62nd joint meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9; 55th meeting of LRMoo SIG

23-26 March 2026

Oxford e-Research Centre, 7 Keble Road, Oxford, UK, OX1 3QG

Participants

Aleksandra Mitiukova: Independent Researcher; **Alessia Vaccariello**: Sapienza University of Rome; **Alex Dedalo**: Dedalia; **Anais Guillem**: E-RIHS/MAP-CNRS; **Artem Kozlov**: RS WORKS EE; **Athanasios Velios**: English Heritage; **Athina Kritsotaki**: ICS-FORTH ; **Bardiot Clarisse**: Université Rennes 2; **Beatriz Tarré Alonso**: Federal University of Santa Catarina; **Bernhard Oberreither**: Austrian Academy of Sciences / ACDH; **César Huiza Romero**: Museo de Arqueología y Antropología, Universidad Nacional Mayor de San Marcos; **Christian-Emil Ore**: University of Oslo; **Chryssoula Bekiari**: ICS-FORTH; **Cristiana Bettella**: University of Padua; **Daria Hookk**: The State Hermitage Museum; **Dominic Oldman**: Kartography; **Edurne Uriarte Santillán**: CIDOC CRM Spanish Translation Initiative; **Eleni Tsouloucha**: ICS-FORTH; **Elias Tzortzakakis**: ICS- FORTH; **Elli Reuhl**: University of Cologne; Erin Canning: University of Oxford; **Gabriela Betsabé Miramontes Vidal**: UNAM- Instituto de Investigaciones Estéticas; **George Bruseker**: SARI / Takin; **Gerald Hiebel**: University of Innsbruck ; **Giulia Biagioni**: TNO; **Graham Klyne**: Nine by Nine**; Isabelle van Ongeval**: Letterenhuis; **Juliane Hamisch**: Germanisches Nationalmuseum; **Kai Niebes**: University of Cologne; **Kalliopi Tsape**: University of West Attica; **Katharina Hefele**: Germanisches Nationalmuseum; **Leticia Martínez**: House of European History; **Lucía Sánchez de Bustamante**: UNAM; **Maria Sotomayor Chicote**: University of Cologne; **Markos Katsianis**: University of Patras; **Martin Doerr**: ICS-FORTH; **Massoomeh Niknia**: University of Cologne; **Muriel Van Ruymbeke**: University of Luxembourg / University of Liège; **Nicola Carboni**: University of Illinois Urbana-Champaign**; Øyvind Eide**: University of Cologne; **Pat Riva**: Concordia University; **Patricia Wanderley Ferreira Lopes**: Universidad de Sevilla; **Paula CASAJUS**: Museo Nacional de Bellas Artes; **Pavlos Fafalios**: ICS-FORTH; **Puyu Wang**: University of Oxford; **Ron Van den Branden**: Letterenhuis; **Sabine Sältzer**: Germanisches Nationalmuseum; **Sarantos Kapidakis**: University of West Attica; **Stephen Hart**: University of Bern; **Stephen Stead**: Paveprime Ltd; **Thomas Wikman**: Skylodge; **Valentina Bartalesi**: CNR-ISTI; **Weronika Grochowska**: National Institute for Museums, Poland; **William Thorne**: University of Sheffield; National Gallery; **Yipei Ye**: The Palace Museum; **Zoë Renaudie**: Université de Montréal

Contents

Monday 23 March 2026

Issue 711: Managing CIDOC CRM SIG Membership

The Interim Steering Committee informed participants about their actions to update the SIG membership. All listed members were contacted. For the most part, said institutions were happy to continue engaging with the SIG. Out of "current" membership, only seven (7) institutions have not reacted to our inquiries, and there are still another three (2) that we're waiting to confirm.

In the meantime, there has been a call for membership shared on the listserv, which has resulted in **5 new applications**, to be reviewed immediately after. We expect additional applications.

Communication with the Steering Committee has improved through the designated email account contact[at]cidoc-crm.org.

In terms of where one can find these things on the site:

- Call for membership: Under "News", so it can be shared with one's network easier (https://cidoc-crm.org/Event/call-for-membership-in-the-cidoc-crm-sig).
- Contact information: a designated tab in the root menu (https://cidoc-crm.org/contact)

Proposal:

1) Create a new subsite where we list past members (i.e., currently inactive members)
2) Issue a standardized membership form to allow partially automating the application process (also better for record-keeping) –see appendix for details. Shared with the SIG for feedback, not to be voted on during the meeting.

Application for membership in the SIG.

- The SIG approved the application for membership in the CIDOC CRM SIG of Nicola Carboni, for the **School of Information Sciences at the University of Illinois Urbana-Champaign**.
- The SIG approved the application for membership in the CIDOC CRM SIG of Massomeh Niknia, for the **Iranian Library and Information Science Association (ILISA)**.
- The SIG approved the application for membership in the CIDOC CRM SIG of Clarisse Bardiot, for **the Unité de Recherche Arts: Pratiques et Poétiques at the Université Rennes 2.**
- The SIG approved the application for membership in the CIDOC CRM SIG of Donatella Fioranni, for the **Department of History, Representation and Restoration of Architecture at the University of Rome**.
- The SIG approved the application for membership in the CIDOC CRM SIG of Bogumil Szady and Wiseslava Duzy, for the **Polish Academy of Sciences at Tadesz Manteuffel Institute of History**.

Election of the CIDOC CRM SIG Steering Committee; Nominations Committee – election timeline – electorate

The Interim Steering Committee has confirmed with Pat Riva, Christian-Emil Ore and Oyvind Eide that they are willing to serve as the Nominations Committee that will see through the election of the SIG Steering Committee.

Proposal for the election timeline:

- **Call for nominations**: 20 June 2026
- **End of nomination period**/nominees announced: 20 August 2026
- **Voting period**: 21–25 September 2026 (maximum 3 days)

- **System confirmation**: Interim committee to confirm use of HELIOS with ICOM Documentation
- **Results announced**: 63rd SIG meeting, Nuremberg, 6–9 October 2026
- **Formal notification**: ICOM Documentation at annual conference, 16–20 November 2026

N.b.: The electorate will have to be determined by 20 June 2026 (call for nominations). Any applications to join the SIG should be processed by then.

Discussion points:

- **The electorate should be determined by 20 June 2026.** It is assumed that the proposed timeframe includes Individual ICOM Documentation members eligible to vote for the SIG Steering Committee. Individual members should therefore be required to register to vote by 20 June 2026, which will serve as the cut-off date for determining the final electorate.
- **How do we process new applications to join the SIG from now until 20 June 2026:** through e-vote, provided that membership applications have been submitted by 31 May 2026.
- **The specifics of the vote will be determined by the Nominations Committee**

Decisions: The SIG approved the proposed timeline

HW: to the Nominations Committee (PR, CEO, OE)

- Issue the call for nominations (make sure to flag important dates, positions to be filled, eligibility criteria for voting/running),
    - Share the call for voting with ICOM Documentation Officials,
    - Share the list of nominees with ICOM Documentation Officials, to be included in their newsletter
- Clarify the voting procedure (decide whether candidates formally file for specific roles –e.g., Chair, Co-chair –or if positions assigned automatically based on vote totals instead),
    - Determine the specifics of using HELIOS for the vote. Make sure that representatives of institutional members get links to vote (collaborate with the Interim Steering Committee on that).

Issue 274: Archetypical Sounds

The SIG reviewed the HW by GB, RS, ClB, OE, concerning the properties of E100 Audio Item. The details of the HW can be found in the appendix.

Discussion points:

Concerning the examples:

- The humpback whale song examples need to be reworked if admitted at all. That they stand in a type to token relation (type: the recorded sonic item, token: individual humpback whale song in various interactions with their environment that gets matched to the prototype/archetype) is perceived to ignore variance in individual humpback whale song.
- On the other hand, an ideal example should not account for existing (or postulated) variance in whale song, but should rather be a case that meaning is unvaried across instances.
    - Examples that are all human-made, with an unambiguous meaning (Wilhelm scream, the sound of a dial-up internet connection, the Nokia tune, etc.) would be a better fit.
    - However, it must be acknowledged that Natural History collections do need to document sounds/audio items. Hence the statement "**this** is how humpback whales sound" should be allowed –**this** referring to recorded sounds emitted by humpback whales as perceived and recorded by surveying teams of experts in various occasions/settings. E100 and its properties aspire to do that exactly: pinpoint the identifiable sonic item that a set of patterns are understood to instantiate.

        - Redoing the examples should allow for human-made (i.e., recorded via some recording device) sounds originally emitted by non-human E20 Biological Object to be documented using some property that connects to E100 Audio Item.
- Based on the humpback whale & the Radiohead examples: E100 Audio Item is understood as though it were mixing emitted/perceived sound with recorded sound. But in reality, the same principle applies as if one were taking an instance of E20 Biological Object (let's say a particular beetle), pinning and preserving it, and calling a human-made "specimen for species x". That we cannot easily tease apart sound emission (and perception) from recording sound (and then playing it back) is predominantly culture driven.
    - Use cases identified from the domain of Intangible Cultural Heritage and Oral tradition are long known to us (https://immaterieelerfgoed.be/nl/nieuws/recording-and-presentations-cidoc-ich-working-group)

Concerning the proposal for Pxx sounds typical for (is typical sound of):

- Its usefulness was contested. The property closely resembles P137 exemplifies (is exemplified by), to the extent that people felt it replicates P137.
- The relation does not have a semantic bearing besides specifying the domain of P2 has type (to E100 Audio Item instead of E1 CRM Entity).
- An alternative would be to subtype E55 Type as Audio Type, but so far, we haven't needed to document that.

Decisions:

- Update the scope note of E100 Audio Item as proposed in CIDOC CRM version 7.4
- Introduce properties P201 sounded (was sounded by), P202 bears recording of (is recorded on) in CIDOC CRM version 7.4. It is a draft version, so it doesn't matter that they're not polished.
- Do not introduce property Pxx sounds typical for (is typical sound of) at the moment. Explore its connection to P137 exemplifies, to avoid duplicating the property.
- **HW**: PR, SdS, NC, GB to review the scope notes for E100 Audio Item, P201 sounded (was sounded by), P202 bears recording of (is recorded on) & Pxx sounds typical for (is typical sound of), and provide additional comments.

Issue 716: E24 Physical Human -Made Thing --notes on movability

The SIG reviewed the proposal to swap the order of the paragraphs in E18 Physical Thing, to allow which instances of E18 moveability applies to before having to talk about E92 and E93.

The SIG did not approve the proposed placement of the paragraphs (1-**3**-**4**-**2**-5). The details can be found in the appendix.

At the same time, the proposal by DO to redraft the scope note in plain(er) English could not be decided on (it had not been proposed ahead of the meeting). However, participants and explicitly marked that referring interested readers to harmonized ontologies upon defining CRMbase concepts should be avoided, in the sense that CIDOC CRM is self-contained.

Decision:

The scope note that was admitted following the evote on 24 February will remain in CIDOC CRM v7.4. Any suggestions to redraft it must be formally brought to the SIG in a way that is consistent with our usual process.

Issue closed

Issue 636: Update the list of property quantifiers

WS shared the HW that he, GB & CEO prepared, regarding

- a general instruction on how to read property quantifiers (especially those that reference cardinality constraints different from 0/1/n)
- relabelling some property quantifiers (fixing typos)
- reordering the property quantifiers in the list first by domain, then by range.

Decision: The SIG approved the proposal by WS, CEO & GB. The edits will be incorporated in CIDOC CRM v7.4. The details can be found in the appendix.

Issue closed

Issue 681: Scope notes of P40, P43

WS shared his HW with the SIG. It comprises some exclusion statements & their textual renditions (for the respective scope notes) indicating that one and the same instance of E54 Dimension cannot simultaneously pertain to an E70 Thing, E52 Time-Span, E96 Purchase. The set of properties for which exclusion statements have been produced are the following. The details of each proposal can be found in the appendix.

- P43 has dimension (is dimension of),
- P40 observed dimension (was observed in),
- O12 has dimension (is dimension of),
- O39 observed dimension (was observed in),

Decision:

The SIG approved the proposals. They will appear in CIDOC CRM v7.4 and CRMsci v3.2, respectively.

Issue closed

Issue 701: Redo the diagram for E13 Attribute Assignment and its properties

MD presented the new diagram for E13 Attribute Assignment, to be included in the Functional Overview, as well as the Introduction of the CIDOC CRM (a subsection under Basic Concepts).

The diagram marks the shift to a more restrictive semantics of the properties of E13 Attribute Assignment, which resolves the previously existing ambiguity in the interpretation of P140, P141, P177 which permitted instantiating multiple attributes (values/dimensions/conditions/…) assigned to one object via one instance of E13. The resulting situation forms a major shift, around a core CIDOC CRM concept that affects a substantive part of the modelling (both in CIDOC CRM and its extensions).

Discussion points:

- The constructs around E13 form a core part of the model, one that should be properly explained. The diagram is a first step (so is the migration instruction at the end of the CIDOC CRM document), but for the purpose of teaching the model, some textual descriptions to accompany the diagram (in the spirit of issue 687) would prove to be very useful.
- The “any property” connecting two instances of E1 on the diagram should be able to be ascribed a type. There is currently no standard notation for this; it’s something to be reviewed for the next meeting.
    - On an unrelated topic, yet still on the topic of standardizing the notation used in diagrams: there is no uniform manner to represent shortcut properties until now. Enclosing them in boxes (like in Figure 2: Argumentation, Proposition Sets and E13 Attribute Assignment, in

CRMinf v1.2.1, p.17) could serve like a blueprint.

- To be discussed in a new issue. GB or MD to start it.

Decision: Diagram approved.

Introduce the diagram in the functional overview, consider adding subclasses and subproperties, provide some textual description for it along the lines of 687. Ultimately add it to the CIDOC CRM Introduction section, under Basic Concepts.

HW: CEO to draft the text for the diagram.

Issue 718: inverse direction for P177 assigned property of type

WS & MD gave an overview of the proposed edits for P177 assigned property of type (is type of property assigned) to indicate what CRM regards as a property instance, and the note that inverse properties are considered as semantic flare but not inherently different to the forward going properties. The details of the proposal can be found in the appendix.

Decision:

The proposal was accepted –even though the last paragraph does not seem very well motivated: it would be better if the scope note referred back to the introduction where inverse properties are defined (this way the scope notes would be less verbose). Something worth reconsidering, but not for the current issue as it flags exactly how a particular property should be used.

Issue closed

Issue 721: Interfacing CRMinf with CRMsci, CRMbase and CRMtex

The SIG went through the descriptive texts for the following diagrams in CRMinf (HW by MD):

- Argumentation and Proposition Sets [1]
- Observation and Inference Making [2]
- Belief Adoption Concepts [3]

The details of the HW can be found in the appendix.

Decision: The SIG approved of the text, it will appear in CRMinf V1.2.1, which will be considered a stable version.

Issue closed

Issue 709: Reviewing Area in CRMdig 4.0

The SIG went through the updates proposed by MD for CRMdig (D35 Area, D36 Virtual Geometry, L49 is primary area of (has primary area), L50 is propagated area of (has propagated area), L62 is defined by (defines), L63 has content copy (is content copy of). The details of the proposal can be found in the appendix.

