ECSS MasterDB

Conceptual Data Model

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Foreword

This document has been prepared by the ECSS MasterDB Task Force, reviewed by the ECSS Executive Secretariat and approved by the ECSS Technical Authority.

Disclaimer

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Change log

ECSS MasterDB CDM	Under construction...
Draft 1	The conceptual data model document is still under construction. This draft is produced for the sole purpose of the October 2018 “call for interest”. It includes a formal graphical specification of the E-RMS conceptual model, compliant with the Object Role Modelling language. The verbalization of the model under a formal rule based controlled natural language is currently not present in this draft. This verbalization will be added at later stage. Meanwhile, attached to the call for interest data package, the model verbalization generated by the NORMA software tool is provided as html pages.

Table of contents

1 Introduction

The purpose of this document is to specify the conceptual data model of the next generation of the ECSS digital requirements management system, called E-RMS below.

This conceptual data model (CDM) has been elaborated by the ECSS Master Database Task Force, involving ESA, National Space Agencies and European Space Industry.

This document complies with the requirements specified in the E-RMS user requirements document (refer to E-RMS-URD) and further defines the E-RMS information model to implement.

The information modelling methodology used to produce the conceptual data model is a fact based modelling methodology named "Object Role Modelling" or "ORM". For detailed information, refer to http://www.orm.net).

ORM provides the means to capture the semantics to be modelled at conceptual level, making abstraction of any specific software implementation. Formal transformations exist to transform ORM conceptual data models in logical and physical data models for use by software solutions such as, relational, object-oriented or XML databases.

The software tool used to produce the E-RMS conceptual data model is NORMA Pro. NORMA allows visualizing the conceptual data model by means of ORM diagrams. The ORM diagrams view of the conceptual data model is formal. NORMA also allows verbalizing the conceptual data model in a formal, i.e. logic-based, way. The verbalization produced by NORMA uses a controlled natural language that is a subset of English restricting the English grammar and vocabulary in order to reduce or eliminate ambiguity and complexity, to enable, for example, reliable automatic semantic analysis.

In this document, the conceptual data model is represented by a set of ORM diagrams[1] complemented by the verbalization of the main rules specified in the diagrams.

This full E-RMS information model specification can be found as a NORMA-Pro data repository in annex.

Within this document, the conventional nomenclature used to specify system requirements using words such as "shall" to express requirements, "should" to express recommendations, "may" and "need not" to express permissions has not been followed. Instead, the logic-based modelling capability offered by ORM and NORMA is used.

[1] For a summary of the ORM graphical notation, refer to http://www.orm.net/pdf/ORM2GraphicalNotation.pdf

2 References

2.1 Applicable documents

E-RMS-SoW	E-RMS statement of work
E-RMS-URD	E-RMS user requirement document
ISO/IEC 9834-8:2014	Information technology – Procedures for the operation of object identifier registration authorities – Part 8: Generation of universally unique identifiers (UUIDs) and their use in object identifiers https://www.iso.org/standard/62795.html *The UUID concept is also specified in ITU-T X.667 (10/2012) : "Information technology - Procedures for the operation of object identifier registration authorities: Generation of universally unique identifiers and their use in object identifiers", refer to http://www.itu.int/itu-t/recommendations/rec.aspx?rec=X.667 and freely accessible from https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-X.667-201210-I!!PDF-E&type=items* *It is noted that the ISO or ITU UUID Version 4, i.e. the random-number-based version as specified in e.g. ITU Clause 15 is applicable.*

2.2 Reference documents

ECSS-E-TM-10-23A	Space engineering - Space system data repository http://www.ecss.nl/hbstms/ecss-e-tm-10-23a-space-system-data-repository
E-RMS-Native-ICD	E-RMS native interface control document
E-RMS-Doors-ICD	E-RMS from/to DOORS mapping specification
E-RMS-ReqIF-ICD	E-RMS from/to OMG requirement interchange format (ReqIF) mapping specification
E-RMS-Excel-ICD	E-RMS from/to MS Excel mapping specification
E-RMS-Word-ICD	E-RMS from/to MS Word mapping specification
E-RMS-CR-Report-ICD	E-RMS change record reporting interface specification
FAMOUS	fact based modelling unifying system user specification http://www.esa.int/Our_Activities/Space_Engineering_Technology/Shaping_the_Future/Semantic_Modelling_and_Semantic_Interoperability_-_FAMOUS-2
FBM	fact based modelling www.factbasedmodeling.org
IETF-RFC-3987	Internationalized Resource Identifiers - IRI

	https://tools.ietf.org/html/rfc3987
NORMA	ORM software tool www.ormsolutions.com
ORM	object role modelling www.orm.net

3 Abbreviated terms

The following abbreviations apply:

Abbreviation	*Meaning*
CDM	conceptual data model
DB	database
ECSS	European cooperation for space standardization
E-RMS	ECSS requirements management system
IRI	internationalized resource identifier
SoW	statement of work
SQL	structured query language
TF	task force
URD	user requirements document
WG	working group

