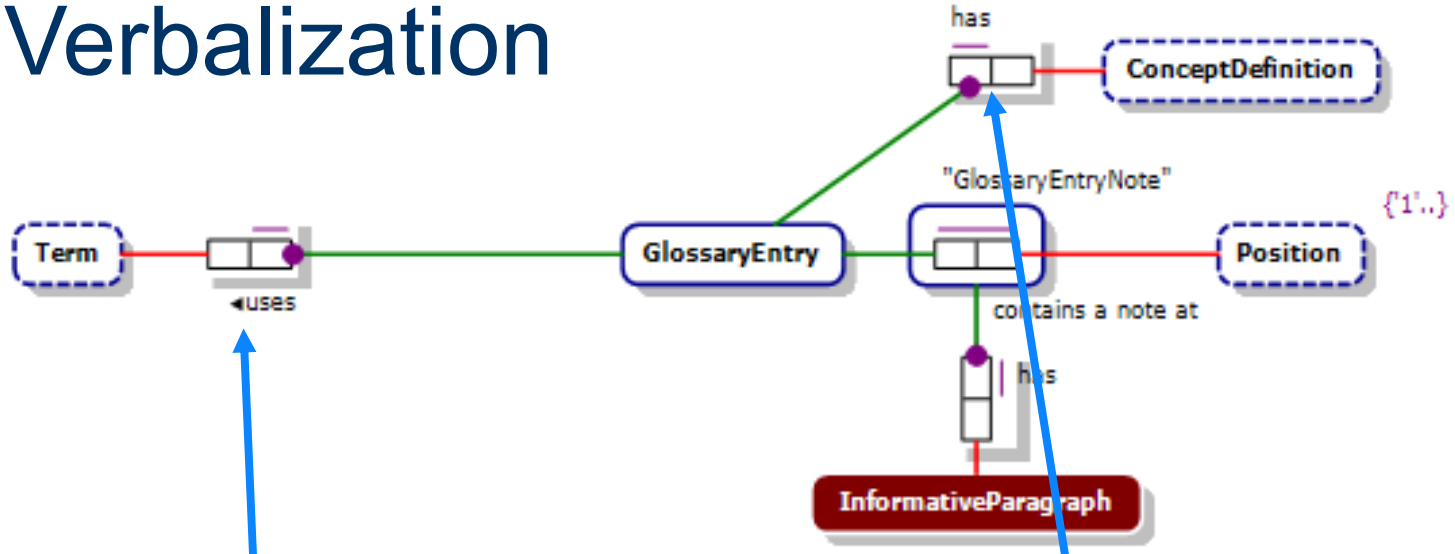


NOTE 1 A conceptual schema specifies the semantics, i.e. the WHAT, including the meaning of every term that could be misunderstood by the intended audience and ignoring the aspects of data representation, physical data organisation and access, i.e. the HOW.

NOTE 2 A conceptual schema declares the fact types, constraints, derivation rules, events and concepts relevant to the universe of discourse.

Fact based Modelling

Verbalization



Glossary entry uses term.

- **Each** glossary entry uses **exactly one** term.
- **It is possible that more than one** glossary entry uses **the same** term.

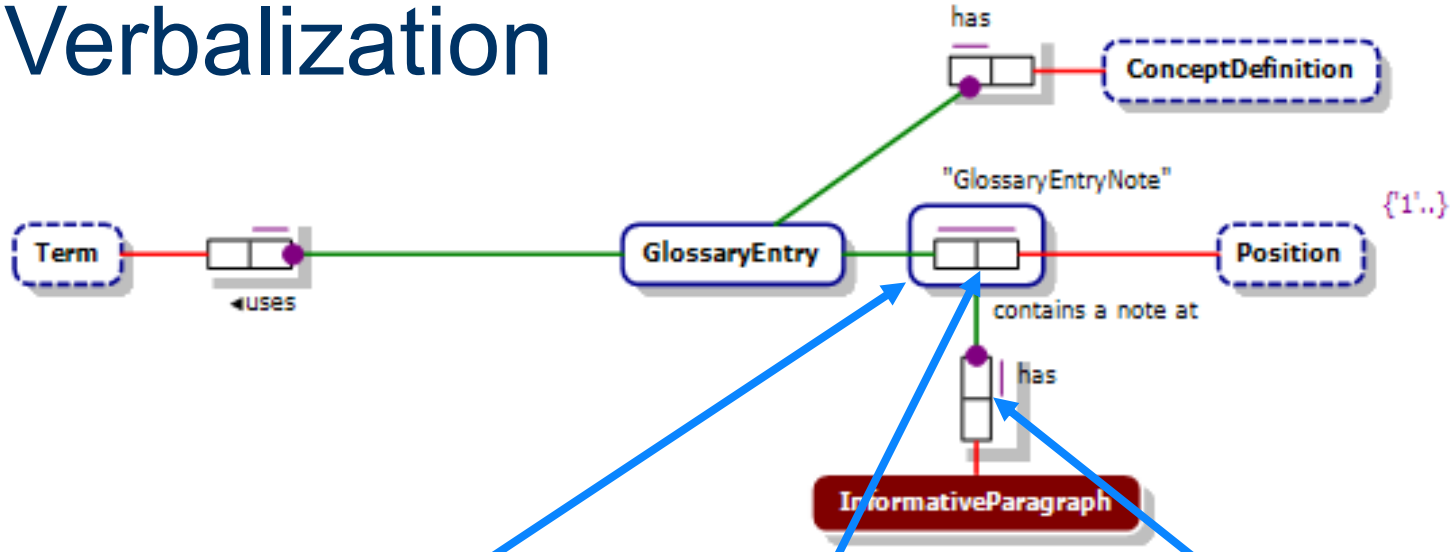
Glossary entry has concept definition.