Discussion points:

- The overall sentiment is that the modelling is headed in the right direction, but the scope notes need to be enriched with supplementary text that illustrates how they should be used, and even more importantly with examples. Additional references need to be considered:
    - For the METS standard see
        - Cantara, Linda. (2005). METS: The Metadata Encoding and Transmission Standard. Cataloging & Classification Quarterly. 40. 237-253. https://doi.org/10.1300/J104v40n03_11.

        - https://www.loc.gov/standards/mets/mets
- The scope notes and examples should consider both
    - the Open Annotation Model (despite it being incompatible with the event centric approach of CIDOC CRM) and
    - the International Image Interoperability Framework (IIIF), which is becoming increasingly relevant for manuscript annotation. A mapping to it would be beneficial (even at a conceptual level).
- N.b.: the Issue topic is a misnomer (it stemmed from the modelling of D35 Area in V4.0 of CRMdig, but during the 61st CIDOC CRM SIG meeting a new stable version was issued, where the conceptually wrong multiple inheritance from D1 Digital Object and E26 Physical Feature has been corrected; D35 Area is no longer considered a subclass of E26 Physical Feature. The definitions however, are not updated according to what has been proposed here. For the original definitions in CRMdig v5.0 see here.

Decision: proceed as proposed, work towards updating the model for annotations in CRMdig until the next meeting.

HW: for the next meeting, extend the scope notes and provide examples for the modelling constructs around D35 Area: OE, MD, NC,

- **AG**: provide examples/use cases of 3D to 2D annotations from the Notre Dame Restoration
- **ClB**: provide examples/use cases of video annotations
- **AK**, **MT**: provide examples/use cases from 3D-COFORM
- **NC**, **ØE**: help with aligning with IIIF

Tuesday 24 March 2026

Issue 687: Review the textual descriptions to diagrams in the functional overview

The SIG went through the HW that GB had prepared for the issue. The idea is that the diagrams under Functional Overview are a useful tool for people to learn how to apply the CRM, but their original purpose was to establish the minimal information that needs to be registered for CH documentation. This is evident from the descriptions that were originally provided (a cut-paste from CIDOC reference model Information Groups (1997). The two goals are misaligned, so we need to provide descriptions that explain how to model the kind of information represented in each diagram using CIDOC CRM.

Proposal:

Agree on a general pattern (a guideline) on what kind of information should be represented in the descriptions for the diagrams, as well as the overall structure that the descriptions should have. The proposal is the following. Two examples illustrating how to put this pattern to use can be found in the appendix.

- **General Idea**: what area of documentation in the real world does this diagram attempt to address
- **Ontological Enjeu**: how does this real-world problem get addressed into a modelling pattern using CIDOC CRM
- **Direct Classes and Properties**: what are the most salient classes and properties of this diagram that you should learn about. Here we provide a less formal description of the classes and properties that may be more easily digested in considering the overall pattern. Learners are always provided links to the full formal class and property definitions. We explain not only the classes and properties but important distinctions and decisions within the ontology that are raised by the diagram and the particular application of these classes and properties in this scenario.

- **Examples**: we put in real world, simple examples that are easy to understand and of fairly broad general intellectual appeal (as far as this possible, depending on the classes and properties!)
- **Cross Pattern Mentions**: one semantic modelling pattern may have important references to another. E.g.: acquisition might reference transfer of custody, title may inherit from general appellation and so on.
- **Anti-Examples**: what doesn't apply here but you might think would, see instead x pattern

Discussion points:

- The intended audience of the supplementary documentation has not been adequately specified, but in general, everyone who needs to apply the CRM and is not actively engaging with the SIG would benefit from such descriptions.
- EC reported having used suchlike patterns for teaching the CRM to students and museum staff alike, and it's always helped ease them into applying the CRM.

Decision:

The SIG approved the proposal above.

HW: GB, PF, CEO, SdS, EC to provide descriptions for as many diagrams as possible ahead of the next meeting (maybe start with 1 or 2 each). ETs to share the excel spreadsheet with the diagrams and they can indicate which ones they will be drafting a description for.

Issue 704: The future of the mailing list & issues management

PF gave an outline of the proposal:

A. Export all existing issues in CSV format and import them in the testing GitLab repository [HW: ETz, PF]
B. Initial testing: creating/updating issues both on the website and GitLab. [HW: ETs]
C. Assuming (B) goes well, encourage community members to directly start issue tickets on GitLab. [HW: everyone]
D. Assuming (C) goes well, abandon the website for issue management. The Model\Issues will contain links to GitLab.

Discussion points:

- The plan is to abandon the SIG list for issues management within 2026 or early 2027.
- The mailing list is not to be abandoned completely.
    - Modeling questions or things that the community has flagged as important will be shared through the mailing list as always.
    - That a new issue has been raised in GitLab should be flagged for community members to see, so email notifications are something that will continue (both for starting an issue ticket and for any important developments in the issue).
- GitLab has not been used by this group for issue management, familiarizing ourselves with the new way of doing things will take time (and assistance).

Decision: Proceed as proposed

Issue 706: The News Strategy

GB informed the SIG that he has created a LinkedIn account for the SIG (**CIDOC CRM SIG**: https://www.linkedin.com/company/cidoc-crm/?viewAsMember=true) and proposed that we use it to share things like

- The line of work of a new member institution and its relevance to the SIG's activities,
- Issuing a new stable version for CIDOC CRM (or an extension), a new translation,

- Publishing new educational material, etc.
- A community member published a paper on a new application

The steering committee members should all have access to editing it. Eventually it would be great to have a designated person that will handle the SIG's social media presence, but it's hard to do so without any budget.

Discussion points:

The news shared on LinkedIn should be used for documenting the group's activities for the ICOM Documentation Newsletter.

A YouTube channel might also prove useful for content dissemination (workshops, tutorials, etc.)

Issue 705: The mapping section: redrafting and different placement

PF made a proposal concerning updating the section about Mappings: completely reorganize it.

a) introduction tabs: short text where to distinguish and describe two main kinds of mappings
    - model-to-model mappings (f.i., LIDO-CRM)
    - data transformation mappings (f.i., XML data to RDF using CRM).
b) Merge content currently under the tabs Methods & Technology and Tools, but also update it, including links to additional resources. Keep the text as short as possible.
c) Keep "Reports and Documents" tab as is –include updates if there are any.

N.b. Part of the update is tied to the overall website update (deprecating & updating obsolete content consistently throughout the site).The content of the website needs to be regularly updated/checked

Discussion points:

- Reports & Documents about Mappings: it's a mixed bag, it contains papers about mappings, schema mapping guidelines, all very old documents as a rule. It lacks scope. Some of the things listed therein might need to go to the introduction (LIDO to CRM for instance).
- List of mapping files (x3ml exports from 3M, f.i.) to be shared on the website. But we should start with the material that we know needs to change.
- Zellij/Pletka patterns: they can be used to generate x3ml mapping files to map to LinkedArt, but it does not fall under the prototypical model-to-model mapping concept.

Decision: Proceed as proposed.

HW: PF populate the introduction page, ask at FORTH for x3ml files & model-to-model mappings from old projects

HW: NC & GB provide model mappings for LinkedArt (CIDOC CRM) and NFDI4Culture, LIDO, EDM, BFO

Issue 642: CIDOC CRM Training Material

GB presented the issue – a proposal concerning revamping the section "Use&Learn", with implications about its structure and content. It is not a new proposal; the point is to see whether the SIG still considers this a hot-topic and whether its members/participants want to continue with this work.

Discussion points:

- A point of criticism is that the proposed revamping of the Use & Learn does not consider individual needs for learning, it serves as a one size-fits all gentle introduction to the using the CRM.
- Many participants mentioned that they have learnt how to use the CRM through semantic patterns and that they would want to see some training material organized around semantic patterns. Possibly even the same use case but at a different level of detail.
- Identifying the needs of different audiences is the first step towards implementing this work.

Issue 674: Harmonize CRMgeo with CRMbase v7.1.2

GH walked the SIG through the new release of CRMgeo (syntactic check by ETz, addition of diagrams and explanatory paragraphs under "Basic Concepts", semantic check by MF & WS). The ensuing document and diagrams can be found here.

There are very few comments yet to be addressed, they primarily concern property quantification, FOL, alternatives to examples and they can be handled as an editorial update (following one last editing round). They are not expected to have any impact on the RDFs file for CRMgeo.

Proposal:

- Release this version (CRMgeo v2.0) as a stable one, aligned with CIDOC CRM v7.1.3.
    - Flag it as a "release candidate", meaning that it can be used for implementations but can change minimally shortly after: in practical terms this means that the status must be set to "Draft", but the encodings should also be made available.
- Assign some readers to perform some final editing and issue the ensuing update as CRMgeo v2.0.1 (the RDFs won't change).

Discussion points:

- Participants noted that the constructs in CRMgeo could possibly extend the D35 Area modelling in CRMdig (provide topological relations for digital files). It was a preliminary discussion, that will need to be supported by examples & use cases.

Decision: Proceed as proposed.

- Concerning the new release of CRMgeo the following HW was assigned.
    - OE, MvR, WD, AK will be reviewing the document before the stable release is issued.
    - GH to share the latest version that WS edited with ETz
- Concerning the connection of CRMgeo to D35 Area in CRMdig: GH to consider it some more, provide an example for it.

Issue 534: Representing .1 properties of full paths in shortcut properties

The SIG reviewed CEO's proposal for the inheritance of .1 properties in shortcuts & subproperties. The HW can be found here.

The generally accepted premise was that .1 properties should be inherited from superproperties to their subproperties (think of P14.1 in the role of, and how it should apply to P22 transferred title to, P23 transferred title from, P28 custody surrendered by, P29 custody received by).

But as a consequence, the question arises of whether a property can have more than one .1 properties (one declared for said property, the other(s) in view of being inherited by a superproperty).

To demonstrate via an example:

- It holds that P138(x,y) ⇒ P67(x,y);
- It holds that both P138 and P67 have .1 properties (i.e., P138(x,y,z) ⇒ P138(x,y) and P67(x,y,z) ⇒ P67(x,y));
- if P138 inherits P67.1, then P138 has two .1 properties, that are not properly distinguished

The same situation applies with shortcut properties and their fully developed counterparts –see for example P107 and P144i.1 that forms part of its fully developed counterpart.

- It holds that P107(x,y) ⇐ (∃z) [E85(z) ∧ P144i(x,z) ∧ P143(z,y)] (i.e.: P107 is part of the fully developed path from E74 Group. P144i gained member by: E85 Joining. P143 joined: E39 Actor

- It holds that both P107 and P144 have .1 properties (i.e., P107(x,y,z) ⇒ P107(x,y) and P144i(x,y,z) ⇒ P144i(x,y);
- If the .1 property is preserved in the shortcut, then P107 has two .1 properties, that are not properly distinguished (they even have the same name: “kind of member”).

Proposal:

- include the following set of FOL axioms in CIDOC CRM:
  - P62(x,y,v) (∧ E55(v)) ⇐ (∃zw)[E36(z) ∧ E55(w) ∧ P65(x,z) ∧ P138(z,y,w)]
  - P107(x,y,v) ⇐ (∃zw)[E85(z) ∧ P144i(x,z,w) ∧ P134(z,y)]
  - P125(x,y,w) ⇔(∃z) [E70(z) ∧ E55(w) ∧ P16(x,z,w) ∧ P2(z,y)] (together with the introduction of a *P125.1 mode of use* property)
  - P199(x,y,w) ⇔ (∃z)[E18(z) ∧ P138(x,z,w) ∧ P2(z,y)] (together with the introduction of a *P199.1 mode of representation* property but taking into consideration that P199 is also declared a subproperty of P138, which in its turn is a subproperty of P67, so it would inherit both their .1 properties)

Discussion points:

- The axiom for P107 did not stir any controversy.
- The axiom for P62 on the other hand, did: P62.1 and P138.1 (the latter gets preserved from the if clause of the inference) are not understood to be the same property the following alternative was proposed instead:
  P62(x,y,w) ⇐ (∃z) [E36(z) ∧ P65(x,z) ∧ P138(z,y,w)],
  Given that variables that appear to be unbound are understood as bound by an implicit universal quantifier, the formula above is read as (∀x,y,w)P62(x,y,w) ⇐ (∀x,y,w ∃z) [E36(z) ∧ P65(x,z) ∧ P138(z,y,w)], i.e., bound by different operators, which implies that the E55(w) occurring in P62 and P138 is not the same instance of E55. There was no decision on that, except for WS & CEO to discuss it in a subgroup and propose a solution to the SIG.
- The axiom for P125.1 (and the introduction of the *P125.1 mode of use* property) did not stir any controversy either.
- For P199: it is contested that it forms a subproperty of P138. To be reconsidered.
- The requirement that a property can have any number of .1 properties (through declaration, inheritance, and/or in view of its shortcutting a fully developed path that contains a .1 property) together with what notation to use in order to express that should be part of a new issue: CEO, WS to discuss this in a separate subgroup.

Decisions: The SIG did not resolve to incorporate the axioms above. Instead, CEO & WS will be discussing this in a subgroup (anyone else interested to participate in the discussions can join in). Regarding the hierarchy of .1 properties and the ability to stack them, CEO will formally start a new issue on the list.

Schedule the 64th CIDOC CRM & 57th FRBR/LRMoo SIG Meeting

The meeting will be hosted by the University of Cologne. It will take place on Tuesday 16- Friday 19 February 2027.

OE that participants flying to Germany from the meeting could consider going to Dusseldorf (less expensive commuting to Cologne compared to Frankfurt; also, better connections than the Cologne-Bonn airport).

Issue 662: Explore the connection among I11 Situation, S23 Position Determination, and E3 Condition State

WS presented the HW that he, MD & AK have prepared. It's an attempt at refining the modelling constructs around S23 Position Determination through an improvement of the scope notes and the examples used, plus a definition of a set of new properties.

The updates concern the classes and properties listed below:

- S23 Position Determination (new scope note, additional example)
- O30 determined position (was determined by) (new scope note, additional example)
- O31 has validity time-span (new scope note, additional examples)
- O32 determined position (was located by) (additional example)
- O41 measured dimension (was measured in) (new property added)
- O42 used result of (results contributed to) (new property added)
- S25 Relative Dimension (additional example)
- O33 is relative to (has relative dimension) (additional example)

Decision: The SIG approved the proposal. The updates will appear in CRMsci v3.2. The details can be found in the appendix.

The next release of CRMsci (v3.2) is approved by the CRM SIG –a stable release.

Evidence based classes

Presentation by Dominic Oldman. See here for the slide deck.

Modeling Cultural Heritage Conservation Data with the CIDOC-CRM

Presentation by Kalliopi Tsape & Sarantos Kapidakis (University of West Attica). See here for the slide deck.

Updates on the CIDOC CRM Spanish Translation, version 7.1.1

Presentation by Edurne Uriarte Santillán & Pedro Ángeles Jimenez (Universidad Nacional Autónoma de México). See here for the slide deck.