4
E-RMS data model

4.1 Configuration item and structural element, 1

4.1.1 Graphical specification

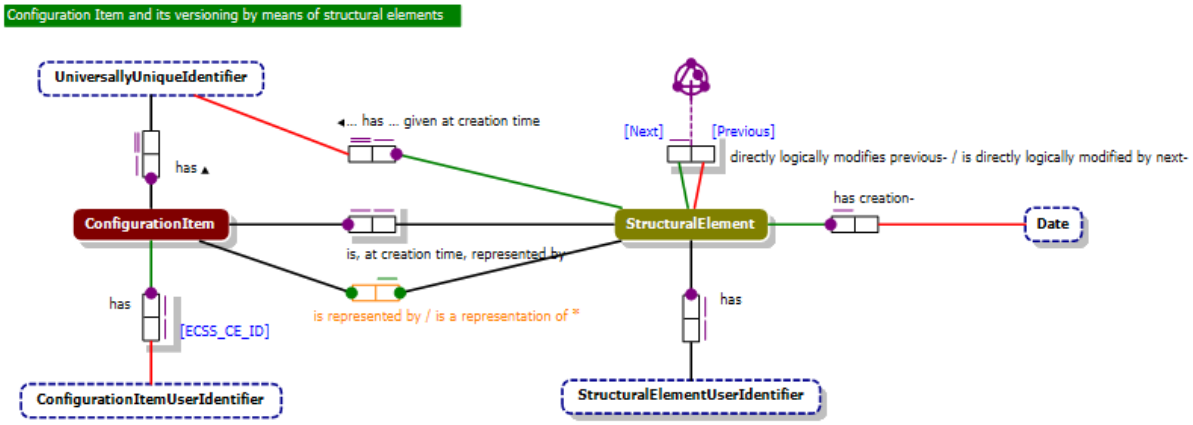

Figure 4-1 Configuration item and structural elements, 1

4.1.2 Rule based specification

a. Configuration item has universally unique identifier.

1. **Each** configuration item has **exactly one** universally unique identifier.
2. **For each** universally unique identifier, **at most one** configuration item has **that** universally unique identifier.

b. Configuration item has configuration item user identifier.

1. **Each** configuration item has **exactly one** configuration item user identifier.
2. **For each** configuration item user identifier, **at most one** configuration item has **that** configuration item user identifier.

c. Configuration item is, at creation time, represented by structural element.

1. **Each** configuration item is, at creation time, represented by **exactly one** structural element.
2. **For each** structural element, **at most one** configuration item is, at creation time, represented by **that** structural element.

d. Structural element has universally unique identifier given at creation time.

1. **Each** structural element has **exactly one** universally unique identifier given at creation time.
2. **For each** universally unique identifier, **at most one** structural element has **that** universally unique identifier given at creation time.

e. Structural element has creation date.

1. **Each** structural element has **exactly one** creation date.

f. Structural element has structural element user identifier.

1. **Each** structural element has **exactly one** structural element user identifier.
2. **For each** structural element user identifier, **at most one** structural element has **that** structural element user identifier.

g. Structural element directly logically modifies previous structural element.

1. **Each** structural element directly logically modifies **at most one** previous structural element.
2. **It is possible that some** structural element is directly logically modified by **more than one** next structural element.
3. **No** structural element **may cycle back to itself via one or more traversals through** structural element directly logically modifies previous structural element.
4. **If** structural element$_2$ is directly logically modified by **some** next structural element$_1$ **then it is not true that** structural element$_2$ **is indirectly related to** structural element$_1$ **by repeatedly applying this fact type**.

h. By nature and by derivation,
***Structural element$_1$** is a representation of configuration item **if and only if**
that configuration item is, at creation time, represented by **that** structural element$_1$
or that structural element$_1$ directly logically modifies **some** previous structural element$_2$ **that** is a representation of **that** configuration item.

1. **Each** structural element is a representation of **exactly one** configuration item.
2. **Each** configuration item is represented by **some** structural element.
3. **It is possible that some** configuration item is represented by **more than one** structural element.