- **Each** glossary entry has **exactly one** concept definition.
- **It is possible that more than one** glossary entry has **the same** concept definition.

NORMA tool

Fact based Modelling

Verbalization



Glossary entry note **is an entity type**.

- Glossary entry note **objectifies** "glossary entry contains a note at position".

Glossary entry note has informative paragraph.

- **Each** glossary entry note has **exactly one** informative paragraph.
- **It is possible that more than one** glossary entry note has **the same** informative paragraph.

Glossary entry contains a note at position.

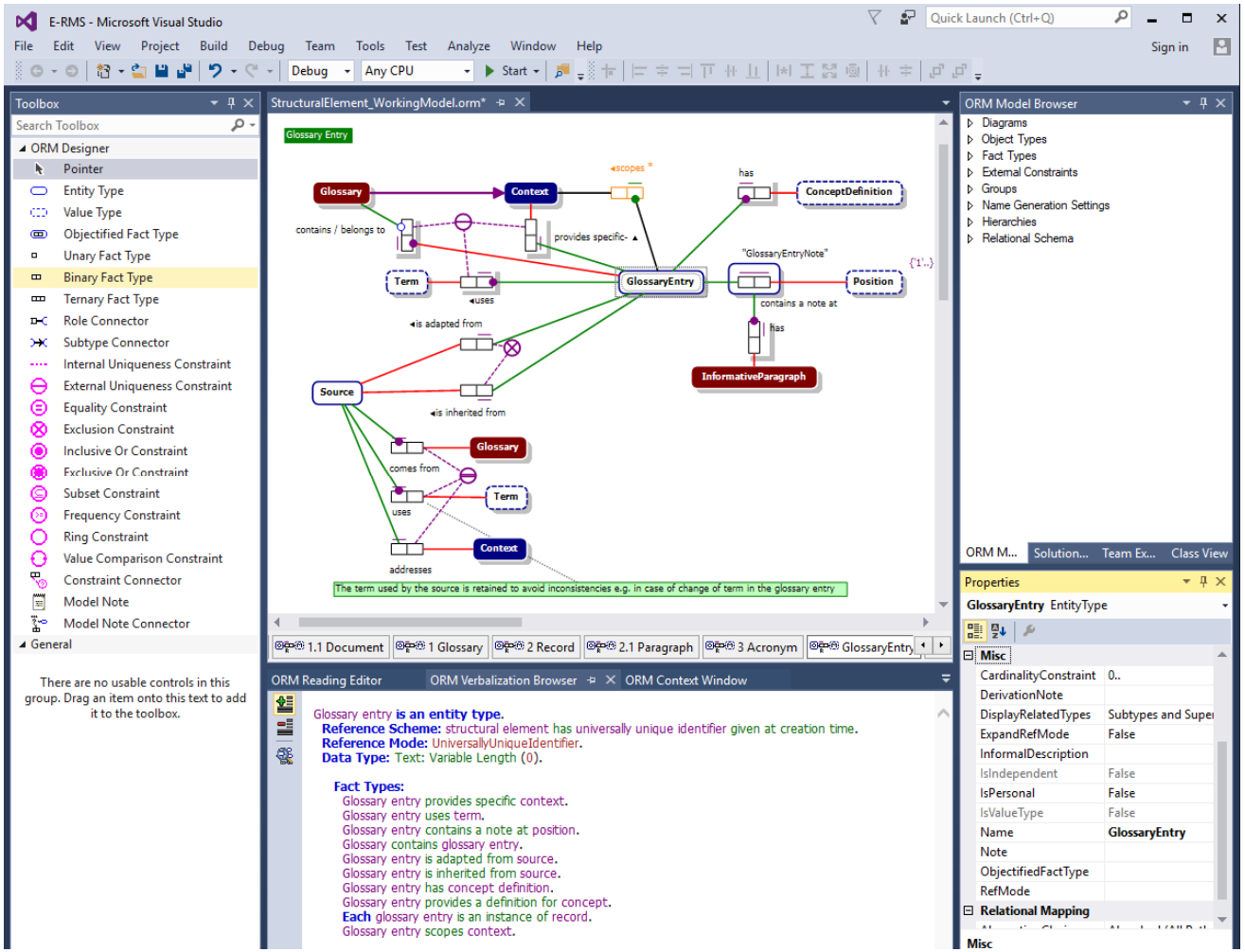
- **It is possible that some** glossary entry contains a note at **more than one** position **and that for some** position, **more than one** glossary entry contains a note at **that** position.

NORMA tool

Fact based Modelling

Using NORMA freeware versus Pro

DEMO…



Information Modelling

Modelling Semantics using the Fact Based Modelling methodology

- **2009-2015 - FBM WG 1** www.factbasedmodelling.org

  Exchanging conceptual data models using FBM

  http://www.factbasedmodeling.org/Data/Sites/1/media/FBM1002WD08.pdf

- **2010-2016 – TRP FAMOUS-2** Fact based Modelling Unifying System

  http://m.esa.int/Our_Activities/Space_Engineering_Technology/Shaping_the_Future/Semantic_Modelling_and_Semantic_Interoperability_-_FAMOUS-2