Informal membership request:

The Spanish translation WG has requested to obtain membership at the CIDOC CRM SIG despite not forming an organization/institution per se. This runs counter to the institutional membership requirement that has been in place since the beginning of the SIG.

An open-ended discussion followed, the main arguments are summarized below:

- Allegedly ISO has issues with "community of use" unless the community is supported by institutions. But according to EC, who oversaw the last ISO update, ISO posed no requirement for legal bodies to be represented in the community of practitioners. It is possible that ISO's view has changed.
- The idea behind institutional membership (as it was first articulated when the SIG became a CIDOC WG) ensured fostering a community of practitioners through adoption of the standard (an implicit "obligation" to use/ promote it) and also a continued engagement (it meant that institutions would support the activities of the SIG by allocating time, effort). It also allowed non-CIDOC members to participate in the WG –provided that the requirement 80% of the SIG's membership would also be CIDOC members.
- The CIDOC CRM Spanish translation WG itself does not qualify as an organization. But its members are ICOM members, some of them ICOM Documentation officials even, and as such they can have a say in

how the SIG operates (given the new bylaws). Their contribution is extremely central to the maintenance and dissemination of the standard. In that sense, we might want to make an exception or (even better) extend the invitation to other translation initiatives.

- The CIDOC CRM Spanish translation WG is not the only existing translation initiative –any decisions made now, will affect the other WGs too. Maybe the SIG should allow
  - individual membership to accommodate such cases
  - another tier of participation, something like "associate members" (that are groups, though not legal bodies), that will apply to translation groups (Spanish, European & Canadian French, Russian, Iranian, Chinese) or other WG (f.i.: Archaeological Excavation Semantic Modelling Workgroup Scope and Activities; LRMoo).

N.b.: Individual participation is an option that allows ICOM members to follow closely on the SIG's activities despite lacking institutional support at a given point in their career. But we should encourage institutional support nonetheless, as it implies adoption and use.

Decision: revive issue 605, the interim steering committee to collaborate with EC, CEO, SdS on the specifics of membership and try to come up with a proposal even before the election. Part of the work would involve approaching the WGs that have been identified above.

Wednesday 25 March 2026

From CIDOC CRM to CRM-ACA: Ontology Extension and Knowledge Graph Construction for Ancient Chinese Artefacts at the Palace Museum

Presentation by Yipei Ye (The Palace Museum). For the slide deck see here.

Mediating Access to CIDOC CRM data using RAGs

Presentation by Nicola Carboni (University of Illinois Urbana-Champaign). For the slide deck see here.

(Re-)visiting a CIDOC CRM teaching tool

Presentation by Kai Niebes (University of Cologne). For the slide deck see here.

A Meta-Level CIDOC CRM Model for Representing Intangible Heritage Patterns: The Case of the Tuna Canning Industry in Low Guadiana

Presentation by Pavlos Fafalios (ICS-FORTH) & Patricia Ferreira Lopes (University of Seville). For the slide deck see here.

Issue 722: Integrating Resources in LRMoo

PR gave an outline of the issue. The slide deck of her presentation can be found here.

The proposal involves the addition of two properties to connect the distinct and discrete updates (expressions) that are integrated to an existing manifestation, to the manifestation in question:

- R82 is diachronically embodied in (diachronically embodies)
- R83 is next iteration of (is previous iteration of)

The specifics of the proposal can be found in the appendix.

Discussion points:

There is a connection with issue 534 and the HW that CEO and WS have been assigned – to provide an uncontroversial notation for .1 property inheritance (it is extremely relevant for R83, as both R83 and its superproperty have .1 properties).

Decision: the proposal was approved. It will appear in LRMoo v1.2

Issue 684: Modelling of Series in LRMoo

PR gave an outline of the issue. The slide deck of her presentation can be found here.

The proposal involves:

- Introducing new class F56 Container
- Deprecating F18 Serial and move its examples to the new class
- Introduce new properties:
    - R84 has member (is member of)
    - R85 has editor (is editor of)
    - R86 has responsible agent (is responsible for)
    - R87 has related container (is container related to)

There are some to-do's still:

- Replacing R11 has issuing rule
- Indicating the intended audience for F56 Container
- Indicating the general topic of the articles in the F56 Container

Discussion points:

There is a connection with issue 534 and the HW that CEO and WS have been assigned – to provide an uncontroversial notation for .1 property that appears in a long path being preserved in a shortcut (see R85, R56).

Toward a Shared Model for Performing Arts: A Linked Art Extension Proposal

Presentation by Clarisse Bardiot (Université Rennes 2), George Bruseker (SARI & Takin.solutions), Oyvind Eide (University of Cologne). For the slide deck see here.

DORA – Digital Ontology-Based Rights Management for Archival Collections: Connecting CIDOC CRM with the rights expression language ODRL

Presentation by Kathrin Fischeidl & Katharina Hefele (Germanisches Nationalmuseum). For the slide deck see here.

Issue 720: A new example for P46 and E13, P140, P141, P177

The SIG reviewed HW by WS: The issue concerns

- the examples of P46 is composed of (forms part of) [addition of example, deprecation of fictitious example and its replacement by a meaningful example using the same domain and range]
- reusing the example of P46 for E13 and properties (P140, P141, P177)
- deprecating fictitious examples from the properties of E13 (P140, P141, P177)

Decision: The examples were accepted following minor modifications. The details can be found in the appendix.

Pletka: The Semantic Data Pattern Library Tool

Presentation by George Bruseker (SARI & Takin.solution), Thomas Hänsli (ETH Zurich & SARI), Sjoerd Siebinga (Delving), Denitsa Nenova (Takin.solutions). For the slide deck see here.

Artresearch.net – Open access discovery platform for the combined collections of PHAROS: The International Association of Photo Archives

Presentation by Artem Kozlov (RS WORKS EE, PHAROS: The International Association of Photo Archives). For the slide deck see here.

The Manuscript AI Ontology

Presentation by Giulia Biagioni (TNO Innovation for Life) & Shari Boots (Radboud University). For the slide deck see here.

Thursday 26 March 2026

Issue 682: List externally maintained CRM Compatible Extensions on New Section of CRM Site

The SIG reviewed the self-reporting form that ontology maintainers are expected to fill out if they want to submit their ontologies to be listed as a CIDOC CRM Compatible Ontology.

The form was produced out of the minimal metadata that the SIG has agreed to collect for CRM Compatible Ontologies that are externally maintained. The metadata descriptions can be found here. An editable copy of the form (in a google doc) can be found here.

Discussion points:

- The form has too many free text fields. However, participants believed this to be unproblematic.
- It was considered very important to mention the version of CIDOC CRM and/or other Harmonized ontology that the submitted ontology claims to be compatible with.
- The form is not intended to do version control. Rather, to submit an ontology to be reviewed for CRM compatibility. However, it is possible that a relatively stable ontology may be resubmitted (after it's changed due to a new use case being identified and represented). If newer releases are to be resubmitted, the form should allow a submitter to skip a few steps in the questionnaire (relating to project/ adoption etc.). The purpose is to connect community members with projects and outputs that may be relevant for their work. The important thing to consider is that the SIG does not assume any responsibility for these externally maintained ontologies. It is the responsibility of the maintainers of the ontologies in question to offer them.

Decision:

HW: ETs to update the form accordingly.

HW: ETz to consult with PF, WS, GB & ETs on how to represent the harmonized and compatible ontologies on the site, where to place the questionnaire and make it visible. Then put it to the test.

Issue 715: Deprecate the shortcut statement that goes through E1. P140i: E15. P37: E42 in the scope note of P1

Proposal: close the issue because its premise is wrong.

The motivation for the issue was that it was erroneously assumed that (P1(x,y) ⇐ (∃z) [E15(z) ∧ P140i(x,z) ∧ P37(z,y)]) imposed stricter semantics to P1(x,y) –namely that its range be an instance of E42 Identifier. However, the description of the relation between P1 and the full path that it can shortcut over is not that "instantiating a P1, implies that an identifier has been assigned via an activity of identifier assignment", but rather a normal shortcut interpretation: that the long path from E1. P140i: E15. P37: E42, can be shortcut by P1.

The problem is that the use of the inverse arrow for material implication was not understood to be read from right to left. And it seems that much of the confusion concerning the validity of the FOL statement (P1(x,y) ⇐ (∃z) [E15(z) ∧ P140i(x,z) ∧ P37(z,y)]) stems from that fact, namely that it was not understood as expressing a shortcut-full path relation, where the shortcut is implied by the full path.

Decision: approved.

Issue closed

Issue 713: Can the SIG license a stable version of a CIDOC CRM Harmonized Ontology if it references an unstable version of the CIDOC CRM or some other Harmonized Ontology?

Proposal: close the issue on the grounds that it is bad practice to try and build stable ontologies referencing other ontologies that are currently being developed. Make the requirement that creating a stable ontology means that its external references should only be to other stable ontologies, and document the cases in which we have already done that (CRMtex V1.0; the parallel development of CRMinf and CRMsci) –which will allow us to check them for errors or inconsistencies between the stable forms of the ontologies in question.

Decision: approved

Issue closed

Issue 708: Reviewing CRMdig 4.0 Digitization and D9

Proposal: close the issue on the grounds of there being no loose ends with the HW. The HW was discussed at the 61st SIG Meeting, it was accepted, which resulted in a new stable release in October 2025 (CRMdig V5.0).

The loose ends identified for CRMdig do not fall within the scope of this issue, rather issue 709 (Reviewing D35 Area in CRMdig).

Decision: approved

Issue closed

APPENDICES

Appendix I: List of abbreviated names

AG: Anaïs Guillem,

AK: Athina Kritsotaki,

CEO: Christian-Emil Ore,

ClB: Clarisse Bardiot;

DO: Dominic Oldman,

EC: Erin Canning,

ETs: Eleni Tsouloucha,

ETz: Elias Tzortzakakis,

GB: George Bruseker,

GH: Gerald Hiebel;

MD: Martin Doerr,

MT: Maria Theodoridou;

MvR: Muriel van Ruymbeke;

MZ: Maja Žumer,

NC: Nicola Carboni

ØE: Øyvind Eide

PF: Pavlos Fafalios,

PR: Pat Riva,

RS: Robert Sanderson,

SdS: Stephen D. Stead

WS: Wolfgang Schmidle

Appendix II: Model updates, scope note reformulations, documents

Issue 711:

Proposal for automating the membership application process

Section1: CIDOC CRM SIG –Institutional Membership Application

[DESCRIPTION] Applications for institutional membership in the CIDOC CRM Special Interest Group (SIG) should be submitted through this form.

A formal letter of intent from an authorized representative of the applicant institution is required. Please upload the signed letter as a PDF document below.

Email

(the form collects emails)

Section 2: Institutional Information

Institution Name

(short answer)

Country

(short answer)

Type of Organization

(multiple choice)

- ○ Archive
- ○ Library
- ○ Museum
- ○ University/Research Institution
- ○ Private Organization
- ○ Public Institution
- ○ Other: (short text)

Website URI

(short answer)

Year of Application

(short answer)

Primary Area of Engagement

(multiple choice)

- ○ Documentation
- ○ Education/Training
- ○ Knowledge Engineering
- ○ Research
- ○ Software Development
- ○ Other: (short text)

Section 3: Official Representative

Name of Authorized Representative

(short answer)

Title/Position

(short answer)

Email Address of the Representative

(short answer)

Additional Participants (if known)

(short answer)

Section 4: Institutional Engagement

Brief Overview of Institutional Activities

[DESCRIPTION] Please summarize the institution's main areas of activity (e.g., research, conservation, education, documentation, archiving, etc.).

(paragraph)

Relevant Projects or Experience Related to CIDOC CRM or Semantic Technologies

(paragraph)

Expertise the Institution would contribute to the SIG

(paragraph)

Section 5: Required Document Upload

Upload Formal Letter of Intent (PDF)

[add file]

Section 6: Final Confirmation

We confirm that our institution seeks membership on a voluntary, non-commercial basis and agrees to participate according to the SIG's principles

(checkbox)

- ○ YES

Issue 274:

E100 Audio Item update

NEW DEFINITION

E100 Audio Item

Subclass of:

E73 Information Object

Scope note:

This class comprises identifiable immaterial audio items such as songs, jingles, an audio scape, machine noises etc. with an objectively recognizable form that are documented as single units.

The substance of an audio item is an audio pattern. Instances of E100 Audio Item are not sound events themselves, but their pattern, recognizable and identified by a social cultural group either because of its intentional encoding or its communally recognized common pattern. An example of the latter would be the first recording of the Beatles' Abbey Road; an example of the latter might be the soundscape of a busy London street circa 2025.

This class does not intend to describe the idiosyncratic characteristics of an individual occurrence of a particular song, jingle and/or audioscape, but rather the underlying prototype. For example, a sound such as Walter Werzowa's Intel sonic logo is generally considered to be the same logo when played in any number of adverts or media, despite it having minor variation. The tone may change, but the underlying sound encoded remains uniquely identifiable. The same is true of music or other audio performances which are performed or played back many times. While individual characteristics of the performance may incidentally change, a basic, identical form can be recognized across performance instances. Thus, for example one might distinguish between the characteristic sound of the Leonard Cohen performance of Hallelujah or that of Jeff Buckley. This means that an instance of E100 Audio Item is independent of performance.

Aside from sounds following a particular composition, sounds captured from the environment (natural or human) and recognizable within a certain society or culture can be instances of E100 Audio Item. Examples would include the sound of a tuned Porsche Carrera engine revving at 3000 rpm, the warble of the common Loon, or the David Frost Interviews with Nixon.

Instances of E100 Audio Item come to be when they are intentionally created to capture and communicate a particular sound. They continue to exist as long as carriers of this item exist.

The class E100 Audio Item provides a means of identifying and linking together instances of E5 Event in which the same sounds, compositions or utterances etc. can be identified to have occurred, using *P201 sounded (was sounded by)*, E100 Audio Item. Further an instance of E100 Audio Item may be recorded and then can be indicated as P*202i is recorded on (bears recording of)* E22 Human-Made Object.

Examples:

- Walter Werzowa's Intel sonic logo
- Francisco Tárrega's Nokia tune [Grande Valse]
- a recording of the Greater Horned Toad
- the sound of the Porsche 911 engine revved at 3000 rpm

In first-order logic:

E100(x) ⇒ E73(x)

Properties:

P201 sounded (was sounded by) D: E5 Event
P202 is recorded on (bears recording of): E22 Human-Made Object

OLD DEFINITION

E100 Audio Item

Subclass of:

E73 Information Object

Scope note:

This class comprises the intellectual or conceptual aspects of recognisable sounds and compositions.

The substance of an audio item is a recognizable pattern of vibration in a medium as perceivable by an auditory system. Sounds in and of themselves are not human constructs, instances of audio item, however, are. Specifically, they are the identifiable and recognizable vibratory patterns which have become objects of discourse within given cultures and societies and act as symbolic markers and can be the basis for contemplation, discourse and reasoning inter alia.

This class does not intend to describe the idiosyncratic characteristics of an individual occurrence of a particular sound, performance or playback of sound, but rather the underlying prototype. For example, a sound such as Walter Werzowa's Intel sonic logo is generally considered to be the same logo when played in any number of adverts or media. The tone may change, but the logo remains uniquely identifiable. The same is true of music or speeches which are performed many times. While individual characteristics of the performance or speech may incidentally change, a basic, identical form can be recognized across performance instances. This means that an instance of audio item is independent of performance.