4.2 Configuration item and structural element, 2

4.2.1 Graphical specification

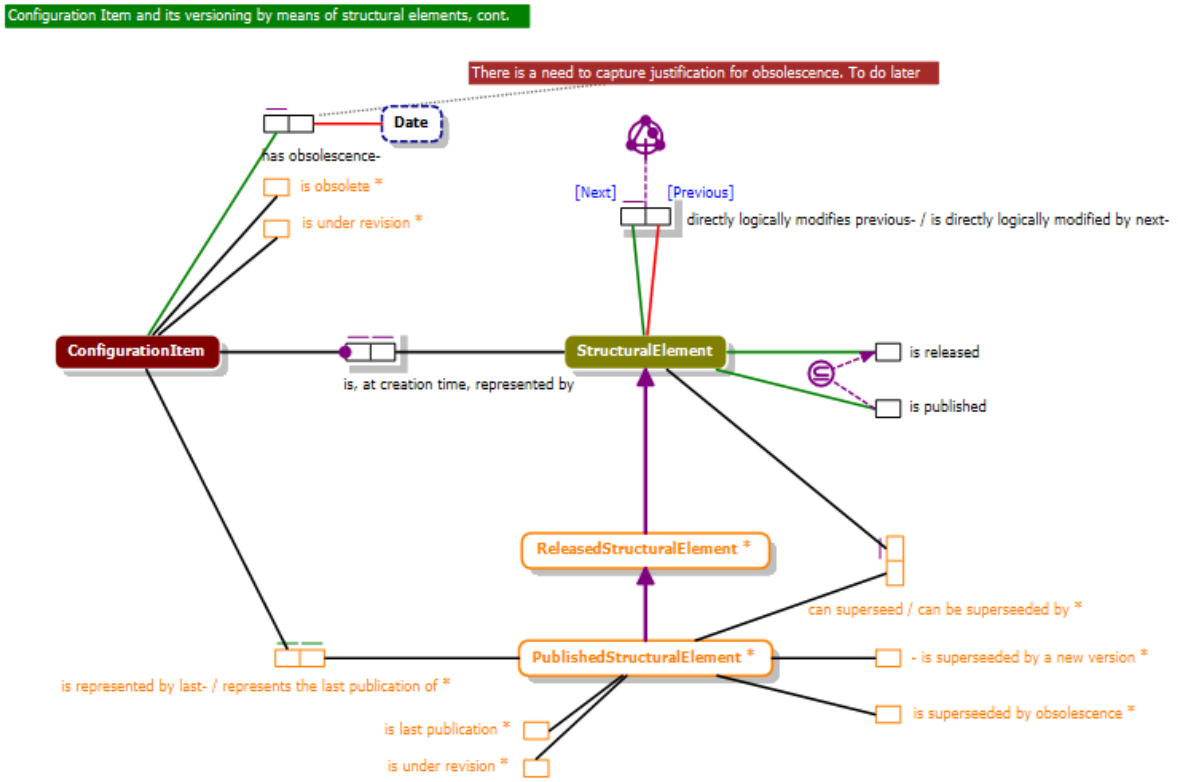

Figure 4-2 Configuration item and structural element, 2

4.2.2 Rule based specification

4.3 Structural element release and publication

4.3.1 Graphical specification

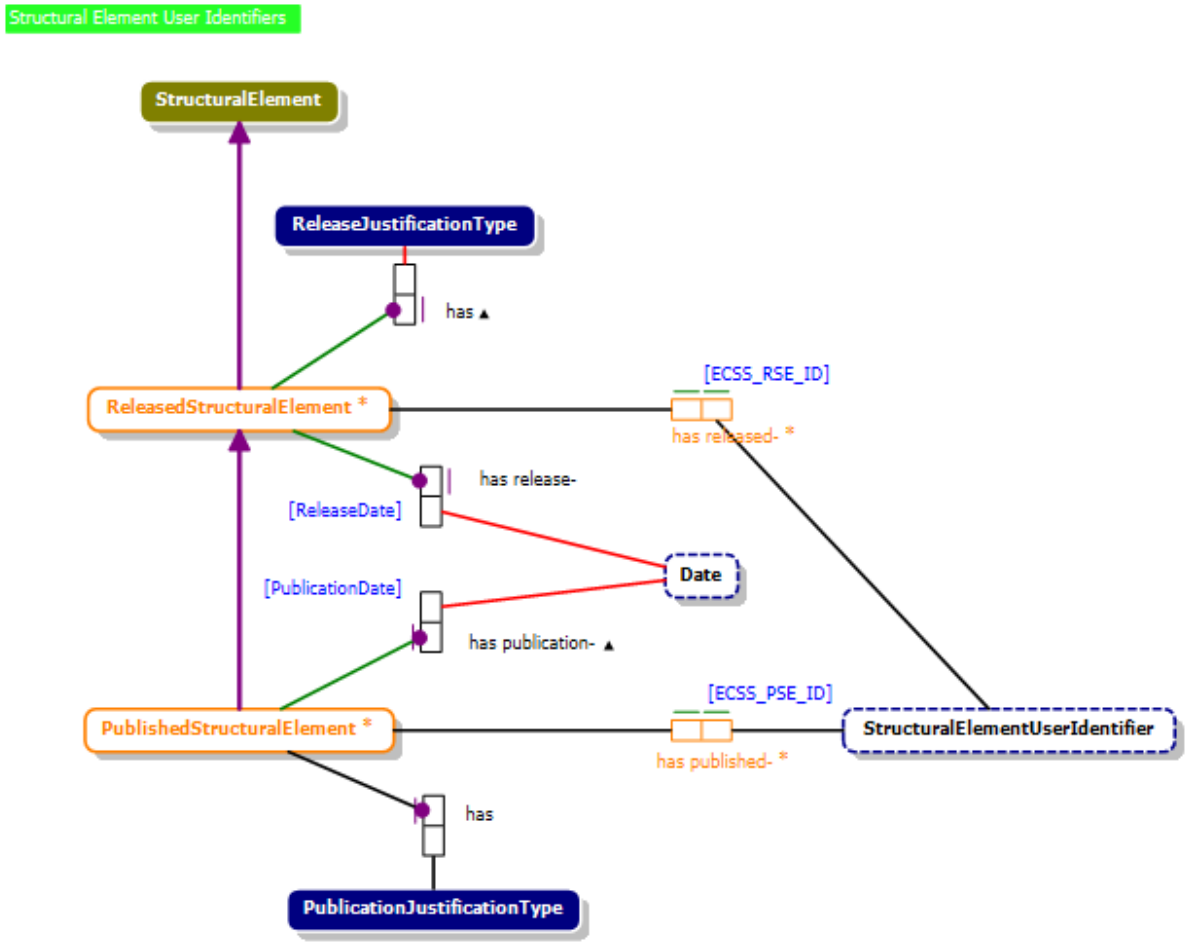

Figure 4-3 Structural element release and publication

4.3.2 Rule based specification

4.4 Justification type

4.4.1 Graphical specification