- **2017-20xx – FBM WG 2** website under construction
- *others*

Main Tooling

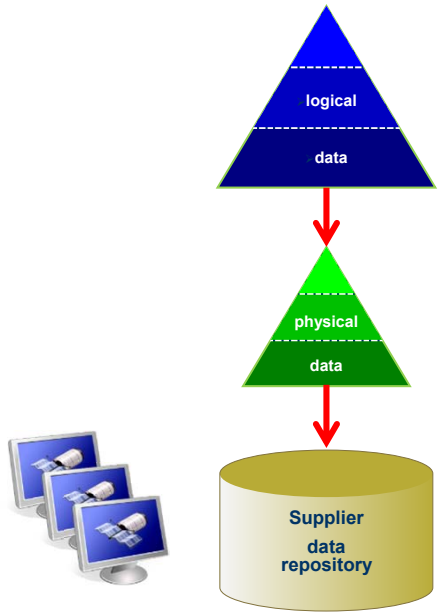
- **NORMA tool - freeware**
- **NORMA Pro – under construction, beta versions available**
- **NORMA Pro + FAMOUS 2 add-ons**

Exchanging Data – Classical Approach

A

classical information system's development approach

Use UML class diagrams and develop RMS-A

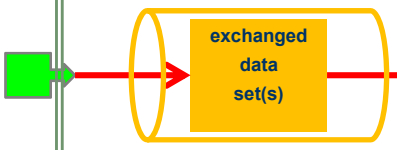


classical approach

Interoperate !

1. create an ICD or tailor a standard ICD e.g. ReqIF
2. map logical/physical schema A to ICD
3. build **exporter-A**
4. map ICD to logical/physical schema B
5. build **importer-B**

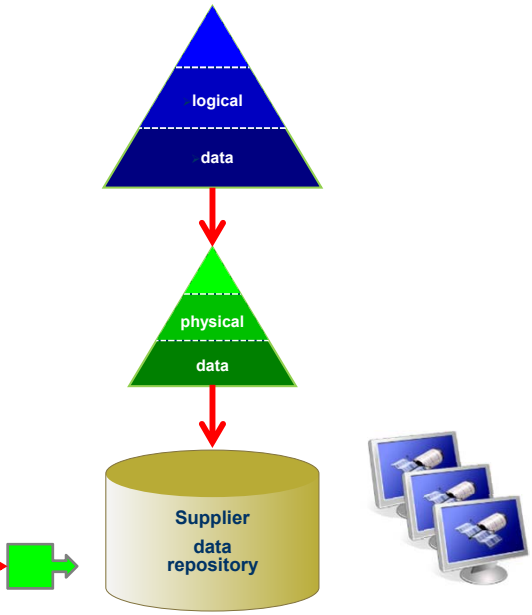
exchange !!!



B

classical information system's development approach

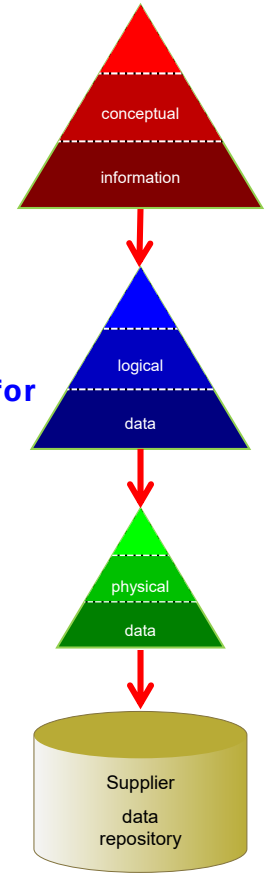
Use Entity/Relation diagrams and develop RMS-B