Aside from sounds following a particular composition, sounds captured from the environment (natural or human) and recognizable within a certain society or culture can be instances of audio item. Examples would include the sound of a tuned Porsche Carrera engine revving at 3000 rpm, the warble of the common Loon, or the David Frost Interviews with Nixon.

The class E100 Audio Item provides a means of identifying and linking together instances of E5 Event in which the same sounds, compositions or utterances etc. can be identified to have occurred, using P100 sounded (was sounded by), E100 Audio Item. Further an instance of E100Audio Item may be recorded and then can be indicated as *PXX is recorded on (bears recording of)* E24 Physical Human-Made Thing.

Examples:

- Walter Werzowa's Intel sonic logo
- Francisco Tárrega's Nokia tune [Grande Valse]
- a recording of the Greater Horned Toad
- the sound of the Porsche 911 engine revved at 3000 rpm

In first-order logic:

E100(x) ⇒ E73(x)

Properties:

Pxx is recorded on (bears recording of): E24 Physical Human-Made Thing

P201 sounded (was sounded by)

P201 sounded (was sounded by)

Domain:

E5 Event

Range:

E100 Audio Item

Subproperty of:

Superproperty of:

Quantification:

many to many (0,n:0,n)

Scope note:

This property connects an event in which a sound was produced, to the corresponding instance of E100 Audio Item that represents the identifiable, recurring pattern of that sound. This property allows modelling of multiple occurrences of the same audio item across distinct events, e.g., a live performance, a broadcast, or environmental sound recording.

Full path:

Examples:

- Radiohead's performance Glastonbury Festival June 1997 (E100) *sounded* "Fake Plastic Trees" (E100)

In first-order logic:

P201(x,y) ⇒ E5(x)
P201(x,y) ⇒ E100(y)

P202 bears recording of (is recorded on)

P202 bears recording of (is recorded on)

Domain:

E22 Human-Made Object

Range:

E100 Audio Item

Subproperty of:

E18 Physical Thing. P128 carries (is carried by): E90 Symbolic Object

Superproperty of:

Quantification:

many to many (0,n:0,n)

Scope note:

This property specifies that an instance of E22 Human-Made Object contains a recording of a particular instance of E100 Audio Item. The physical carrier (E22) bears the encoded audio pattern, making it possible to replay or reproduce the identifiable sound. Examples include vinyl records, CDs, or magnetic tapes.

Full path:

Examples:

- A copy of the CD "The Bends" by Radiohead *bears recording* of "Fake Plastic Trees" (E100)

In first-order logic:

P201(x,y) ⇒ E22(x)
P201(x,y) ⇒ E100(y)

Pxx sounds typical for (is typical sound of)

Pxx sounds typical for (is typical sound of) [will not be introduced in CRM]

Domain:

E100 Audio Item

Range:

E55 Type

Subproperty of:

E100 Audio Item. Pxx sounds typical for (is typical sound of): E55 Type

Superproperty of:

Quantification:

many to many (0,n:0,n)

Scope note:

This property indicates that particular audio item is recognized as a representative instance of a type of sound within a society or cultural context. This property allows the identification of audio items as bearing standard categories or types of sounds, such as “engine revving,” “bird call,” or “corporate sonic logo,” without indicating also a particular instance.

Full path:

Examples:

- “Fake Plastic Trees” (E100) by Radiohead *Pxx sounds typical for* Alternative Rock UK ca. 1990 (E55)

In first-order logic:

Pxx1(x,y) ⇒ E100 (x)
Pxx(x,y) ⇒ E55(y)

Issue 716:

E18 Physical Thing

Subclass of:

E72 Legal Object

Superclass of:

E19 Physical Object
E24 Physical Human-Made Thing
E26 Physical Feature

Scope note:

[1] This class comprises all persistent physical items with a relatively stable form, human-made or natural.

[2] An instance of E18 Physical Thing occupies not only a particular geometric space at any instant of its existence, but in the course of its existence it also forms a trajectory through spacetime, which occupies a real, that is phenomenal, volume in spacetime. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces, such as the interior of a box. For the purpose of more detailed descriptions of the presence of an instance of E18 Physical Thing in space and time it can be associated with its specific instance of E92 Spacetime Volume by the property *P196 defines (is defined by)*.

[3] In general, many instances of this class cannot be moved as a whole independently from surrounding or attached matter, or be detached along well-defined boundaries in all dimensions, such as the Temple of Abu Simbel before its transfer.

[4] Specifically, depending on the existence of natural boundaries of such things, the CIDOC CRM distinguishes the instances of E26 Physical Feature, such as holes, rivers, pieces of land etc., that are integral to the surrounding matter, from instances of E19 Physical Object, which have well defined boundaries in all dimensions. Therefore, the class E9 Move applies only to the latter as targets of a move.

[5] The CIDOC CRM is generally not concerned with amounts of matter in fluid or gaseous states, as long as they are not confined in an identifiable way for an identifiable minimal time-span.

Examples:

- the Cullinan Diamond (E19) (Scarratt and Shor, 2006)
- the cave "Ideon Andron" in Crete (E26) (Smith, 1844-49)
- the Mona Lisa (E22) (Mohen, 2006)

In first-order logic:

$E18(x) \Rightarrow E72(x)$

Properties:

P44 has condition (is condition of): E3 Condition State
P45 consists of (is incorporated in): E57 Material
P46 is composed of (forms part of): E18 Physical Thing
P49 has former or current keeper (is former or current keeper of): E39 Actor
P50 has current keeper (is current keeper of): E39 Actor
P51 has former or current owner (is former or current owner of): E39 Actor
P52 has current owner (is current owner of): E39 Actor
P53 has former or current location (is former or current location of): E53 Place
P59 has section (is located on or within): E53 Place
P128 carries (is carried by): E90 Symbolic Object
P156 occupies (is occupied by): E53 Place
P196 defines (is defined by): E92 Spacetime Volume

Issue 636:

Guideline on how to read property quantifiers (Introduction, section Applied Form/Property Quantifiers:

NEW TEXT

Quantifiers for properties are provided for the purpose of semantic clarification only, and should **not** be treated as implementation recommendations. The CIDOC CRM has been designed to accommodate alternative opinions and incomplete information, and therefore **all** properties should be implemented as optional and repeatable for their domain and range ("many to many (0,n:0,n)"). Therefore, the term "cardinality constraints" is avoided here, as it typically pertains to implementations.

The following table lists all possible property quantifiers occurring in this document by their notation, together with an explanation in plain words. In order to provide optimal clarity, two widely accepted notations are used redundantly in this document, a verbal and a numeric one. The verbal notation uses phrases such as "one to many", and the numeric one, expressions such as "(0,n:0,1)". While the terms "one", "many" and "necessary" are quite intuitive, the term "dependent" denotes a situation where a range instance cannot exist without an instance of the respective property. In other words, the property is "necessary" for its range. (Meghini, C. & Doerr, M., 2018)

The formalism is as follows. The pair before the colon is the lower and upper limit of how often the property can instantiate a domain instance, that is, how many times the domain instance can be used with the property. The pair 0,n means that there are no restrictions. The pair 1,n means that the property must instantiate each domain instance at least once, the pair 0,1 means at most once, the pair 1,1 means exactly once. The pair after the colon expresses the same for the range.

For example, the property *P56 bears feature (is found on)* with domain E19 Physical Object and range E26 Physical Feature has the quantification (0,n:1,1). This means that a Physical Object can bear any number of Physical Features (or none), but a Physical Feature is found on exactly one Physical Object.

In rare cases, a property can have a quantification with a lower or upper limit other than 0, 1, or n. For example, the property *P152 has parent (is parent of)* has the quantification (2,n:0,n), which indicates that every person has at least two parents (biological, legal or social), and that a person may have any number of children, or none. The quantifications found in CRMbase and compatible models are listed below; cases like (2,n:0,n) are not included.

OLD TEXT

Quantifiers for properties are provided for the purpose of semantic clarification only, and should **not** be treated as implementation recommendations. The CIDOC CRM has been designed to accommodate alternative opinions and incomplete information, and therefore **all** properties should be implemented as optional and repeatable for their domain and range ("many to many (0,n:0,n)"). Therefore, the term "cardinality constraints" is avoided here, as it typically pertains to implementations.

The following table lists all possible property quantifiers occurring in this document by their notation, together with an explanation in plain words. In order to provide optimal clarity, two widely accepted notations are used redundantly in this document, a verbal and a numeric one. The verbal notation uses phrases such as "one to many", and the numeric one, expressions such as "(0,n:0,1)". While the terms "one", "many" and "necessary" are quite intuitive, the term "dependent" denotes a situation where a range instance cannot exist without an instance of the respective property. In other words, the property is "necessary" for its range. (Meghini, C. & Doerr, M., 2018)

The formalism is as follows. The pair before the colon is the lower and upper numbers of a single domain instance that can be the argument of a given property and the pair after the colon is the lower and upper numbers of a single domain instance. That is, the pair 0,n indicates that there are no restrictions. The pair 1,1 says that each domain instance must be an argument but only one time, while the pair 0,1 says that each instance may be an argument but only one time. The pair 1,n says that each domain instance must be an argument and there is no upper limit. This can be generalized so that the pair can consist of any numbers as long as the first is lower or equal to the second. For example, the property *P152 has parent (is parent of)* has the quantification (2,n:0:n) indicates that every person has at least 2 parents but may have more (adoption) and that every person may not have a child but there are no restrictions on the number of children a person may have. Below the quantifications found in CRMbase and compatible models are listed. The cases with interval-bounds explicitly larger than one, are not included.

Property quantifier labels that needed editing

NEW LABELS

one to one, necessary, dependent **(1,1:1,1)**	An individual domain instance and range instance of this property must have exactly one instance of this property. In other words, this property is necessary and not repeatable for its domain and for its range.
one to one **(0,1:0,1)**	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is optional for its domain and range.

one to one, dependent (0,1:1,1)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is optional for its domain and necessary and not repeatable for its range.

OLD LABELS

one to one (1,1:1,1)	An individual domain instance and range instance of this property must have exactly one instance of this property. In other words, this property is necessary and not repeatable for its domain and for its range.
one to one, optional (0,1:0,1)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is optional for its domain and range.
one to one (0,1:1,1)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is optional for its domain and necessary and not repeatable for its range.

Reordering property quantifiers name-description sets

NEW ORDERING

many to many (0,n:0,n)	Unconstrained: An individual domain instance and range instance of this property can have zero, one or more instances of this property. In other words, this property is optional and repeatable for its domain and range.
many to many, necessary (1,n:0,n)	An individual domain instance of this property can have one or more instances of this property, but an individual range instance can have zero, one or more instances of this property. In other words, this property is necessary and repeatable for its domain, and optional and repeatable for its range.
many to many, necessary, dependent (1,n:1,n)	An individual domain instance and range instance of this property must have at least one instance of this property. In other words, this property is necessary and repeatable for its domain and range.
one to many (0,n:0,1)	An individual domain instance of this property can have zero, one or more instances of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is optional for its domain and range, but repeatable for its domain only. In some contexts, this situation is called a “fan-out”.
one to many, necessary (1,n:0,1)	An individual domain instance of this property can have one or more instances of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is necessary and repeatable for its domain, and optional but not repeatable for its range. In some contexts, this situation is called a “fan-out”.
one to many, dependent (0,n:1,1)	An individual domain instance of this property can have zero, one or more instances of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is optional and repeatable for its domain, but necessary and not repeatable for its range. In some contexts, this situation is called a “fan-out”.
one to many,	An individual domain instance of this property can have one or more instances of this

necessary, dependent (1,n:1,1)	property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is necessary and repeatable for its domain, and necessary but not repeatable for its range. In some contexts, this situation is called a “fan-out”.
many to one (0,1:0,n)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance can be referenced by zero, one or more instances of this property. In other words, this property is optional for its domain and range, but repeatable for its range only. In some contexts, this situation is called a “fan-in”.
many to one, necessary (1,1:0,n)	An individual domain instance of this property must have exactly one instance of this property, but an individual range instance can be referenced by zero, one or more instances of this property. In other words, this property is necessary and not repeatable for its domain, and optional and repeatable for its range. In some contexts, this situation is called a “fan-in”.
many to one, necessary, dependent (1,1:1,n)	An individual domain instance of this property must have exactly one instance of this property, but an individual range instance can be referenced by one or more instances of this property. In other words, this property is necessary and not repeatable for its domain, and necessary and repeatable for its range. In some contexts, this situation is called a “fan-in”.
one to one (0,1:0,1)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is optional for its domain and range.
one to one, necessary (1,1:0,1)	An individual domain instance of this property must have exactly one instance of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is necessary and not repeatable for its domain, and optional but not repeatable for its range.
one to one, dependent (0,1:1,1)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is optional for its domain and necessary and not repeatable for its range.
one to one, necessary, dependent (1,1:1,1)	An individual domain instance and range instance of this property must have exactly one instance of this property. In other words, this property is necessary and not repeatable for its domain and for its range.

OLD ORDERING

many to many (0,n:0,n)	Unconstrained: An individual domain instance and range instance of this property can have zero, one or more instances of this property. In other words, this property is optional and repeatable for its domain and range.
one to many (0,n:0,1)	An individual domain instance of this property can have zero, one or more instances of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is optional for its domain and range, but repeatable for its domain only. In some contexts, this situation is called a “fan-out”.
many to one (0,1:0,n)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance can be referenced by zero, one or more instances of this property. In other words, this property is optional for its domain and range, but repeatable for its range only. In some contexts, this situation is called a “fan-in”.
many to many, necessary (1,n:0,n)	An individual domain instance of this property can have one or more instances of this property, but an individual range instance can have zero, one or more instances of this property. In other words, this property is necessary and repeatable for its domain, and

optional and repeatable for its range.

many to many, necessary, dependent (1,n:1,n)	An individual domain instance and range instance of this property must have at least one instance of this property. In other words, this property is necessary and repeatable for its domain and range.
one to many, necessary (1,n:0,1)	An individual domain instance of this property can have one or more instances of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is necessary and repeatable for its domain, and optional but not repeatable for its range. In some contexts, this situation is called a "fan-out".
many to one, necessary (1,1:0,n)	An individual domain instance of this property must have exactly one instance of this property, but an individual range instance can be referenced by zero, one or more instances of this property. In other words, this property is necessary and not repeatable for its domain, and optional and repeatable for its range. In some contexts, this situation is called a "fan-in".
one to many, dependent (0,n:1,1)	An individual domain instance of this property can have zero, one or more instances of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is optional and repeatable for its domain, but necessary and not repeatable for its range. In some contexts, this situation is called a "fan-out".
one to many, necessary, dependent (1,n:1,1)	An individual domain instance of this property can have one or more instances of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is necessary and repeatable for its domain, and necessary but not repeatable for its range. In some contexts, this situation is called a "fan-out".
many to one, necessary, dependent (1,1:1,n)	An individual domain instance of this property must have exactly one instance of this property, but an individual range instance can be referenced by one or more instances of this property. In other words, this property is necessary and not repeatable for its domain, and necessary and repeatable for its range. In some contexts, this situation is called a "fan-in".
one to one, necessary, dependent (1,1:1,1)	An individual domain instance and range instance of this property must have exactly one instance of this property. In other words, this property is necessary and not repeatable for its domain and for its range.
one to one, necessary (1,1:0,1)	An individual domain instance of this property must have exactly one instance of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is necessary and not repeatable for its domain, and optional but not repeatable for its range.
one to one (0,1:0,1)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is optional for its domain and range.
one to one, dependent (0,1:1,1)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is optional for its domain and necessary and not repeatable for its range.