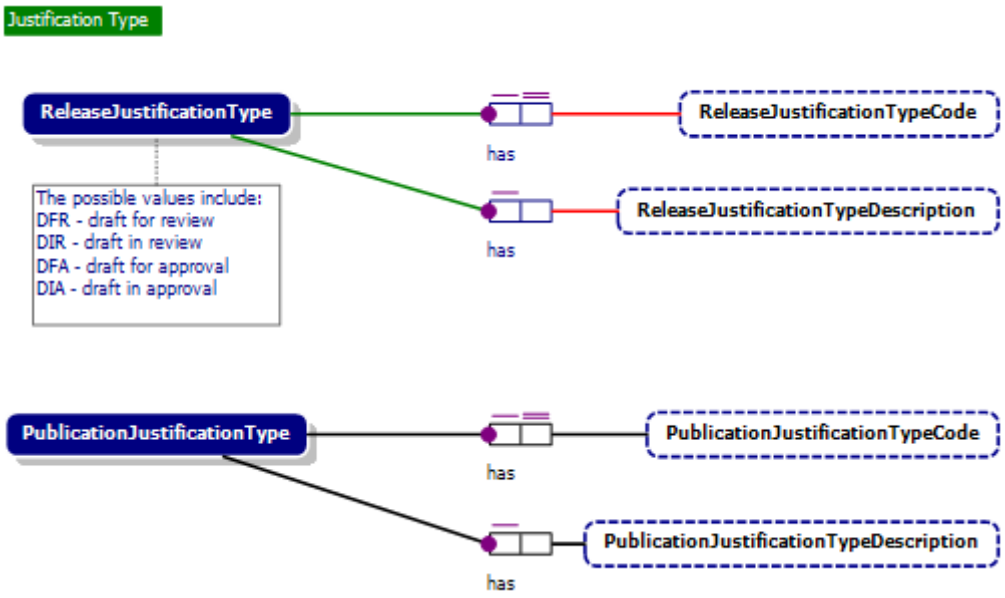

Figure 4-4 Justification type

4.4.2 Rule based specification

4.5 Structural element partitioning

4.5.1 Graphical specification

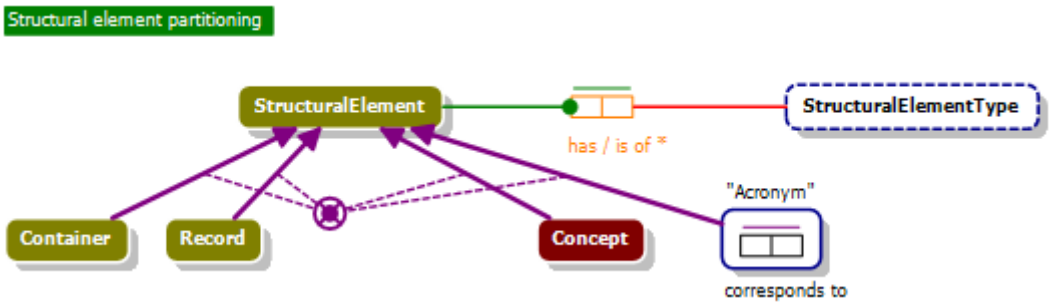

Figure 4-5 Structural element partitioning

4.5.2 Rule based specification

4.6 Context

4.6.1 Graphical specification

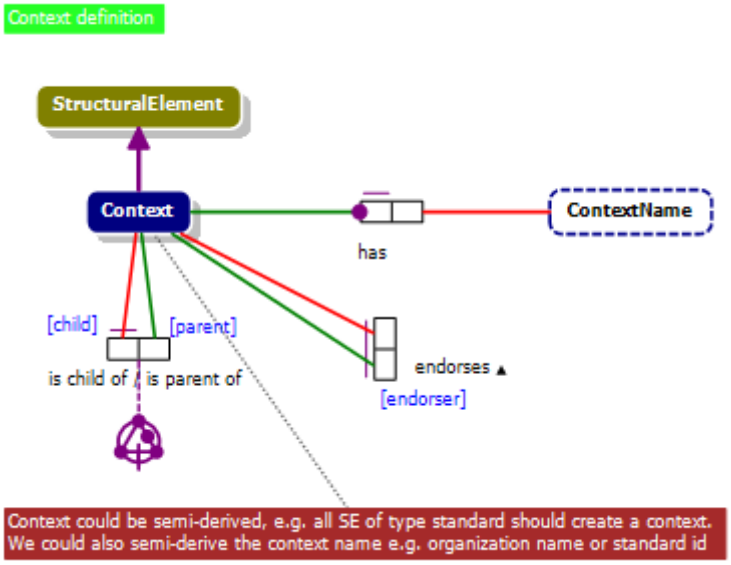

Figure 4-6 Context

4.6.2 Rule based specification

4.7 Container partitioning

4.7.1 Graphical specification

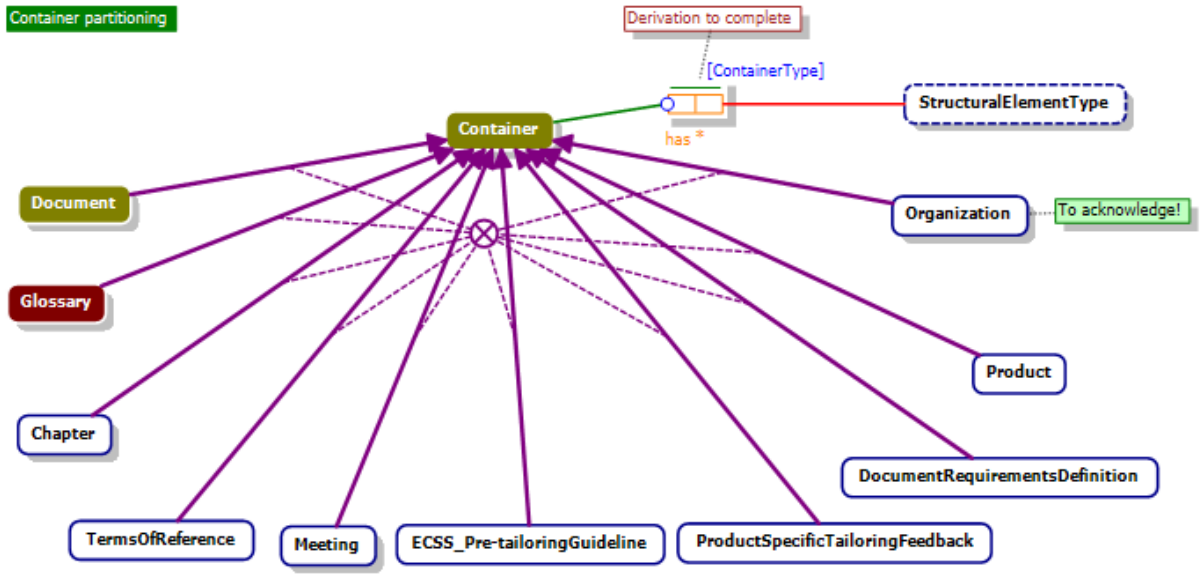