Semantic Modelling

A

e.g.
inject
System
needs



update solution for compliance

FAMOUS

Fact based Modeling Unifying System approach

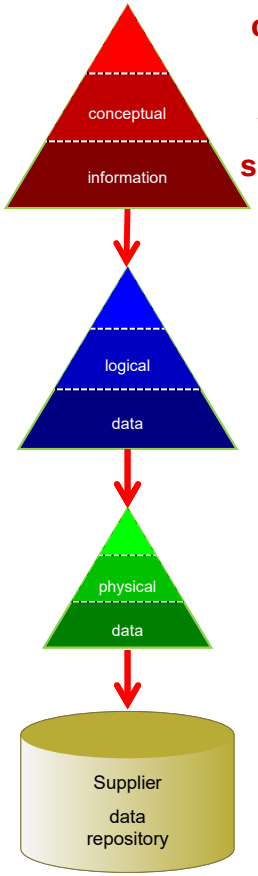
engineers new solution

or

reverse-engineers existing solutions

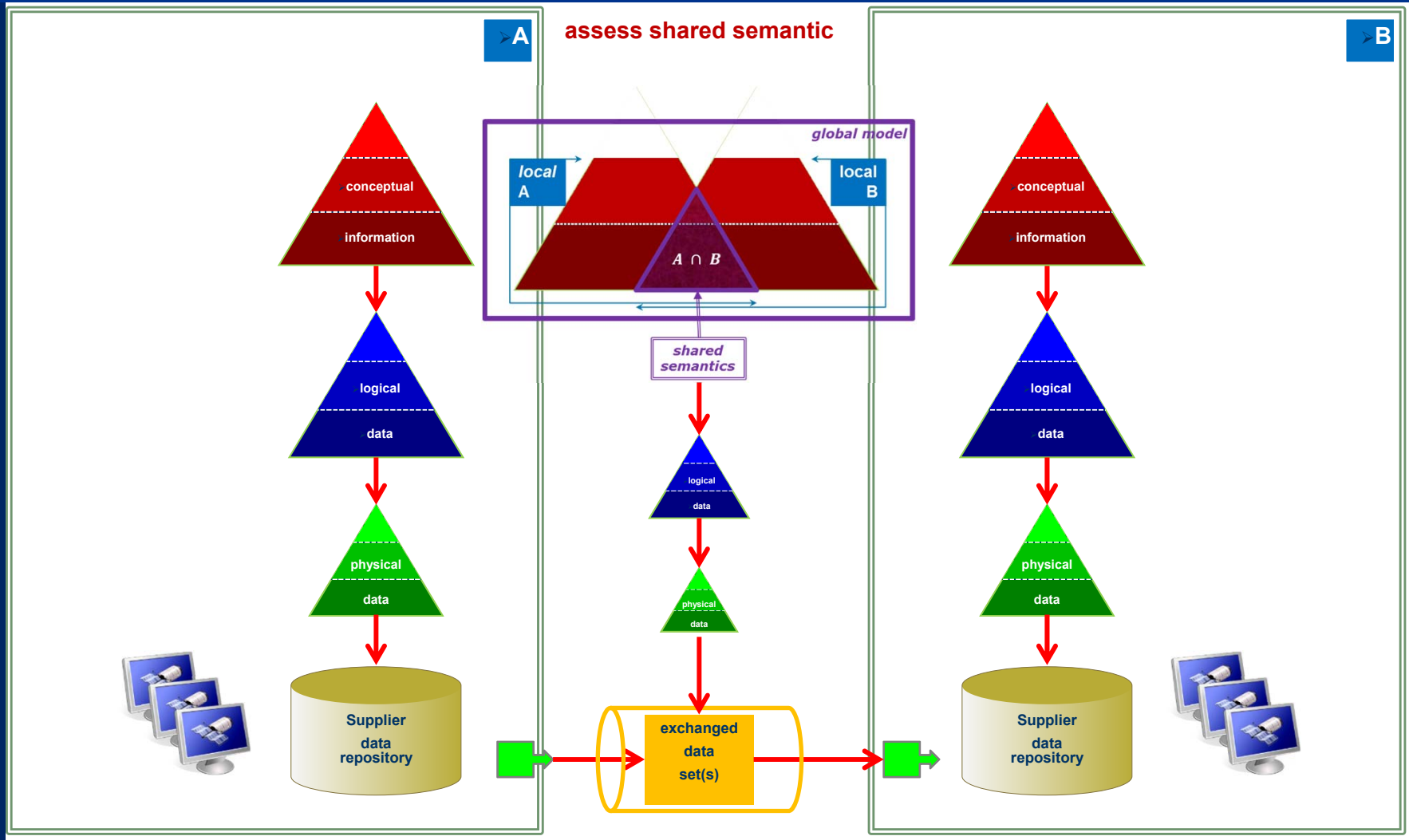
B

conceptualize
&
validate with stakeholders-B

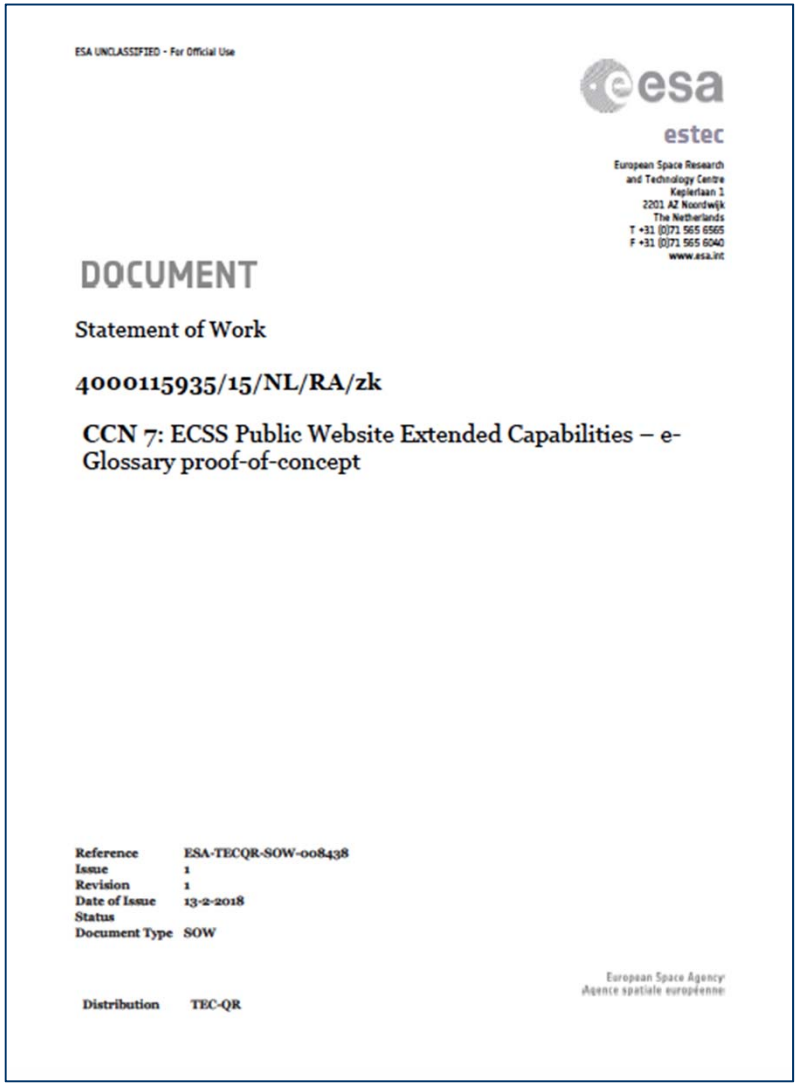


implement
&
verify

Semantic Interoperability



ECSS eGlossary



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www.esa.int

DOCUMENT

Statement of Work

4000115935/15/NL/RA/zk

CCN 7: ECSS Public Website Extended Capabilities – e-Glossary proof-of-concept

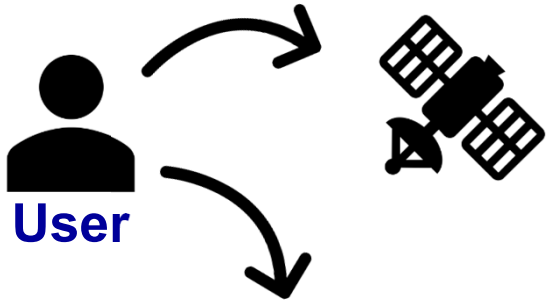
Reference	ESA-TECQR-SOW-008438
Issue	1
Revision	1
Date of Issue	13-2-2018
Status	
Document Type	SOW
Distribution	TEC-QR