Issue 681:

P43 has dimension (is dimension of)

NEW Definition (contains exclusion statements and their rendition in prose)

P43 has dimension (is dimension of)

Domain:

E70 Thing

Range:

E54 Dimension

Quantification:

one to many (0,n:0,1)

Scope note:

This property records an instance of E54 Dimension of some instance of E70 Thing.

In the case that the recorded property is a result of a measurement of an instance of E18 Physical Thing, this property is a shortcut of the more fully developed path from E18 Physical Thing through *P39i was measured by (measured),* E16 Measurement*, P40 observed dimension (was observed in)* to E54 Dimension.

It offers no information about how and when an E54 Dimension was established, nor by whom. Knowledge about an instance of E54 Dimension need not be the result of a measurement; it may be the result of evaluating data or other information, which should be documented as an instance of E13 Attribute Assignment.

Referring to an instance of E54 Dimension by this property is mutually exclusive to using either property *P191 had duration (was duration of)* or *P179 had sales price (was sales price)* to refer to the same instance of E54 Dimension.

Full path:

E18 Physical Thing. P39i was measured by (measured): E16 Measurement. P80 observed dimension (was observed in): E54 Dimension

Examples:

- Silver cup 232 (E22) *has dimension* height of silver cup 232 (E54). [which *has unit (P91)* mm (E58), *has value (P90)* 224 (E60)] (fictitious)
- The “Schoeninger Speer II” (E22)) *has dimension* the carbon 14 based temporal distance from 1996 to the growth of the wood of the “Schoeninger Speer II” (E54). [The carbon 14 dating of the “Schoeninger Speer II” in 1996 of an old complete Old Palaeolithic wooden spear found in Schoeningen, Niederachsen, Germany, in 1995 resulted in approximately 400.000 years. See also: E16 Measurement.] (Kouwenhoven, 1997)

In first-order logic:

$P43(x,y) \Rightarrow E70(x)$
$P43(x,y) \Rightarrow E54(y)$
$E18(x) \wedge P43(x,y) \Leftarrow (\exists z)\ [E16(z) \wedge P39i(x,z) \wedge P40(z,y)]$

Exclusion statements (if P43, then P191 or P179 with the same y is impossible):
$[P43(x,y) \wedge P191(z,w)] \Rightarrow w \neq y$
$[P43(x,y) \wedge P179(z,w)] \Rightarrow w \neq y$

OLD Definition

P43 has dimension (is dimension of)

Domain:

E70 Thing

Range:

E54 Dimension

Quantification:

one to many (0,n:0,1)

Scope note:

This property records an instance of E54 Dimension of some instance of E70 Thing.

In the case that the recorded property is a result of a measurement of an instance of E18 Physical Thing, this property is a shortcut of the more fully developed path from E18 Physical Thing through *P39i was measured by (measured),* E16 Measurement*, P40 observed dimension (was observed in)* to E54 Dimension.

It offers no information about how and when an E54 Dimension was established, nor by whom. Knowledge about an instance of E54 Dimension need not be the result of a measurement; it may be the result of evaluating data or other information, which should be documented as an instance of E13 Attribute Assignment.

An instance of E54 Dimension that is referred to by this property is specific to an instance of E70 Thing.

Full path:

E18 Physical Thing. P39i was measured by (measured): E16 Measurement. P80 observed dimension (was observed in): E54 Dimension

Examples:

- Silver cup 232 (E22) *has dimension* height of silver cup 232 (E54). [which *has unit (P91)* mm (E58), *has value (P90)* 224 (E60)] (fictitious)
- The "Schoeninger Speer II" (E70)) *has dimension* the carbon 14 based temporal distance from 1996 to the growth of the wood of the "Schoeninger Speer II" (E54). [The carbon 14 dating of the "Schoeninger Speer II" in 1996 of an old complete Old Palaeolithic wooden spear found in Schoeningen, Niederachsen, Germany, in 1995 resulted in approximately 400.000 years. See also: E16 Measurement.] (Kouwenhoven, 1997)

In first-order logic:

$P43(x,y) \Rightarrow E70(x)$
$P43(x,y) \Rightarrow E54(y)$
$E18(x) \wedge P43(x,y) \Leftarrow (\exists z)\,[E16(z) \wedge P39i(x,z) \wedge P40(z,y)]$
$P43(x,y) \Rightarrow \neg(\exists z)\,[E52(z) \wedge P191(z,y)]$
$P43(x,y) \Rightarrow \neg(\exists z)\,[E96(z) \wedge P179(z,y)$

P40 observed dimension (was observed in)

NEW Definition (contains exclusion statements and their rendition in prose)

P40 observed dimension (was observed in)

Domain:

E16 Measurement

Range:

E54 Dimension

Subproperty of:

E13 Attribute Assignment. P141 assigned (was assigned by): E1 CRM Entity

Quantification:

one to one, necessary (1,1:0,1)

Scope note:

This property records the dimension of an instance of E18 Physical Thing that was observed in an E16 Measurement Event. The observed item should be documented using the property *P39 measured (was measured by)*.

One measurement activity only determines one dimension of an instance of E18 Physical Thing. This dimension may be any quantifiable aspect of E70 Thing. Weight, length, and chemical content are dimensions in this sense.

Dimensions of an instance of E18 Physical Thing may be determined either by direct observation or using recorded evidence. However, determination by measuring requires the presence of the measured item. Other methods may constitute instances of E13 Attribute Assignment.

Even though knowledge of the value of a dimension requires measurement, the dimension may be an object of discourse prior to, or even without, any measurement being made.

This property is part of the fully developed path from E18 Physical Thing through *P39i was measured by (measured),* E16 Measurement*, P40 observed dimension (was observed in),* to E54 Dimension, which is shortcut by *P43 has dimension (is dimension of).*

Referring to an instance of E54 Dimension by this property is mutually exclusive to using either property *P191 had duration (was duration of)* or *P179 had sales price (was sales price)* to refer to the same instance of E54 Dimension. This follows from the same rule as for *P43 has dimension (is dimension of).*

Examples:

- The measurement of the height of silver cup 232 on 31st August 1997 (E16) *observed dimension* silver cup 232 height (E54). [which *has unit* mm (E58), *has value* 224 (E60)] (fictitious)
- The carbon 14 dating of the "Schoeninger Speer II" in 1996 (E16) *observed dimension* the carbon 14 based temporal distance from 1996 to the growth of the wood of the "Schoeninger Speer II" (E60). [The carbon 14 dating of an approximately 400.000-year-old complete Old Palaeolithic wooden spear found in Schoeningen, Niederachsen, Germany, in 1995. See also: E16 Measurement.] (Kouwenhoven, 1997)

In first-order logic:

P40(x,y) ⇒ E16(x)
P40(x,y) ⇒ E54(y)
P40(x,y) ⇒ P141(x,y)

P40 implies a shortcut P43 with the same y:
P40(x,y) ⇒ (∃z) [E18(z) ∧ P39i (z,x) ∧ E16(x) ∧ P40(x,y)] ⇒ (∃z) [E18(z) ∧ P43(z,y)]

Exclusion statements (by deduction from P43):
[P40(x,y) ∧ P191(z,w)] ⇒ w≠y
[P40(x,y) ∧ P179(z,w)] ⇒ w≠y

OLD Definition

P40 observed dimension (was observed in)

Domain:

E16 Measurement

Range:

E54 Dimension

Subproperty of:

E13 Attribute Assignment. P141 assigned (was assigned by): E1 CRM Entity

Quantification:

one to one, necessary (1,1:0,1)

Scope note:

This property records the dimension of an instance of E18 Physical Thing that was observed in an E16 Measurement Event. The observed item should be documented using the property *P39 measured (was measured by)*.

One measurement activity only determines one dimension of an instance of E18 Physical Thing. This dimension may be any quantifiable aspect of E70 Thing. Weight, length, and chemical content are dimensions in this sense.

Dimensions of an instance of E18 Physical Thing may be determined either by direct observation or using recorded evidence. However, determination by measuring requires the presence of the measured item. Other methods may constitute instances of E13 Attribute Assignment.

Even though knowledge of the value of a dimension requires measurement, the dimension may be an object of discourse prior to, or even without, any measurement being made.

This property is part of the fully developed path from E18 Physical Thing through *P39i was measured by (measured),* E16 Measurement*, P40 observed dimension (was observed in),* to E54 Dimension, which is shortcut by *P43 has dimension (is dimension of).*

Examples:

- The measurement of the height of silver cup 232 on 31st August 1997 (E16) *observed dimension* silver cup 232 height (E54). [which *has unit* mm (E58), *has value* 224 (E60)] (fictitious)
- The carbon 14 dating of the “Schoeninger Speer II” in 1996 (E16) *observed dimension* the carbon 14 based temporal distance from 1996 to the growth of the wood of the “Schoeninger Speer II” (E60). [The carbon 14 dating of an approximately 400.000-year-old complete Old Palaeolithic wooden spear found in Schoeningen, Niederachsen, Germany, in 1995. See also: E16 Measurement.] (Kouwenhoven, 1997)

In first-order logic:

P40(x,y) ⇒ E16(x)
P40(x,y) ⇒ E54(y)
P40(x,y) ⇒ P141(x,y)

O12 has dimension (is dimension of)

NEW DEFINITION (contains exclusion statements and their rendition in prose)

O12 has dimension (is dimension of)

Domain:

S15 Observable Entity

Range:

E54 Dimension

Subproperty of:

Superproperty of:

S15 Observable Entity. O33i has relative dimension (is relative to): S25 Relative Dimension

Quantification:

many to many (0,n:0,n)

Scope note:

This property associates an instance of S15 Observable Entity with an instance of E54 Dimension that the observable entity has. It offers no information about how and when an E54 Dimension was established.

Most instances of E54 Dimension pertain to one item only. An instance of E54 Dimension referred to by more than one item via this property or a specialization of it is more specifically an instance of S25 Relative Dimension, such as a distance between two physical objects.

In the case of S25 Relative Dimension the property is equivalent to *O33i has relative dimension (is relative to)*.

In case the instance of S15 Observable Entity is more specifically an instance of S10 Material Substantial and the instance of E54 Dimension is not an instance of S25 Relative Dimension, using the property *O12 has dimension (is dimension of)* is equivalent to using the property *P43 has dimension (is dimension of)*. In other words, using the one implies the other.

This property is a shortcut of the fully developed path from S15 Observable Entity through *O24i was measured by (measured)*, S21 Measurement, *O39 observed dimension (was observed in)*, to E54 Dimension.

Referring to an instance of E54 Dimension by this property is mutually exclusive to using either property *P191 had duration (was duration of)* or *P179 had sales price (was sales price)* to refer to the same instance of E54 Dimension. This broadens the same rule for*P43 has dimension (is dimension of)*.

Full path:

S15 Observable Entity. *O24i was measured by (measured)*: S21 Measurement: *O39 observed dimension (was observed in)*: E54 Dimension

Examples:

- The earthquake of Mexico City in 2017 (E7) has dimension Mexico City 2017 earthquake magnitude (E54) [which *has type* seismic magnitude (E55), has unit Richter (E58) and has value 6.2 (E60)]. (Mindock, 2017)
- The landslide that was activated in Parnitha in 1999 after the earthquake (E26) *has dimension* Parnitha 1999 landslide crest length (E54) [which *has type* landslide crest length (E55), *has unit* meters (E58) and *has value* (70, ∞) (E60). For the interval interpretation of the value ">70" in the source see notation: https://www.math.net/interval-notation]. (Lucchese et al., 2013; Kritikos et al., 2013; InGeoCloudS, 2012; InGeoCloudS, 2013)

In first-order logic:

O12(x,y) ⇒ S15(x)
O12(x,y) ⇒ E54(y)
(∃xz)[O12(x,y) ∧ O12(z,y) ∧ (x≠z)] ⇒ S25(y) –this follows from the quantification (2,n:0,n) of its subproperty O33)

O12(x,y) ⇐ (∃z) [S21(z) ∧ O24i(x,z) ∧ O39(z,y)]

Both O12 and P43 can be used with S10(x). With the restriction that P43 can pertain to one item only and thus cannotbe used with S25(y), they are in fact equivalent there:
[S10(x) ∧ ¬S25(y)] ⇒ [O12(x,y) ⇔ P43(x,y)]

Exclusion statements (broadening the statements of P43):
[O12(x,y) ∧ P179(z,w)] ⇒ w≠y
[O12(x,y) ∧ P191(z,w)] ⇒ w≠y

OLD DEFINITION

O12 has dimension (is dimension of)

Domain:

S15 Observable Entity

Range:

E54 Dimension

Subproperty of:

Superproperty of:

S15 Observable Entity. O33i has relative dimension (is relative to): S25 Relative Dimension

Quantification:

many to many (0,n:0,n)

Scope note:

This property associates an instance of S15 Observable Entity with an instance of E54 Dimension that the observable entity has. It offers no information about how and when an E54 Dimension was established.

Most instances of E54 Dimension pertain to one item only. An instance of E54 Dimension referred to by more than one item via this property or a specialization of it is more specifically an instance of S25 Relative Dimension, such as a distance between two physical objects.

Referring to an instance of E54 Dimension by this property is mutually exclusive to using either property *P191 had duration (was duration of)* or *P179 had sales price (was sales price)*.

In case the instance of S15 Observable Entity is more specifically an instance of S10 Material Substantial and the instance of E54 Dimension is not an instance of S25 Relative Dimension, using the property *O12 has dimension (is dimension of)* is equivalent to using the property *P43 has dimension (is dimension of)*. In other words, using the one implies the other

This property is a shortcut of the fully developed path from S15 Observable Entity through *O24i was measured by (measured)*, S21 Measurement, *O39 observed dimension (was observed in)*, to E54 Dimension.