Figure 4-7 Container

4.7.2 Rule based specification

4.8 Document partitioning

4.8.1 Graphical specification

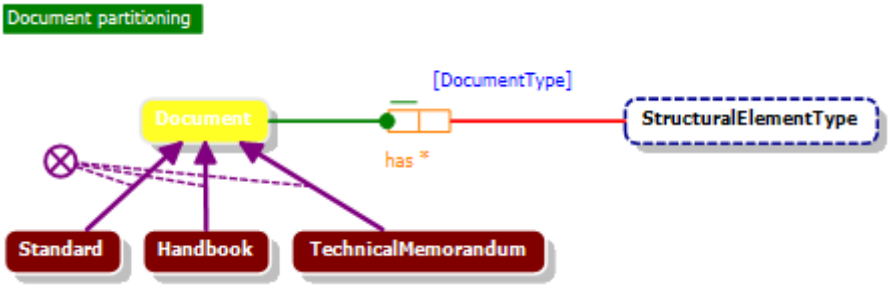

Figure 4-8 Document

4.8.2 Rule based specification

4.9 Glossary

4.9.1 Graphical specification

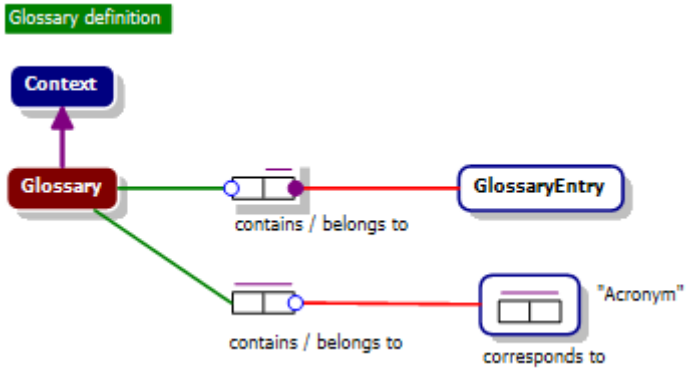

Figure 4-9 Glossary

4.9.2 Rule based specification

4.10 Record partitioning

4.10.1 Graphical specification

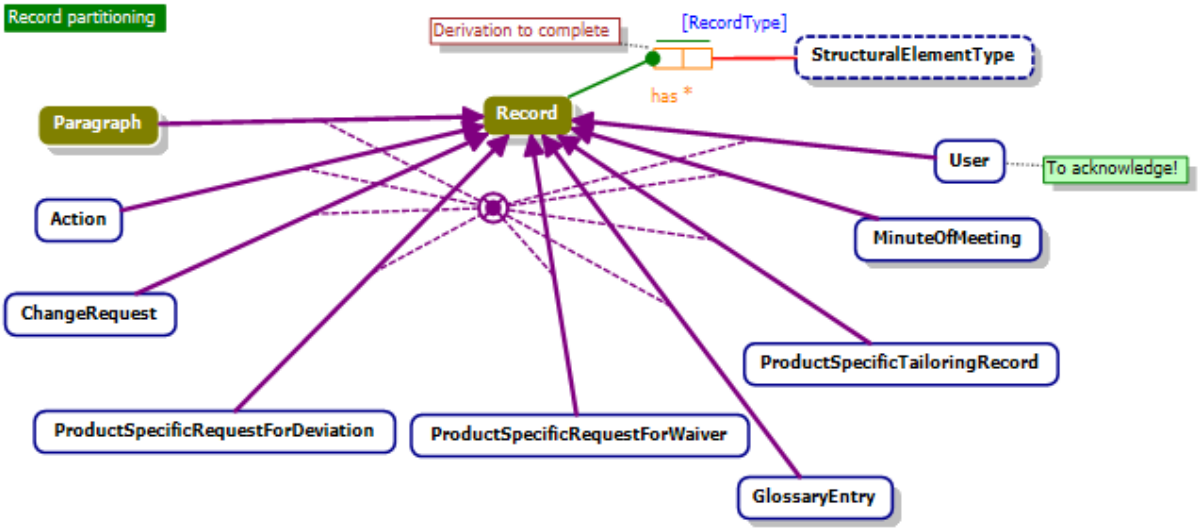

Figure 4-10 Record