European Space Agency
Agence spatiale européenne

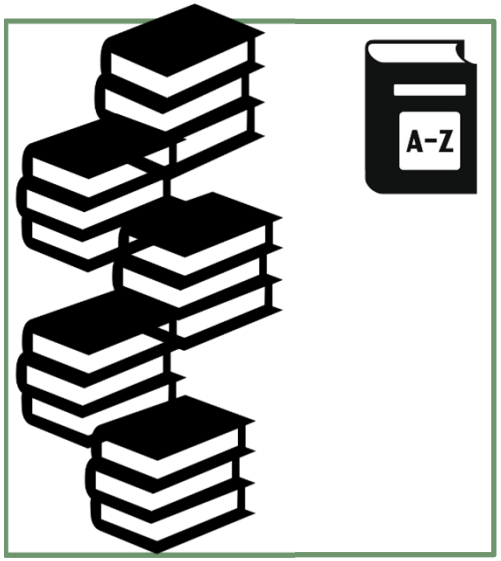
ECSS eGlossary use case

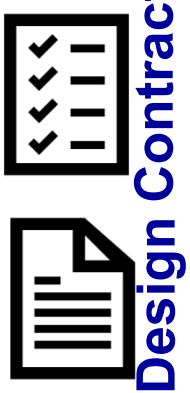
Current situation

- **125+ active standards**
- Structured as a set of books
- **Accessible through**
  - Hardcopy
  - **Website**
  - **Download**
- Used worldwide as the **best stuctured Space Standards**



ECSS Standards

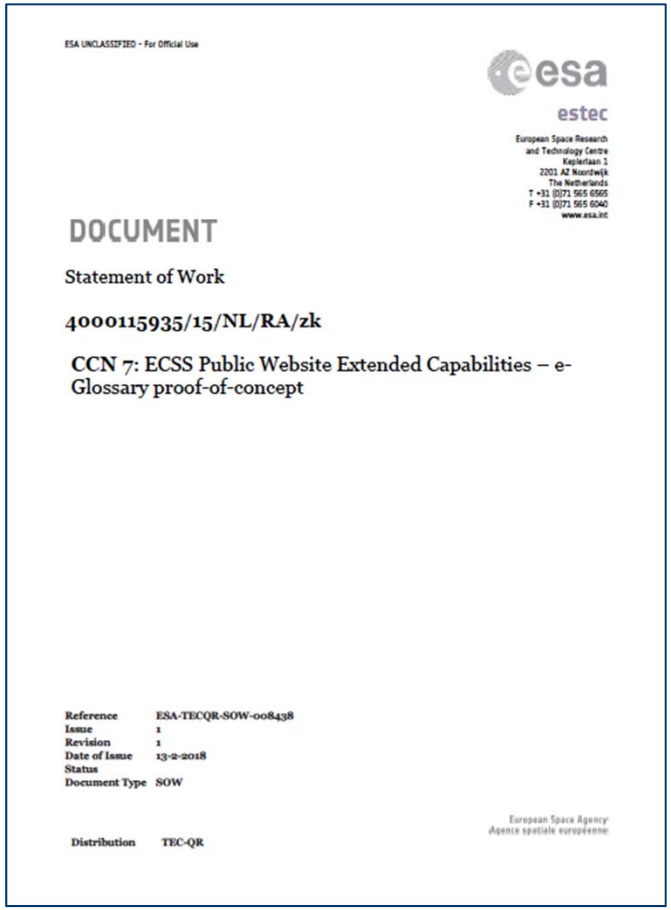




ECSS eGlossary use case

Current situation

- **Full digital management of the ECSS system**
- Development of a data-repository-oriented-system as opposed to a paper based system.
- New eGlossary needs to contain all ECSS terminology and the section 3 of each Standard.
- **eGlossary must be available through**
  - Advanced website search(ecss.nl)
  - **Mobile APP**
  - Assisted **Reading**



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DOCUMENT

Statement of Work

4000115935/15/NL/RA/zk

CCN 7: ECSS Public Website Extended Capabilities – e-Glossary proof-of-concept

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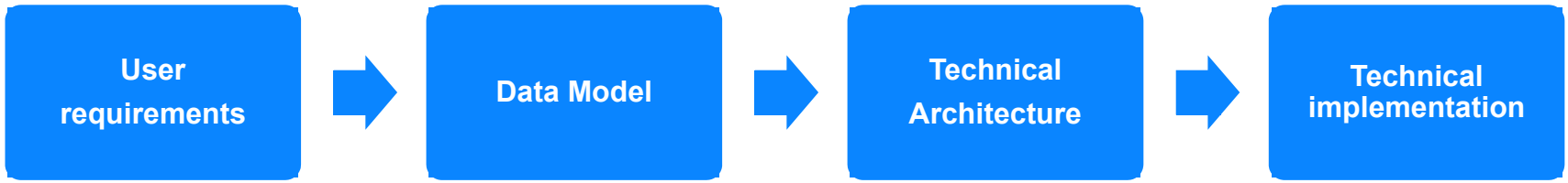
European Space Agency
Agence spatiale européenne