Full path:

S15 Observable Entity. *O24i was measured by (measured)*: S21 Measurement: *O39 observed dimension (was observed in)*: E54 Dimension

Examples:

- The earthquake of Mexico City in 2017 (E7) has dimension Mexico City 2017 earthquake magnitude (E54) [which *has type* seismic magnitude (E55), has unit Richter (E58) and has value 6.2 (E60)]. (Mindock, 2017)
- The landslide that was activated in Parnitha in 1999 after the earthquake (E26) *has dimension* Parnitha 1999 landslide crest length (E54) [which *has type* landslide crest length (E55), *has unit* meters (E58) and *has value* (70, ∞) (E60). For the interval interpretation of the value ">70" in the source see notation: https://www.math.net/interval-notation]. (Lucchese et al., 2013; Kritikos et al., 2013; InGeoCloudS, 2012; InGeoCloudS, 2013)

In first-order logic:

$O12(x,y) \Rightarrow S15(x)$
$O12(x,y) \Rightarrow E54(y)$
$[O12(x,y) \wedge O12(z,y) \wedge (x \neq z)] \Rightarrow S25(y)$
$O12(x,y) \Leftarrow (\exists z)\ (S21(z) \wedge O24i(x,z) \wedge O39(z,y))$

Exclusion statements
$[O12(x,y) \wedge P179(z,w)] \Rightarrow (w \neq y)$
$[O12(x,y) \wedge P191(z,w)] \Rightarrow (w \neq y)$
$[S10(x) \wedge \neg S25(y) \Rightarrow [O12(x,y) \Leftrightarrow P43(x,y)]$

O39 observed dimension (was observed in)

NEW DEFINITION (contains exclusion statements and their rendition in prose)

O39 observed dimension (was observed in)

Domain:

S21 Measurement

Range:

E54 Dimension

Subproperty of:

Superproperty of:

E16 Measurement. P40 observed dimension (was observed in): E54 Dimension

Quantification:

one to one, necessary (1,1:0,1)

Scope note:

This property records the dimension of an instance of S15 Observable Entity or a specific constellation of such instances that was observed in an instance of S21 Measurement. The observed items should be documented using the property *O24 measured (was measured by)*.

One measurement activity may determine only one dimension of an instance of S15 Observable Entity or a specific constellation of such instances. Such a dimension may be any observable and quantifiable aspect of the latter. Weight, length, spatial or temporal distances are characteristic kinds of dimensions in this sense.

A dimension of one or more instances of S15 Observable Entity may be determined either by direct observation or using recorded evidence. However, determination by measuring requires the presence of the measured items. Other methods may constitute other kinds of instances of I1 Argumentation.

Even though knowledge of the value of a dimension requires measurement, the dimension may be an object of discourse prior to, or even without, any measurement being made.

This property is a part of the fully developed path from S15 Observable Entity through *O24i was measured by (measured)*, S21 Measurement, *O39 observed dimension (was observed in)* to E54 Dimension.

In case the instance of S21 Measurement is more specifically an instance of E16 Measurement, the instance of E54 Dimension cannot be an instance of S25 Relative Dimension and using the property *O39 observed dimension (was observed in)* is equivalent to using the property *P40 observed dimension (was observed in)*. In other words, using the one implies the other.

Referring to an instance of E54 Dimension by this property is mutually exclusive to using either property *P191 had duration (was duration of)* or *P179 had sales price (was sales price)* to refer to the same instance of E54 Dimension. This follows from the same rule as for *O12 has dimension (is dimension of)*, in the same way as for *P40 observed dimension (was observed in)* and *P43 has dimension (is dimension of)*.

Full path:

Examples:

- The measurement of the angle between the Sun and Moon with a half-moon at daylight as by Aristarchus of Samos on an unknown day around 280 B.C. *observed dimension* the angle between the Sun and Moon with a half-moon at daylight (S26). [observed as 87 degrees instead of the current value of 89° 50'] (Berggren and Sidoli 2007)
- The measurement of the angle between the summit of the Pico del Teide, Tenerife and a horizontal level by Alexander von Humboldt in the harbour of Orotava in Tenerife on the 19th of June 1799 *observed dimension* the angle between the summit of the Pico del Teide, Tenerife and a horizontal level by Alexander von Humboldt in the harbour of Orotava in Tenerife. [observed as 16 ½ degrees] (Humboldt, 1859)

In first-order logic:

$O39(x,y) \Rightarrow S21(x)$
$O39(x,y) \Rightarrow E54(y)$
$P40(x,y) \Rightarrow O39(x,y)$

When restricted to E16 Measurement, i.e. to dimensions that pertain to a single physical thing, O39 and P40 are equivalent:
$P40(x,y) \Leftrightarrow O39(x,y) \wedge E16(x) \wedge \neg S25(y)$

O39(x,y) ∧ E16(x) => ¬S25(y)

O39 implies a shortcut O12 with the same y:
O39(x,y) ⇒ (∃z) [S15(z) ∧ O24i(z,x) ∧ S21(x) ∧ O39(x,y)] ⇒ (∃z) O12(z,y)

Exclusion statements (by deduction from O12):
[O39(x,y) ∧ P179(z,w)] ⇒ w≠y
[O39(x,y) ∧ P191(z,w)] ⇒ w≠y

OLD DEFINITION

O39 observed dimension (was observed in)

Domain:

S21 Measurement

Range:

E54 Dimension

Subproperty of:

Superproperty of:

E16 Measurement. P40 observed dimension (was observed in): E54 Dimension

Quantification:

one to one, necessary (1,1:0,1)

Scope note:

This property records the dimension of an instance of S15 Observable Entity or a specific constellation of such instances that was observed in an instance of S21 Measurement. The observed items should be documented using the property *O24 measured (was measured by)*.

One measurement activity may determine only one dimension of an instance of S15 Observable Entity or a specific constellation of such instances. Such a dimension may be any observable and quantifiable aspect of the latter. Weight, length, spatial or temporal distances are characteristic kinds of dimensions in this sense.

A dimension of one or more instances of S15 Observable Entity may be determined either by direct observation or using recorded evidence. However, determination by measuring requires the presence of the measured items. Other methods may constitute other kinds of instances of I1 Argumentation.

Even though knowledge of the value of a dimension requires measurement, the dimension may be an object of discourse prior to, or even without, any measurement being made.

This property is a part of the fully developed path from S15 Observable Entity through *O24i was measured by (measured)*, S21 Measurement, *O39 observed dimension (was observed in)* to E54 Dimension.

Referring to an instance of E54 Dimension by this property is mutually exclusive to using either property *P191 had duration (was duration of)* or *P179 had sales price (was sales price)*. This follows from the same rule as for *O12 has dimension (is dimension of)*.

Full path:

Examples:

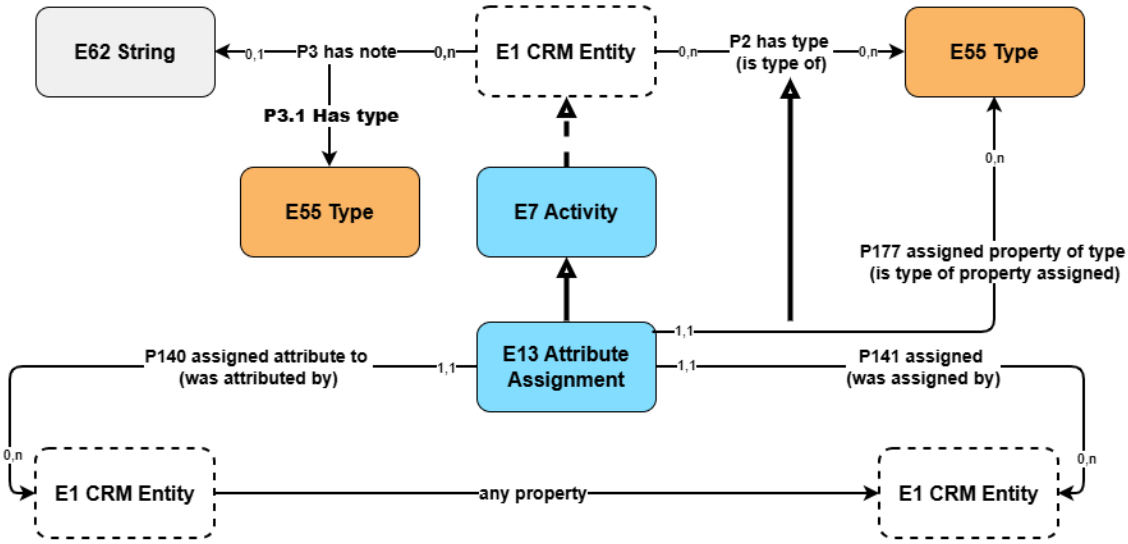
- The measurement of the angle between the Sun and Moon with a half-moon at daylight as by Aristarchus of Samos on an unknown day around 280 B.C. *observed dimension* the angle between the Sun and Moon with a half-moon at daylight (S26). [observed as 87 degrees instead of the current value of 89° 50'] (Berggren and Sidoli 2007)
- The measurement of the angle between the summit of the Pico del Teide, Tenerife and a horizontal level by Alexander von Humboldt in the harbour of Orotava in Tenerife on the 19th of June 1799 *observed dimension* the angle between the summit of the Pico del Teide, Tenerife and a horizontal level by Alexander von Humboldt in the harbour of Orotava in Tenerife. [observed as 16 ½ degrees] (Humboldt, 1859)

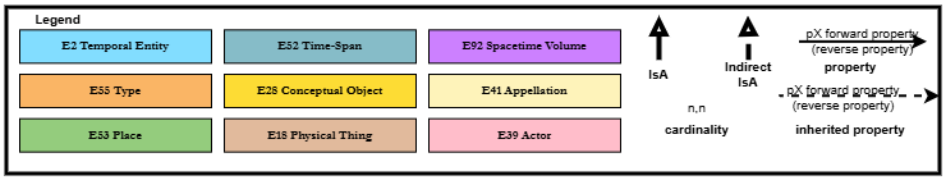
In first-order logic:

O39(x,y) ⇒ S21(x)
O39(x,y) ⇒ E54(y)
O29(x,y) ⇒ (∃z) [S15(z) ∧ O24i(z,x) ∧ O39(x,y)] ⇒ ∃z O12(z,y)
P40(x,y) ⇒ O39(x,y)
P40(x,y) ⇔ O39(x,y) ∧ E18(x) ∧ ¬S25(y)

By deduction:
O39(x,y) ∧ P179(z,w) ⇒ w≠y
O39(x,y) ∧ P191(z,w) ⇒ w≠y

Issue 701:





Issue 718:

NEW DEFINITION

P177 assigned property of type (is type of property assigned)

Domain:

E13 Attribute Assignment

Range:

E55 Type

Subproperty of:

E1 CRM Entity. P2 has type (is type of): E55 Type

Quantification:

many to one, necessary (1,1:0,n)

Scope note:

This property associates an instance of E13 Attribute Assignment with the type of property or relation that this assignment maintains to hold between the item to which it assigns an attribute and the attribute itself. Note that the properties defined by the CIDOC CRM also constitute instances of E55 Type themselves.

A comprehensive explanation about refining CIDOC CRM concepts by E55 Type is given in the section "About Types" in the section on "Specific Modelling Constructs" of this document.

The direction of the assigned property of type is understood to be from the attributed item (the range of property *P140 assigned attribute to (was attributed by))* to the attribute item (the range of the property *P141 assigned (was assigned by)*).

Note that the inverse of a property is not a property in its own right in the CIDOC CRM, but an interpretation implicitly existing for any property. Consequently, an instance of E13 Attribute Assignment relating a pair of items by the inverse of a particular property type is implicitly regarded to relate them by the forward property type as well, but in the direction from the declared range to the declared domain. In a knowledge base implementation, this may be taken care of by the mechanisms for querying, data entry and / or data export.

Examples

- The Current Ownership Assessment of Martin Doerr's silver cup February 1997 (E13) *assigned property of type P52 has former or current owner (is former or current keeper of)* (E55). (fictitious)
- 01 June 1997 Identifier Assignment of the silver cup donated by Martin Doerr (E15) *assigned property of type P48 has preferred identifier (is preferred identifier of)* (E55). (fictitious)
- The examination of MS Sinai Greek 418 (E13) *assigned property of type* binding structure type (E55). ['binding structure type' refers to a property, external to the CIDOC CRM, which connects a book (E22) to the type of its binding structure (E55)] (Honey & Pickwoad, 2010)
- The condition assessment of the endband cores of MS Sinai Greek 418 (E14) *assigned property of type* damage (E55.) ['damage' refers to a property, external to the CIDOC CRM, which connects an instance of a physical thing like an endband core (E22) to the type of damage (E55) it shows] (Honey & Pickwoad, 2010)
- The condition assessment of the cover of MS Sinai Greek 418 (E14) *assigned property of type* quality (E55). ['quality' refers to a property, external to the CIDOC CRM, which connects an instance of a physical thing like a book cover (E22) to its quality (E55)] (Honey and Pickwoad, 2010)

In first-order logic:

P177(x,y) ⇒ E13(x)
P177(x,y) ⇒ E55(y)

OLD DEFINITION

P177 assigned property of type (is type of property assigned)

Domain:

E13 Attribute Assignment

Range:

E55 Type

Subproperty of:

E1 CRM Entity. P2 has type (is type of): E55 Type

Quantification:

many to one, necessary (1,1:0,n)

Scope note:

This property associates an instance of E13 Attribute Assignment with the type of property or relation that this assignment maintains to hold between the item to which it assigns an attribute and the attribute itself. Note that the properties defined by the CIDOC CRM also constitute instances of E55 Type themselves. The direction of the assigned property of type is understood to be from the attributed item (the range of property *P140 assigned attribute to(was attributed by)*) to the attribute item (the range of the property *P141 assigned (was assigned by)*). More than one property type may be assigned to hold between two items.

A comprehensive explanation about refining CIDOC CRM concepts by E55 Type is given in the section "About Types" in the section on "Specific Modelling Constructs" of this document.