4.10.2 Rule based specification

4.11 Paragraph

4.11.1 Graphical specification

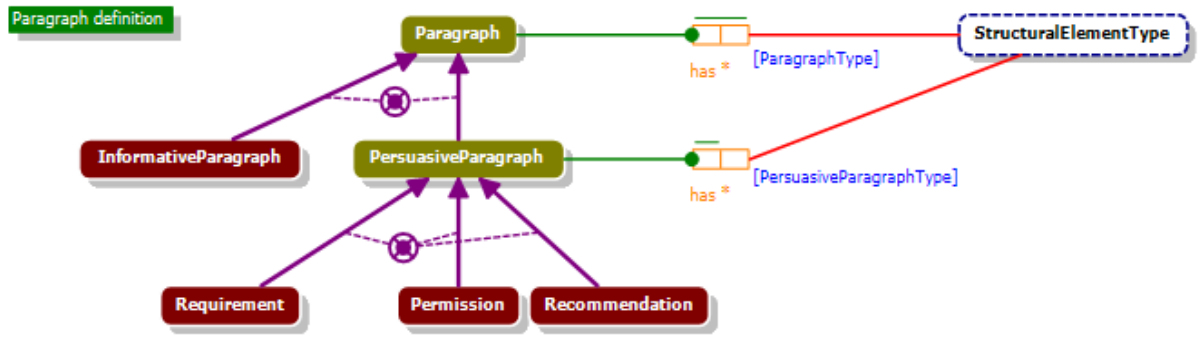

Figure 4-11 Paragraph

4.11.2 Rule based specification

4.12 Acronym

4.12.1 Graphical specification

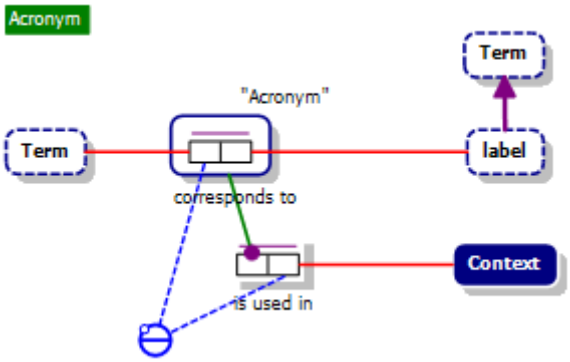

Figure 4-12 Acronym

4.12.2 Rule based specification

4.13 Glossary entry

4.13.1 Graphical specification

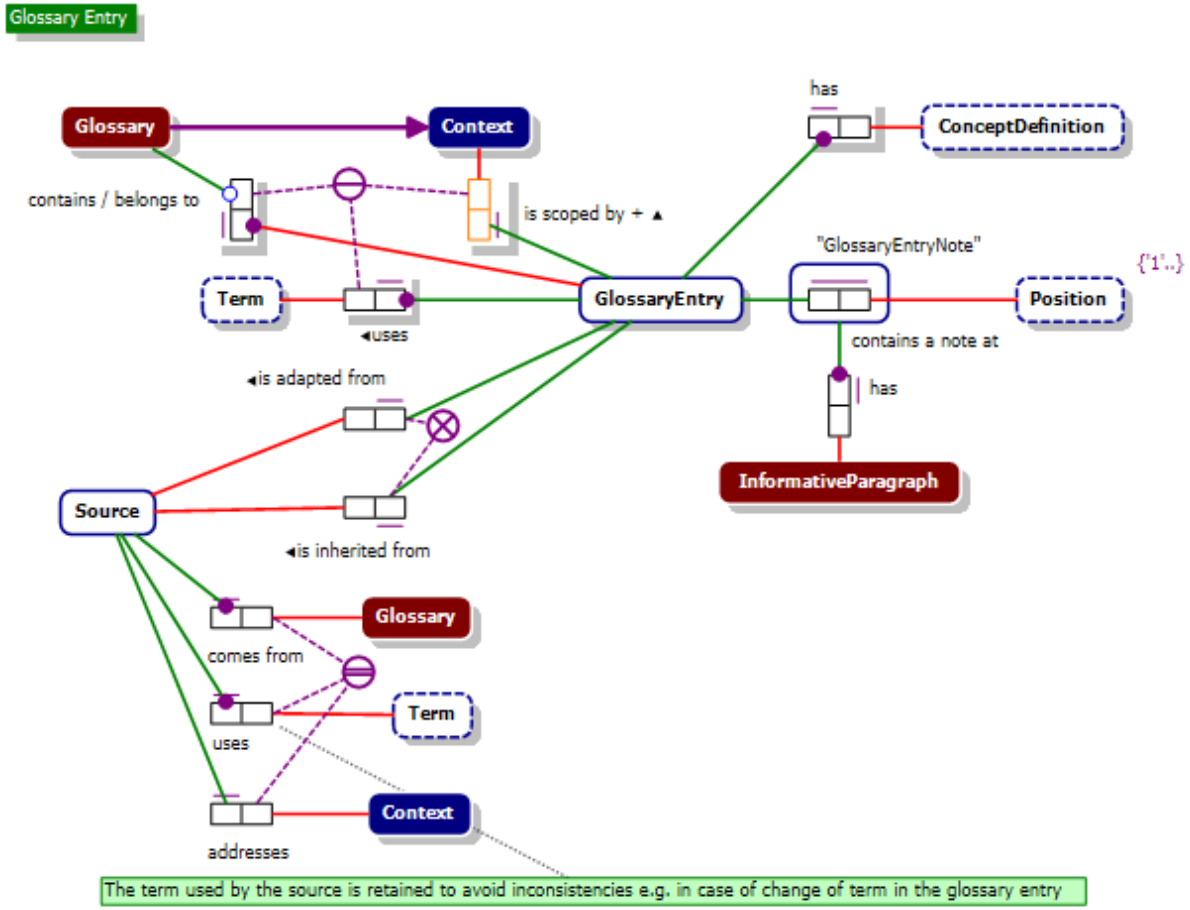

Figure 4-13 Glossary entry

4.13.2 Rule based specification

4.14 Concept