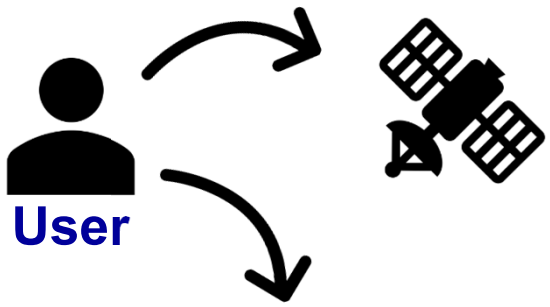
ECSS eGlossary use case



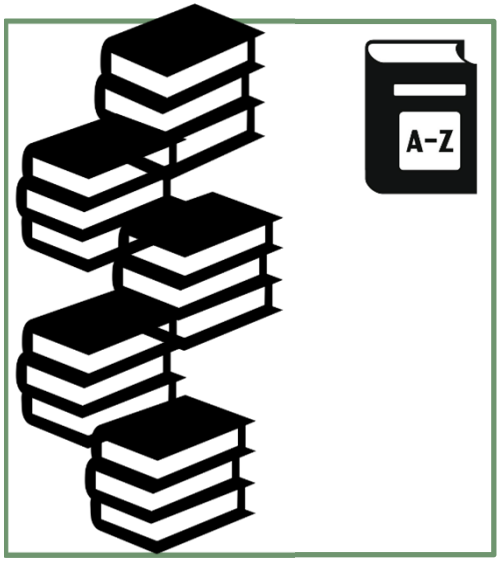
ECSS eGlossary use case

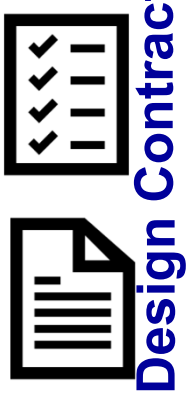
User Requirements

- Focus on USE & USABILITY
- Providing a better working entrance point for the standards through an advanced new eGlossary
- User centric applications on standard / book centric repository
- Create flexibility in usage
- Create consistency



ECSS Standards





ECSS eGlossary use case

Data Model

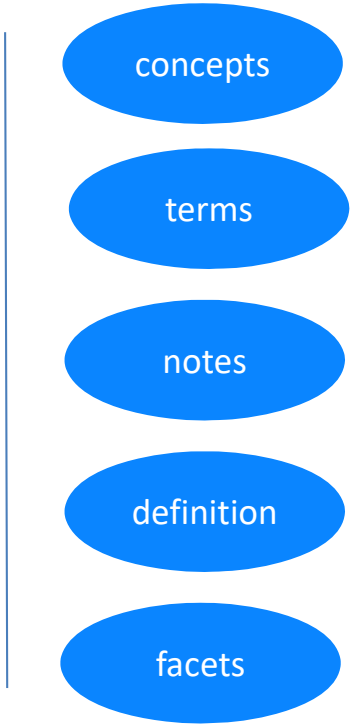
- An enhanced and flexible glossary starts with a good data model. ECSS use case & glossary suggested using a thesaurus (ISO 25964), fitting in with linked data.

- RedData developed an application profile, consisting of the majority of ISO 25964 with some specific additions for thesaurus management.