Examples

- The Current Ownership Assessment of Martin Doerr's silver cup February 1997 (E13) *assigned property of type P52 has former or current owner (is former or current keeper of)* (E55). (fictitious)
- 01 June 1997 Identifier Assignment of the silver cup donated by Martin Doerr (E15) *assigned property of type P48 has preferred identifier (is preferred identifier of)* (E55). (fictitious)
- The examination of MS Sinai Greek 418 (E13) *assigned property of type* binding structure type (E55). ['binding structure type' refers to a property, external to the CIDOC CRM, which connects a book (E22) to the type of its binding structure (E55)] (Honey & Pickwoad, 2010)
- The condition assessment of the endband cores of MS Sinai Greek 418 (E14) *assigned property of type* damage (E55.) ['damage' refers to a property, external to the CIDOC CRM, which connects an instance of a physical thing like an endband core (E22) to the type of damage (E55) it shows] (Honey & Pickwoad, 2010)
- The condition assessment of the cover of MS Sinai Greek 418 (E14) *assigned property of type* quality (E55). ['quality' refers to a property, external to the CIDOC CRM, which connects an instance of a physical thing like a book cover (E22) to its quality (E55)] (Honey and Pickwoad, 2010)

In first-order logic:

P177(x,y) ⇒ E13(x)
P177(x,y) ⇒ E55(y)

Issue 721:

Argumentation and Proposition Sets

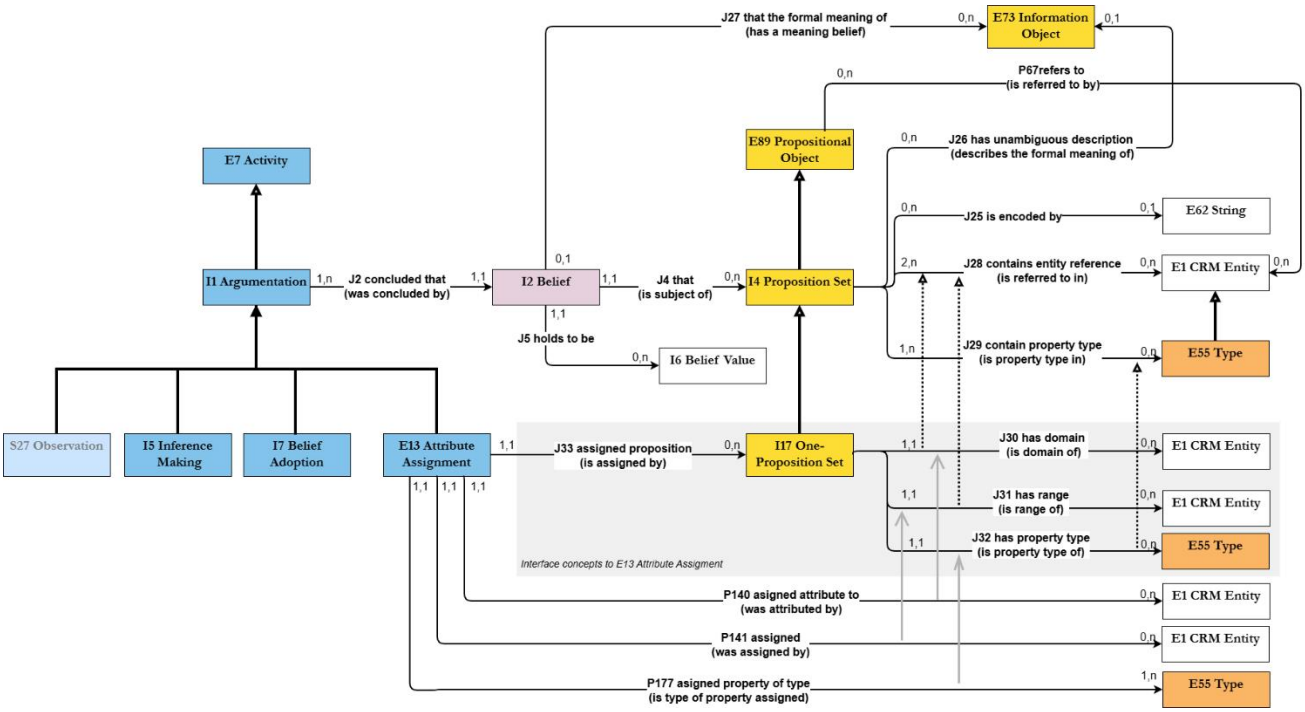


Figure 1: Argumentation, Proposition Sets and E14 Attribute Assignment

The half-saturated colour denotes a concept from CRMsci, its identifier beginning with an "S".

The only top-level epistemological class in CRMinf is I1 Argumentation, a subclass of E7 Activity. Essentially, it comprises all kinds of activities stating a "justified belief". Under I1 Argumentation, CRMinf distinguishes among three basic ways whereby knowledge can be obtained, namely I5 Inference Making and I7 Belief Adoption (both analysed in this model), and S27 Observation (analysed in CRMsci, a separate extension, in view of its applied complexity). The result of argumentation is the belief (I2 Belief) in an instance of I4 Proposition Set, subclass of E89 Propositional Object, which contains the set of propositions that the actors who carried out the argumentation believe to hold true as a whole. Any belief is modified by a belief value (I6 Belief Value). The kinds of belief values to be used are not defined in the model, in order not to make restrictions to the subtleties of scholarly convictions, but a minimal recommended practice would be using "TRUE", "FALSE", or "UNKNOWN".

As a subclass of E89 Propositional Object, the identity of an instance of I4 Proposition Set is given by the meaning (i.e., the referents) of its elements. The latter are formal propositions, independent from their encoding, such as XML RDF, RDF Trig. However, the propositions in question need to be encoded in some form (in a Named Graph or via *J25 is encoded by*).

An instance of I2 Belief pertains to all its elements taken together, which is more expressive than referring to each of the propositions it contains, one by one. The set forms a sort of semantic context, which, if negated, does not amount to negating one particular element of the proposition set (i.e., stating it to be false). E.g., if we have two reports that one and the same person at a specified time was at different places, we would disbelieve the set, but not its elements.

In practical applications, it can be very difficult to formulate all the premises and conclusions of an argumentation in proposition sets by using predicate logic language or knowledge representation language, in particular, because ontologies for the relevant predicates are still missing. Assuming that the automated reasoning mechanism of a knowledge base doesn't need to access every single element of a proposition set, adequate

natural language formulations can be considered sufficiently unambiguous to document relevant premises or conclusions. Therefore, the model offers two simplifications to document the content of a proposition set:

(1) The property *J26 has unambiguous description (describes the formal meaning of)* allows for associating a proposition set (e.g., via its URI) with an instance of E73 Information Object that may contain a text expressing it, such as "Nero was in Antium when the Great Fire broke out in Rome", instead of using *J25 is encoded by*. In this way, the proposition set can still be linked to other entities.
(2) An even shorter modelling option is provided by the property *J27 that the formal meaning of (has a meaning belief)*, which directly associates an instance of I2 Belief with the instance of E73 Information Object containing the text the belief is about.
When this property is used, the intermediate instance of I4 Proposition Set is not explicitly represented and therefore cannot independently be referenced. It is only implicitly defined by *J27 that the formal meaning of (has a meaning belief)*.

In some applications it can be useful to describe by explicit properties that a proposition set refers to certain entities or property types, particularly if the individual propositions constituting the propositions set are accessed by the automated reasoning mechanism in a knowledge base implementation. These are: *J28 contains entity reference (is referred to in)* and *J29 contains property type (is property type in).*

The above model has a similar, but much wider, purpose than the class **E13 Attribute Assignment** in the CIDOC CRM. In contrast, the result of an E13 Attribute Assignment is exactly *one* proposition held to be true by those that carried out the assignment. E13 Attribute Assignment is a central concept with enough specializations in the CIDOC CRM and extensions. Therefore, this version of CRMinf defines how E13 Attribute Assignment and its relevant properties constitute a special case of I1 Argumentation, logically compatible with the CIDOC CRM. The structural differences between the models require a few "auxiliary" concepts, to the end that formal querying and reasoning in a knowledge base implementation will return the correct integrated interpretations of data given with both models. Even though one may find different uses for them in the future, these "auxiliary concepts" need not to be instantiated for typical **data entry** and therefore **can be ignored by** end users. The same holds for the following explanations until the end of this section:

The "auxiliary concepts" are:

- I17 One-Proposition Set
- *J30 has domain (is domain of)*
- *J31 has range (is range of)*
- *J32 has property type (is property type of)*
- *J33 assigned proposition (is assigned by)*

To this end, I4 Proposition Set is further specialized as I17 One-Proposition Set. I17 One-Proposition Set comes with a set of properties to specialise *J28 contains entity reference (is referred to in)* as *J30 has domain (is domain of)* and *J31 has range (is range of)*, each constrained to exactly one occurrence of E1 CRM Entity. On the other hand, *J32 has property type (is property type of)* specialized *J29 contains property type (is property type in)*, again constraining it to exactly *one* occurrence of E55 Type. As an alternative to using the latter three properties (J30, J31, J32), I17 One-Proposition Set may also be implemented by a reification construct, to which it is regarded as logically equivalent in CRMinf. It may also be used in contexts other than the ones described here.

Further, the property *J33 assigned proposition (is assigned by)* serves for associating an instance of I1 Argumentation with an instance of I17 One-Proposition Set, shortcutting over the intermediate instance of I2 Belief, fixed to an implicit belief value "TRUE".

With these auxiliary provisions, E13 Attribute Assignment can formally be declared a subclass of I1 Argumentation: The property *P140 assigned property to (was attributed by)* is interpreted as a strong shortcut of the full path *J33 assigned proposition (is assigned by)*, I17 One-Proposition Set, *J30 has domain (is domain of)*, to E1 CRM Entity (i.e. this path is an equivalent deduction).

An analogous logical relation holds between (i) *P141 assigned (was assigned by)* and *J31 has range (is range of)*, and (ii) between *P177 assigned property of type (is type of property assigned)* and *J32 has property type (is property type of*), respectively.

Since E13 Attribute Assignment is declared a subclass of I1 Argumentation, it inherits the property *J2 concluded that (was concluded by).* This means that one could instantiate *J2 concluded that (was concluded by)* for an instance of E13 Attribute Assignment directly, in addition to its other properties, which would *violate* its definition in CRMbase. Therefore, the *use* of *J2 concluded that (was concluded by)* by E13 Attribute Assignment is logically **restricted** to being instantiated only via its role as the subproperty *J33 assigned proposition (is assigned by)*. For the interested reader, the complete First Order Logic expressions for the above integration of E13 Attribute Assignment under I1 Argumentation is listed under the property *J33 assigned proposition (is assigned by)*.

Differently put, all triples of properties declared for one class to denote the domain/range and type of another property, such as the properties of E13 Attribute Assignment and its subclasses in CRMbase and extensions, can be interpreted as shortcuts over an implicit instance of I17 One-Proposition Set and its properties *J30 has domain (is domain of), J31 has range (is range of),* and *J32 has property type (is property type of)*, or as a reification pattern implicit in the declaring class.

Observation and Inference Making

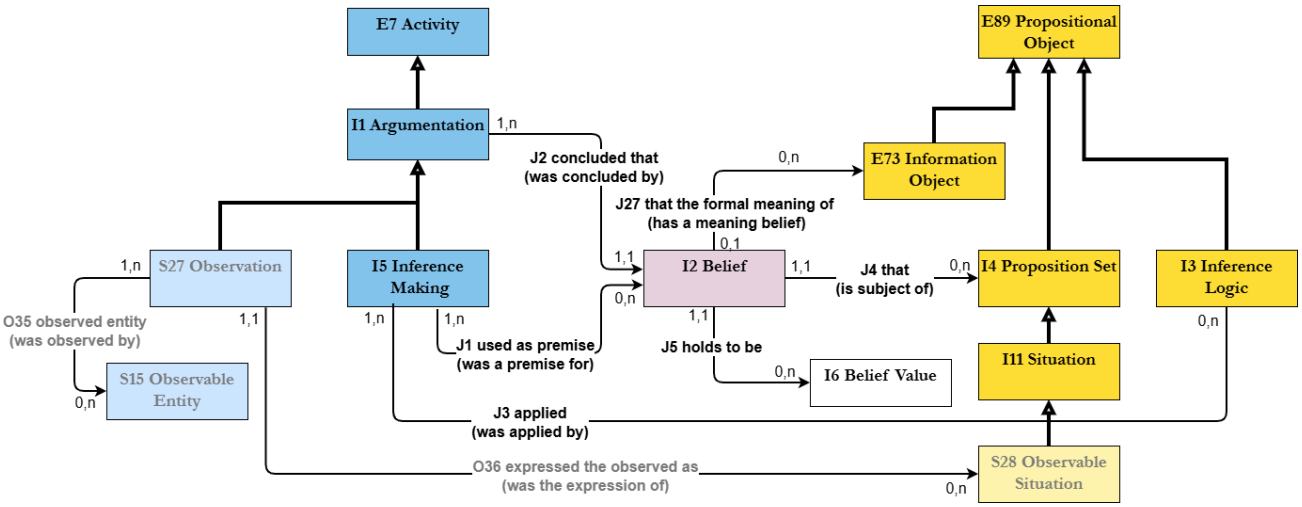


Figure 2: Observation and inference making modelling construct

The half-saturated colours denote concepts from CRMsci, their identifiers beginning with "S" for classes and "O" for properties.

As previously referred to in the Introduction, *Inference making* normally means that one concludes from the belief in the truth or likelihood of one or more propositions, the premises, that other propositions are true or likely, using background theories, such as common logic, laws of nature or assumptions about general human behaviour. This is modelled by the class I5 Inference Making: the belief in the premise, with its set of propositions, is associated via *J1 used as premise (was a premise for),* whereas that in the conclusion is associated using *J2 concluded that (was concluded by)*. The concluded knowledge is contingent upon the assumption that its premises are true. However, an inference may even conclude that at least one of the premises must be wrong, and consequently replaces the belief of the respective Actor in these premises by one to be "FALSE" or at least "UNKNOWN" from this time on.

Making an inference relies on numerous background theories and contextual knowledge, in particular the "Inference for the Best Explanation" (Ladyman, 2002). Hence, for practical reasons, only the least self-evident and most case specific background theories can and should be documented as instances of I3 Inference Logic via *J3 applied (was applied by)*, such as "using the skeletal phenotype characteristics for making a gender estimation".

As described in the introduction, observation is the ultimate primary source of historical scientific knowledge. Due to the complexity of observation processes, they are modelled in detail in CRMsci. Nevertheless, they are completely integrated under the CRMinf concepts: S27 Observation is a subclass of I1 Argumentation, and in the most general case, its results can be described via *J2 concluded that (was concluded by)* and following concepts expressing beliefs, giving credit to the fact that even observations may be unsecure and error prone themselves. Furthermore, CRMsci provides detailed specializations and convenient shortcuts for expressing results, in particular for calibrated measurements, and CRM compatible simplifications falling under the "E13 Argumentation pattern".

In any case, the object of an observation is always regarded to be an instance of a kind of S15 Observable Entity, and the most generic kind of result is regarded to be an instance of S28 Observable Situation (subclass of I11 Situation), which can directly be associated with S27 Observation as domain via the shortcut *O36 expressed the observed as (was the expression of),* if the belief of the observers in the result is "TRUE".

The act of abstraction necessary for expressing the results of an observation as an information object of whatever kind is typically closely tied to an inference, for instance answering the question for which a chemical analysis of

some pigments or of C14 content was made, which should not be confused with the (concluded) primary data of the observation.

Belief Adoption Concepts

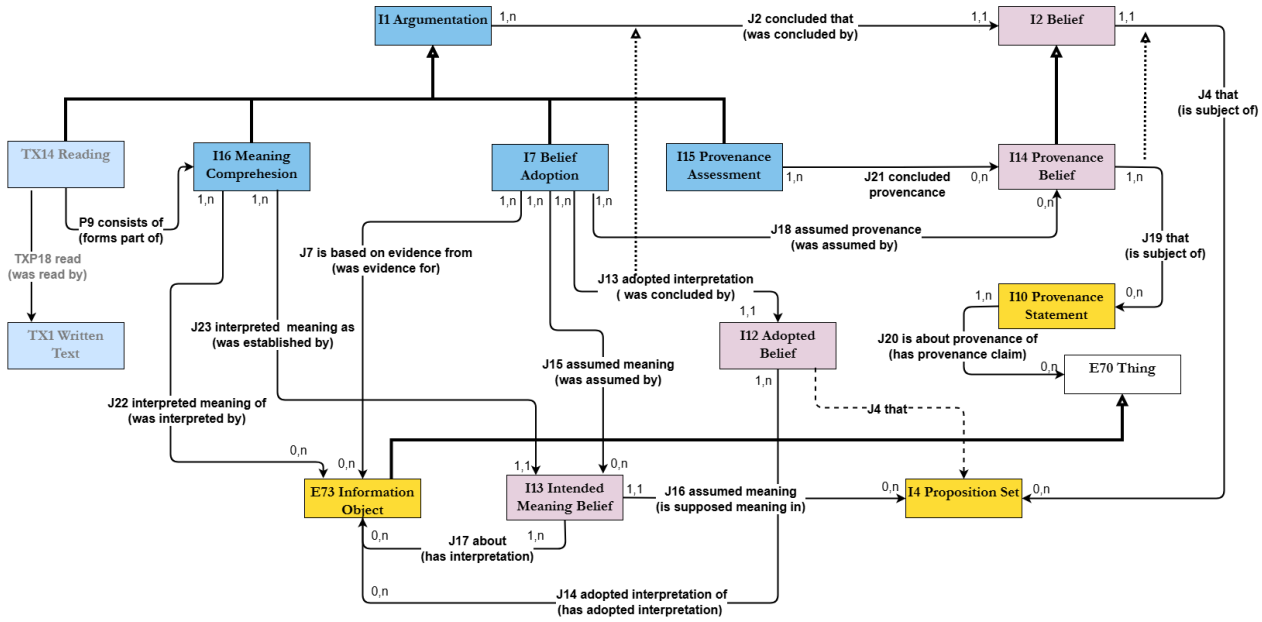


Figure 3:Belief Adoption modelling constructs

The half-saturated colours denote concepts from CRMtex, their identifiers beginning with "TX" for classes and "TXP" for properties.