4.14.1 Graphical specification

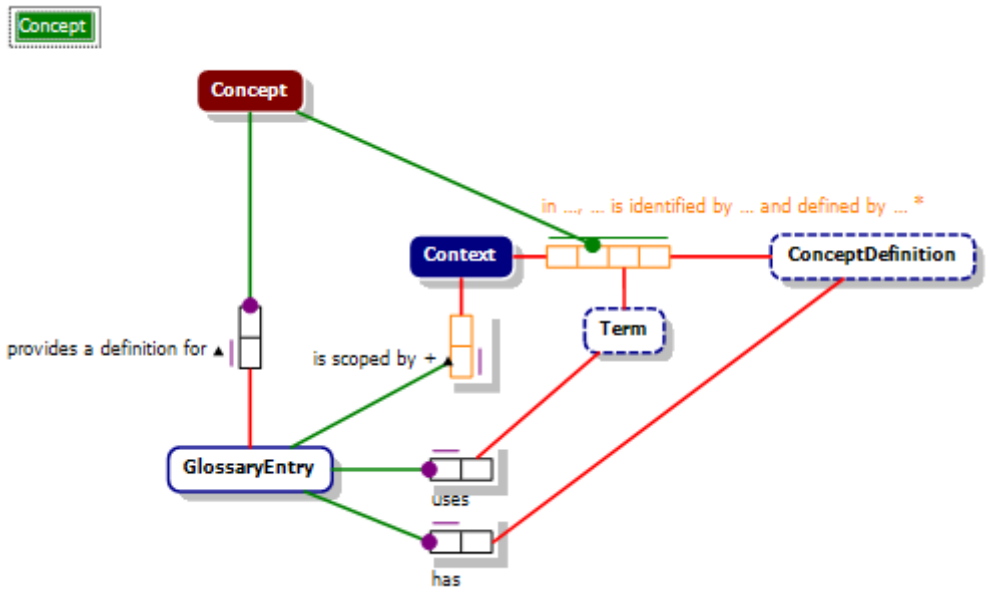

Figure 4-14 Concept

4.14.2 Rule based specification

4.15 Paragraph

4.15.1 Graphical specification

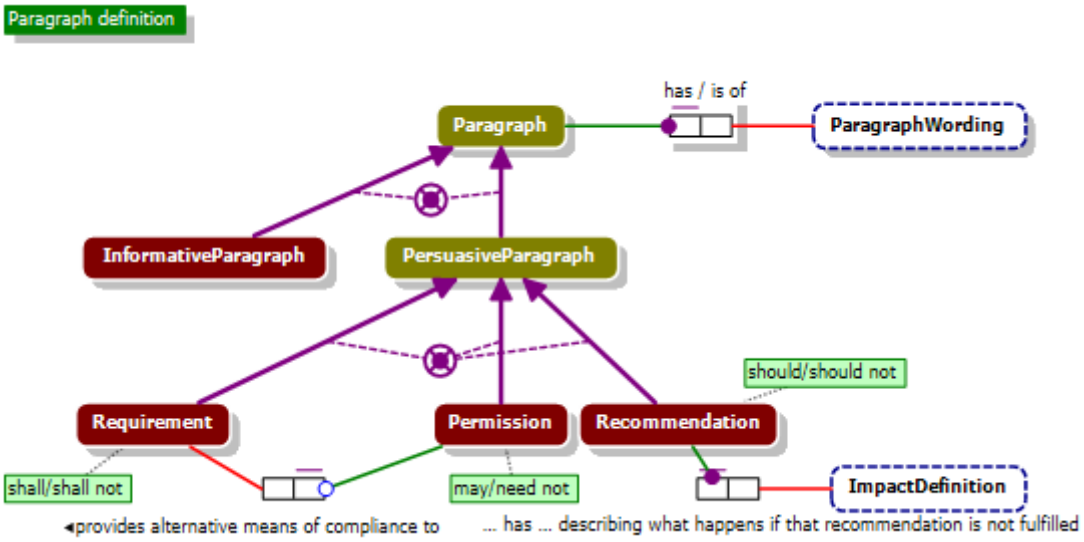

Figure 4-15 Paragraph

4.15.2 Rule based specification

4.16 Requirement

4.16.1 Graphical specification

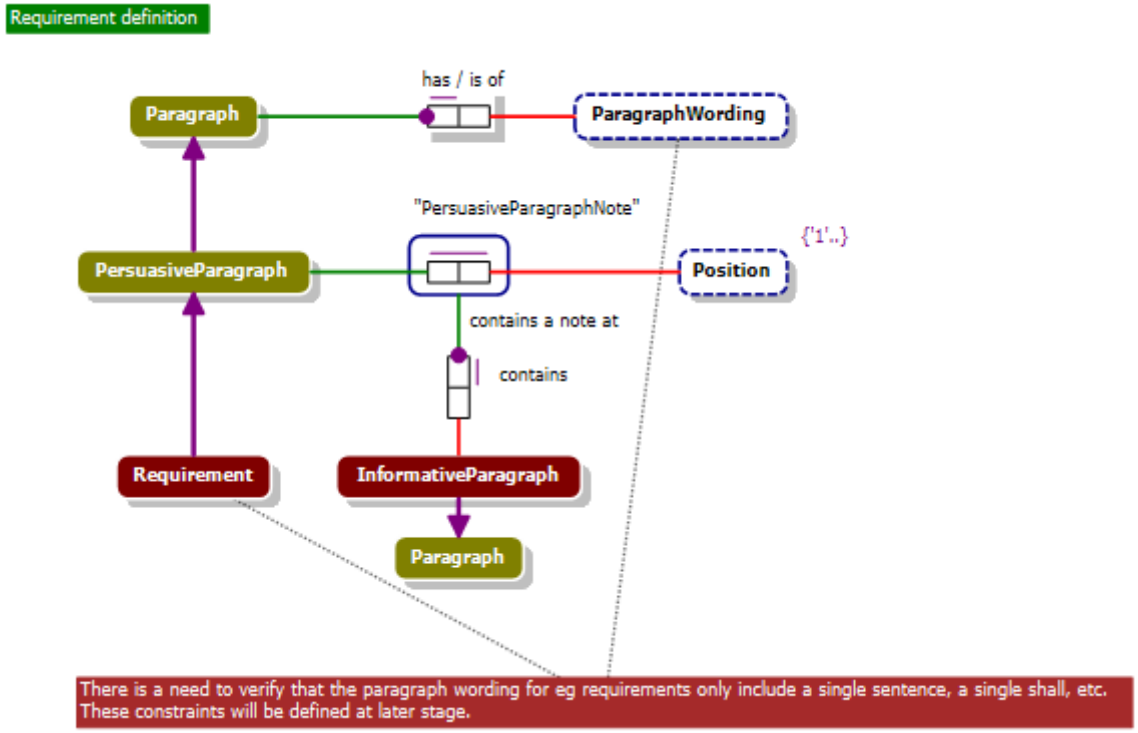

Figure 4-16 Requirement

4.16.2 Rule based specification

4.17 Organization

4.17.1 Graphical specification

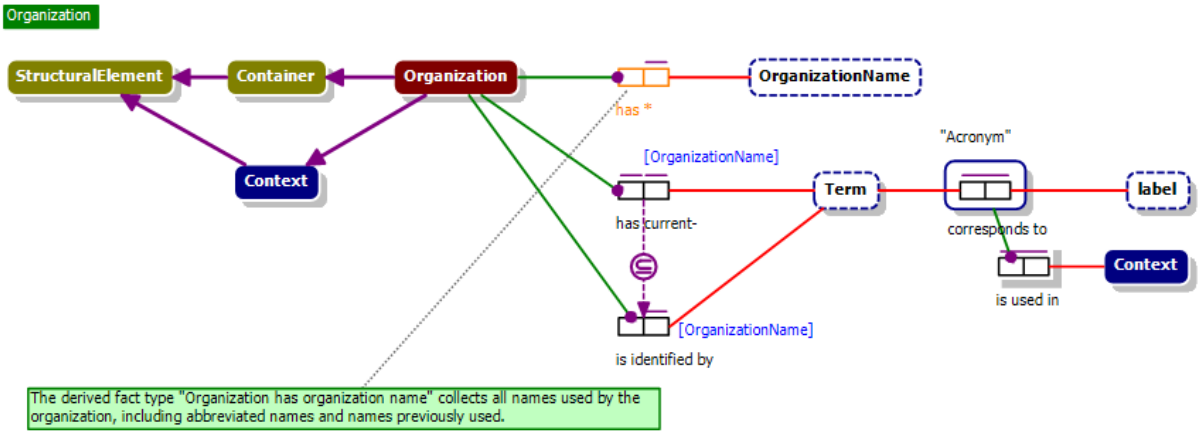