ECSS eGlossary use case

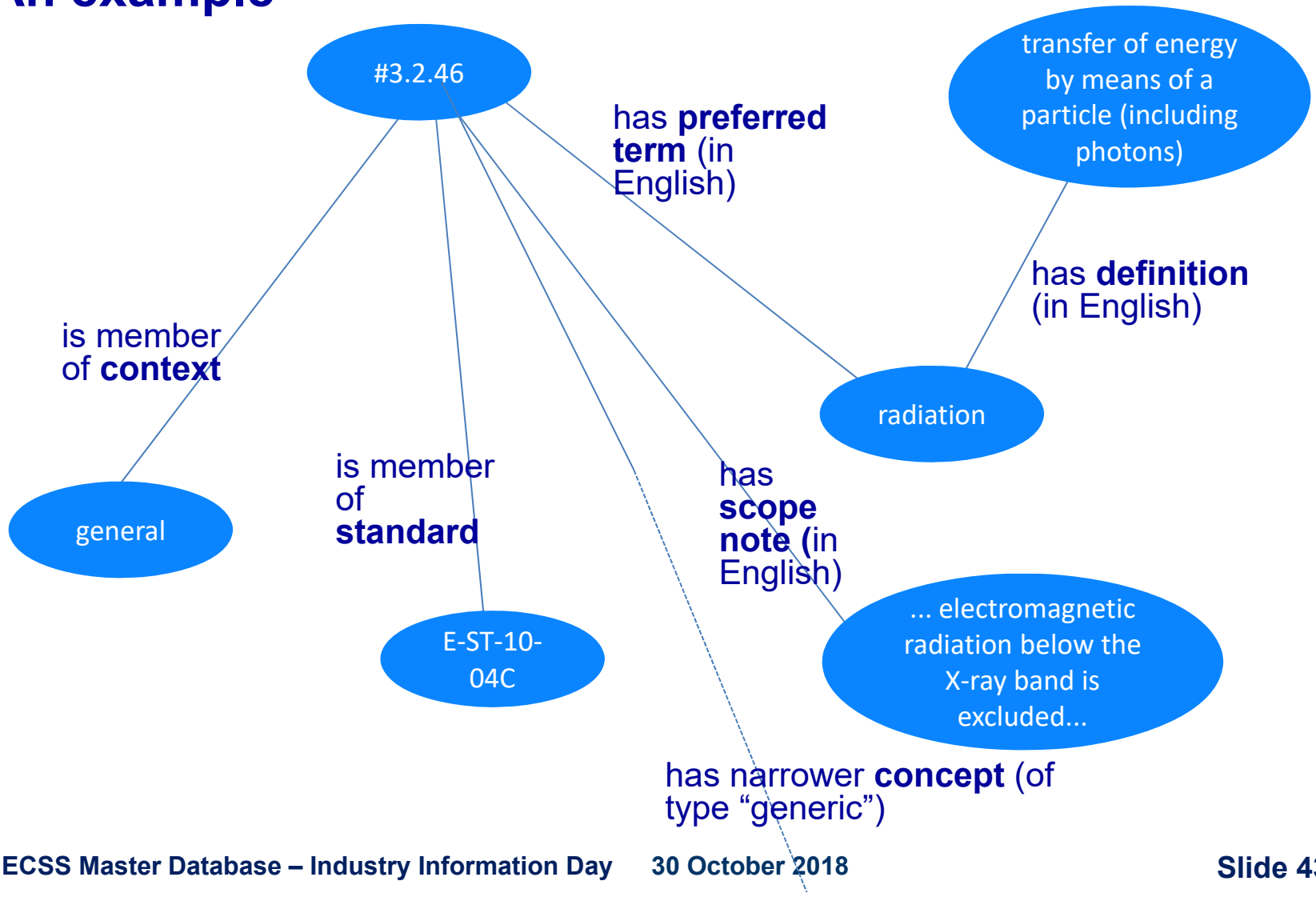
From Theory to Practice

- Actual data should fit into the data model.
- RedData therefore analysed the ESA e-glossary and applied several examples to the model.
- RedData are confident that other data sets will fit into the model equally well.