Figure 4-17 Organization

4.17.2 Rule based specification

4.18 Document

4.18.1 Graphical specification

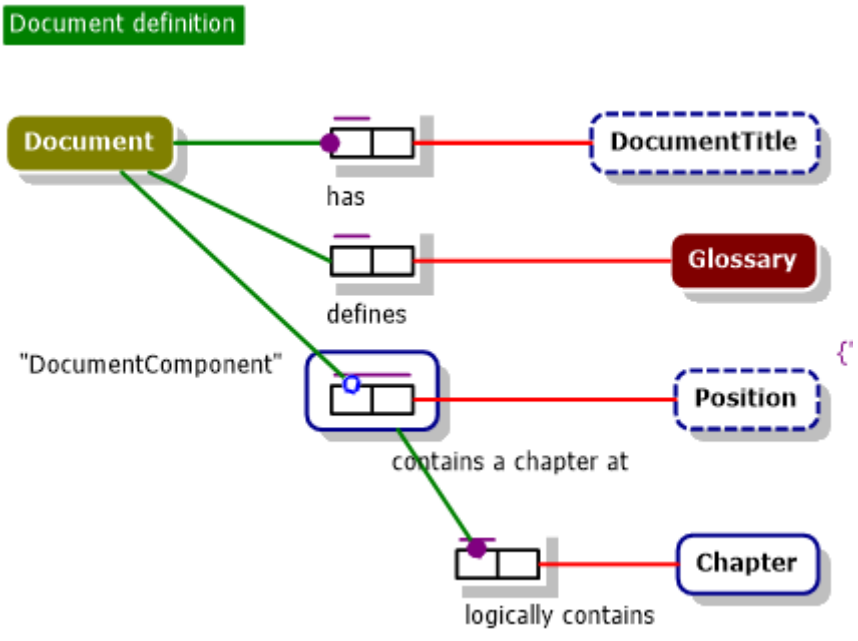

Figure 4-18 Document

4.18.2 Rule based specification

4.19 Chapter

4.19.1 Graphical specification

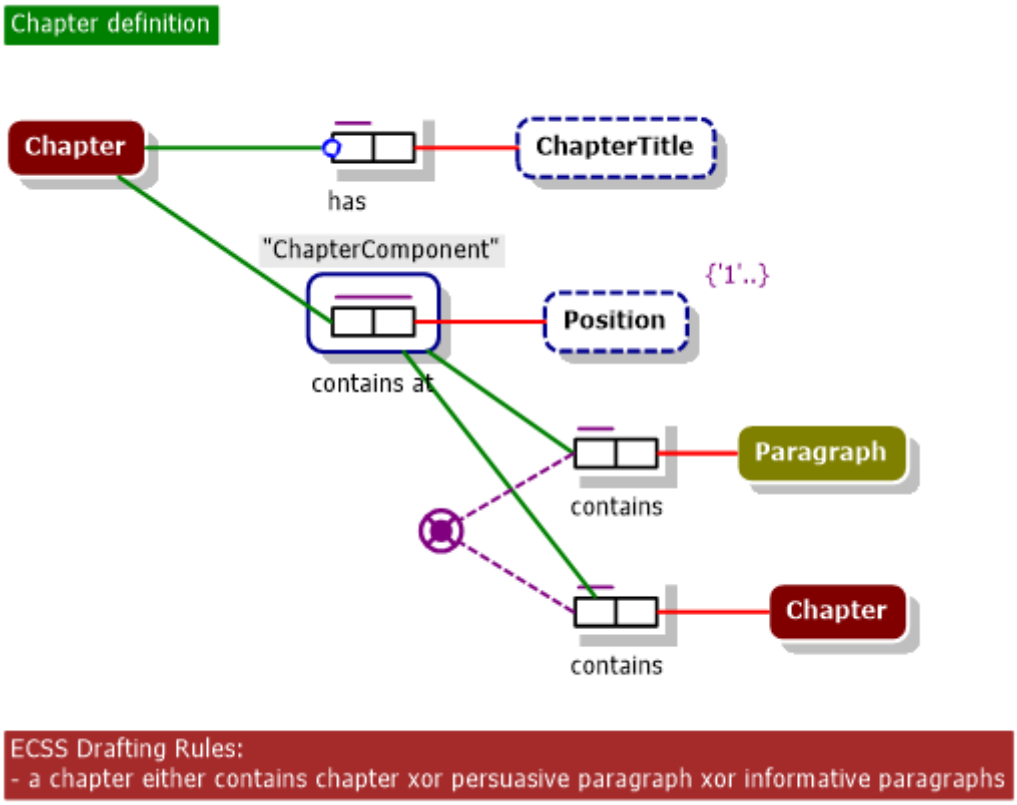

Figure 4-19 Chapter

4.19.2 Rule based specification

4.20 Meeting

4.20.1 Graphical specification

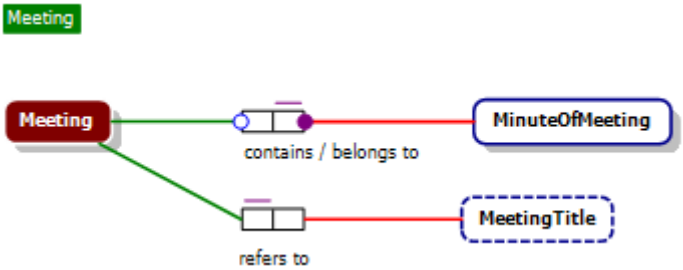

Figure 4-20 Meeting

4.20.2 Rule based specification