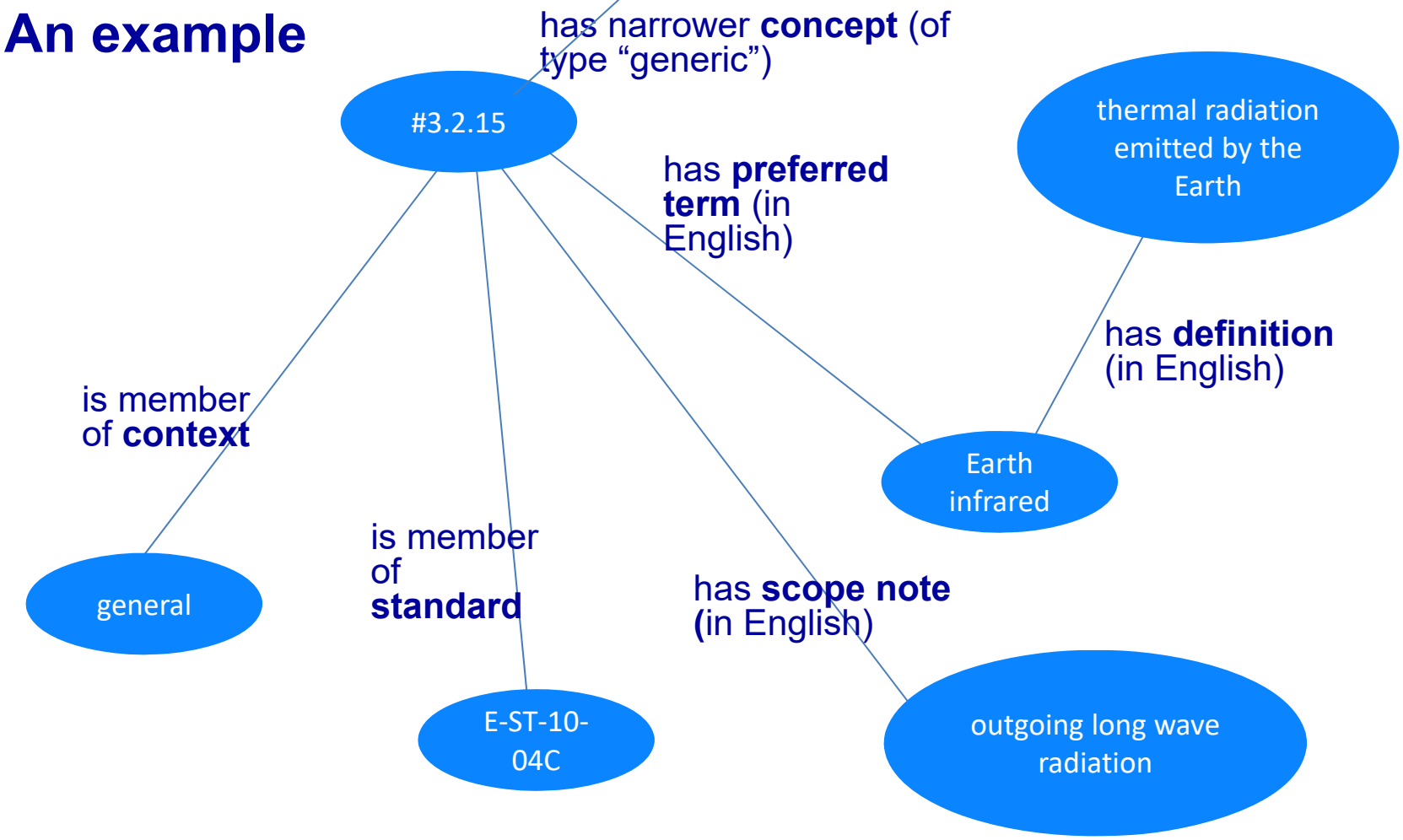
ECSS eGlossary use case

An example



ECSS eGlossary use case

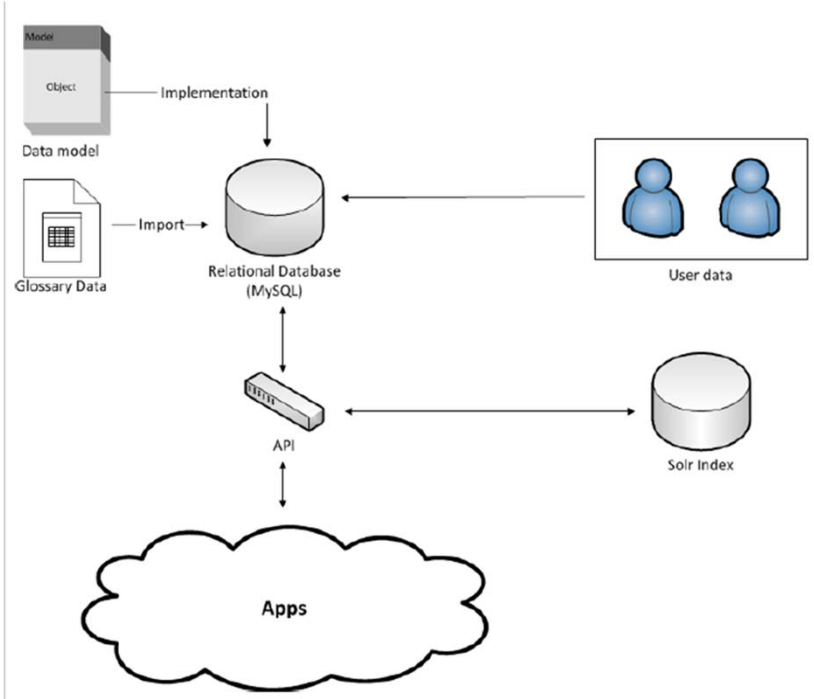
An example



ECSS eGlossary use case

Technical architecture

- Datamodel implemented on a central database
- For advanced search capabilities we are using the Red Data Search & Discovery platform (based on SOLR)
- 1 API for all connections (Apps) including SOLR.
- 3 Applications using the same repository

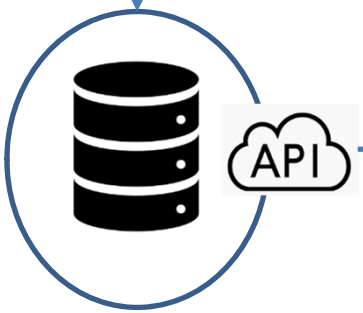


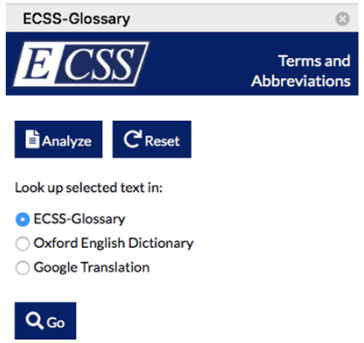
ECSS eGlossary use case

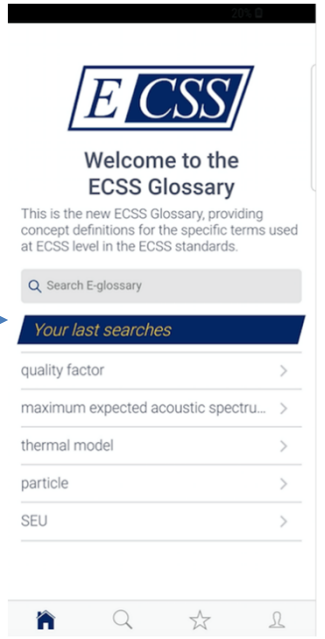
Technical implementation (overview)

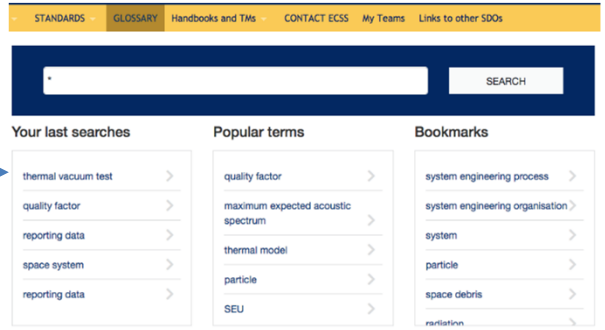
ECSS-S-ST-00-01C

ISO 25964 based model









Your ROM proposal

Proposal should outline:

- Background and experience of company and staff
- Your baseline technical solution
- The today's level of compliance to SoW and URD/CDM draft requirements (compliant, partially compliant, non compliant)
- If not fully compliant, your preferred approach how to become compliant (may include to stay non-compliant)
- Recommendation (e.g. phasing, additional capabilities)
- Schedule and cost associated with all the options above

shall allow us a total cost assessment under these assumptions:

- Conceptual data model ownership to ECSS
- 300 ECSS active players (task forces, working groups,…)
- 18,000 registered users in ECSS website
- Transfer of ownership of the software versus licensing policy
- Software maintenance and user support fees

Bid setup…

Bidders are invited to either deliver self-standing proposals or to pool with other companies in a consortium

Areas of expertise include:

- **formal conceptual data modelling**
- **formal process modelling**
- **large (distributed) database software development**
- **web technology**
- **man machine interfaces (different users communities)**
- **requirement management, engineering, quality**

Questions

should be addressed to:

- **Kathleen Gerlo**

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References

see also

- www.ecss.nl
- https://indico.esa.int/event/263/
- ecss-secretariat@esa.int **copy** roger.jegou@esa.int
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