As mentioned in the Introduction, *Belief adoption* is used in CRMinf as a term for the use of information someone has heard, read or seen presented in symbolic form and has accepted as their own knowledge. It is by far the most frequent way of acquiring knowledge. In many cases, it is equivalent to a citation and reference to a source in an academic publication. However, this model distinguishes a sequence of more detailed prerequisites until one has appropriated some knowledge and refers to it, that may be of great scholarly importance in their own right.

Oral tradition being not yet modelled, the respective processes may start with the "reading" of a material embodiment of a text (or graphics), as modelled in CRMtex by the class TX14 Reading and the property *TXP18 read (was read by)* that associates it with TX1 Written Text, which denotes a material embodiment of a text. CRMtex models in detail the deciphering by material observation and documentation of the result in modern symbolic form as part of the reading.

The actual CRMinf model begins with an instance of I16 Meaning Comprehension, a kind of Argumentation, that *J22 interpreted meaning of (was interpreted by)* an E73 Information Object, which may represent the content of a deciphered text, if a kind of propositional meaning could be established in it. The conclusion, associated by *J23 interpreted meaning as (was interpretation by)* via an I13 Intended Meaning Belief and *J15 assumed meaning (was assumed by)* with an I4 Proposition Set, constitutes an Actor's conviction about what the author of the source, that is, the author of the Information Object, wanted to express, without implying an opinion about its truth. This step is typically implicit in any reading process, including listening to audio, making citations, etc., but it may quite well appear in its own right in critical editions and other scholarly or even jurisdictional investigations.

Once the corresponding source is understood and if it may be regarded to make statements about reality (in contrast to mathematics or fiction), an Actor needs another prerequisite before considering believing one or more statements

in it: There must be a trusted provenance of reference of the source. CRMinf models this process, specializing the general pattern of conclusions in I1 Argumentation, by I15 Provenance Assessment, associated by *J21 concluded provenance (was assessed by)* via an I14 Provenance Belief and *J19 that (is subject of)* with an I10 Provenance Statement. The latter, a subclass of I4 Proposition Set, is used to express that the source assessed, a particular instance of E70 Thing and in principle ***available*** to the Actor believing the Provenance Statement, is ***identical*** in the relevant parts or meaning with a thing that was ***present*** in an appropriate event or context of reference of the source in the past. Therefore, the property *J20 is about the provenance of (has provenance claim)* of I10 Provenance Statement, subproperty of *J28 contains entity reference (is referred to in),* restricts the provenance statement to contain at least one proposition about the source the Actor has at hand. There is plenty of literature about the methodology and extreme complexity of actual processes of I15 Provenance Assessment including observations, inferences and other belief adoptions. However, in normal everyday use, provenance statements are typically themselves the object of belief adoption from trusted sources.

Once the respective source is understood and regarded as having a trusted provenance of reference for its content, an Actor may consider whether to trust (or not) in its credibility, believing statements in it, or at least considering them as likely. CRMinf models this process specifically as I7 Belief Adoption. The process stands out against I5 Inference Making and S25 Observation in so far as it is based on arguments of trust, including the human relations with the providers of the source, in particular, but not restricted to, memory institutions. However, the potential immanent complexity of belief adoption is often self-evident, as for a positively used citation. CRMinf meets this challenge with several simplifications, shortcuts for more elaborate reasoning if worth documenting.

In the **most simple** and frequent case, an I7 Belief Adoption is associated via *J7 is based on evidence from (is evidence for)* with an E73 Information Object, the source(s) of the belief will be taken from and by *J13 adopted interpretation (was concluded by)* with an I2 Adopted Belief. The latter inherits from I2 Belief the property *J4 that (is subject of)* for referring to the propositions considered as credible in the source(s) and *J5 holds to be* for expressing the degree of truth the adopting Actor associates with these propositions **in assumed accordance** with the source. So far in CRMinf, any differentiation by an Actor from a degree of belief expressed in a source is regarded to be a case of I5 Inference Making. Note that a value “TRUE” is meant to characterize a “good explanation” for some facts and not an eternal truth.

The properties *J14 adopted interpretation of (has adopted interpretation)*, *J15 assumed meaning (was assumed by)* and *J17 about (has interpretation)* serve to disambiguate **more complicated** relations between sources and adopted beliefs: *J15 used as premise (was premise for)* associates an I7 Belief Adoption with one or more instances of I13 Intended Meaning Belief that were used to support the I12 Adopted Belief, and possibly were the result of a distinct instance of I16 Meaning Comprehension. In the case that multiple instances of I13 Intended Meaning Belief are used, the property *J17 about (has interpretation)* allows for associating the source for each I13 Intended Meaning Belief separately. Finally, if an instance of I7 Belief Adoption adopts multiple beliefs, the property *J14 adopted interpretation of (has adopted interpretation)* allows for associating an I12 Adopted Belief with its source separately.

Note that subsequent historical activities of belief adoption may form “virtually endless” networks of information transfer, which are of great importance for historical research.

Issue 709:

New proposed definitions for CRMdig annotations-related concepts below.

D35 Area

Subclass of:

D1 Digital Object

Superclass of:

Scope note:

This class describes contiguous parts (of any shape or size) of interest in a digital object that is associated with a kind of topology allowing for such a description, such as a sequential text, a 2D image, a video or a 3D model. It corresponds to and extends the notion of the METS AREA element.

It points to content consisting of a portion or area within the digital object it is defined for. The respective content may be documented independently by another instance of D1 Digital Object using the property *L63 has content copy (is content copy of)*: D1 Digital Object.

Transformations of digital objects, such as 2D projections of 3D models, may require that an annotated area in the original is represented in the projections adequately, both for further annotation, and for distinguishing annotations made for the original or the derived object. Even the opposite may occur, propagating an area defined on a 2D projection back into the 3D model.

The identity of an instance of D35 Area is given by its logical content and the creation event that introduced it for a certain discourse, i.e., multiple authors may introduce different instances of D35 Area that may happen to denote the same area.

Examples:

- …

In First Order Logic:

D35(x) ⇒ D1(x)

Properties:

L49 is primary area of (has primary area): D1 Digital Object
L50 is propagated area of (has propagated area): D35 Area
L62 is defined by (defines): D36 Virtual Geometry
L63 has content copy (is content copy of): D1 Digital Object

D36 Virtual Geometry

Subclass of:

E59 Primitive Value

Superclass of:

Scope note:

This class describes the coordinates of contiguous parts (of any shape or size) of interest in a digital object that is associated with a kind of topology allowing for such a description, such as a sequential text, a 2D image, a video or a 3D model. It corresponds to and extends the notations for the METS AREA element.

Examples:

- …

In First Order Logic:

D36(x) ⇒ E59(x)

Properties:

L49 is primary area of (has primary area)

Domain:

D35 Area

Range:

D35 Area

Subproperty of:

E90 Symbolic Object. P106 is composed of (forms part of): E90 Symbolic Object

Superproperty of:

Quantification:

Scope note:

This property describes the association between an instance of D35 Area with the instance of D1 Digital Object it was originally declared for.

Full path:

Examples:

- …

In First Order Logic:

L49(x,y) ⇒ D35(x)
L49(x,y) ⇒ D35(y)
L49(x,y) ⇒ P106(x,y)

L50 is propagated area (has propagated area)

Domain:

D35 Area

Range:

D35 Area

Subproperty of:

E90 Symbolic Object. P106 is composed of (forms part of): E90 Symbolic Object

Superproperty of:

Quantification:

Scope note:

This property associates an instance of D35 Area with another instance of D35 Area from which it was propagated.

Full path:

Examples:

- …

In First Order Logic:

L50(x,y) ⇒ D35(x)
L50(x,y) ⇒ D1(y)
L50(x,y) ⇒ P106(x,y)

L62 is defined by (defines)

Domain:

D35 Area

Range:

D36 Virtual Geometry

Subproperty of:

Quantification:

many to one, necessary (1,1:0,n)

Scope note:

This property associates an instance of D35 Area with the instance of D36 Virtual Geometry that defines its virtual extent within the respective media object.

In First Order Logic:

L62(x,y) ⇒ D35(x)
L62(x,y) ⇒ D36(y)

L63 has content copy (is content copy of)

Domain:

D35 Area

Range:

D1 Digital Object

Subproperty of:

Quantification:

many to many (0,n:0,n)

Scope note:

This property associates an instance of D35 Area with an instance of D1 Digital Object that contains the definition of its virtual extent within the respective media object.

In First Order Logic:

$L63(x,y) \Rightarrow D35(x)$
$L63(x,y) \Rightarrow D1(y)$

Issue 687:

Subject Information

https://cidoc-crm.org/FunctionalUnits/subject-information

Recording the subject information of a cultural heritage object or "what it is about", is a key means of documenting and retrieving an object based on its intended meaning and content. Subject information gives a key facet by which to find cultural heritage objects with certain topics, be they very specific, e.g. about a particular person, place or event, or categorical, e.g. kinds of people, place or event. For example, a manuscript can be about Jean Paul Sartre, a photograph may have the subject New York, an article may describe World War II, a journal may be about philosophy.

When modelling subject information using the CIDOC CRM we must recall that the ontology clearly divides between physical and conceptual objects. It is the class of conceptual objects, through the more specific class E89 Propositional Object that begins to enable the expression of reference to or being about the world, i.e.: having a subject.

The key patterns then for documenting something having a subject then are:

- E89 Propositional Object P67 refers to E1 CRM Entity
- E89 Propositional Object P129 is about E1 CRM Entity

The distinction between these two properties is that in the former case there is a mention in the subject propositional object of the referred to target object, while in the second case, the object referenced is a central theme or concern of the subject.

Consider the following examples:

- Jean-Paul Sartre: A Life (2005) by Hazel Rowley (E89 Propositional Object) P67 refers to Simone de Beauvoir (E21 Person)
- Jean-Paul Sartre: A Life (2005) by Hazel Rowley (E89 Propositional Object) P129 is about Jean Paul Sartre (E21 Person)

It is important to note of both these properties (P67 and P129) that their ranges are defined as E1 CRM Entity. This is to say that a proposition can be about anything in the world. By implication, a proposition can be about all the major classes of entities of interest to cultural heritage objects including physical things, conceptual objects, events, places and actors.

When documenting a physical cultural heritage object, the CIDOC CRM does allow a direct shortcut property between a physical object and something that it depicts in the world through the pattern:

- E24 Physical Human-Made Thing P62 depicts E1 CRM Entity

Consider the example:

- The Mona Lisa (E22 Human-Made Object) P62 depicts Lisa del Giocondo (E21 Person)

It is, however, best practice in most cases to describe the physical and intellectual content of a cultural heritage object distinctly, for example:

- The Mona Lisa (E22 Human-Made Object) P65 shows visual item the Image of the Mona Lisa (E36 Image) P138 represents Lisa del Giocondo (E21 Person)

This latter form is preferable insofar as the actual entity doing the referring is the propositional object and not the physical object. Capturing its referential information at this point allows the accumulation of documentation to the most relevant instance in the knowledge graph.

Related Patterns: N/A (tbd)

Object Title Information

https://drive.google.com/file/d/1aCIT2nd3ksuYcig7O2QCgT0f4Xayc7dj/view?usp=drive_link

The recording of title information for cultural heritage objects is a key aspect of documentation, allowing the representation of the names that have been ascribed over time to an object to be recorded. Titles are a primary way of identifying objects and retrieving information about them.

To model this information in a uniform way, the CIDOC CRM provides the specialized class E35 Title in order to record the existence of the title itself.

We note that the class E35 Title is a subclass of the E41 Appellation and E33 Linguistic Object classes. This has the implication that it is both a name and a linguistically encoded sign, meaning that in addition to the properties of E41 Appellation we can also use the properties pertaining to language to describe the title. Thus we can connect an instance of E35 Title to an instance of language (E56 Language) through the property P72 has language. Likewise we can connect an instance of E35 Title to another instance of title of which it is the translation through the property P73 has translation.

Instances of E71 Human Made-Thing are linked to their titles through the P102 has title property.

Ontologically, we may note that the pattern E71 Human Made-Thing P102 has title E35 Title is a specialization of the general pattern E1 CRM Entity P1 is identified by E41 Appellation.The specialization occurs as titles are especially given to things that are human made and provide a subject of interest in itself.

A classic example of this pattern is the painting the Mona Lisa. This painting has many names, two of the most well-known being "La Gioconda" in Italian and the "Mona Lisa" in English.

The relation between cultural heritage object and title can be expressed as:

- The Mona Lisa (E22 Human Made Object) P102 has title "The Mona Lisa" (E35 Title)
- The Mona Lisa (E22 Human Made Object) P102 has title "la Giaconda" (E35 Title)

The linguistic information regarding the titles can be expressed as:

- "The Mona Lisa" (E35 Title) P72 has language English (E56 Language)
- "la Giaconda" (E35 Title) P72 has language Italian (E56 Language)
- "The Mona Lisa" (E35 Title) P73 has translation "la Giaconda" (E35 Title)

The information which can be modelled in this pattern thus helps answer questions such as what is the title of this/these object(s), what is/are the languages of the title(s), what translation(s) exist/s, as well, of course, as aiding in finding a particular cultural heritage object by a known title.

Related Patterns: Naming

Issue 662:

Definition of S23 Position Determination

NEW DEFINITION

S23 Position Determination

Subclass of:

S27 Observation

Scope note:

This class comprises activities of determining the actual position of some instance of S15 Observable Entity in space and time by measuring the necessary parameters sufficient for calculating this position. In the case of a material item, the determined position is intended to approximate a part or all of the extent of the presence (instance of E93 Presence) of an instance of the S15 Observable Entity of interest, such as the outer walls of an excavated settlement, the position of a ship sailing or the start and/or end of an athlete's run in a competition. Characteristically, a theodolite or GPS device may be positioned on some persistent feature. Determining the position of the device will yield an approximation of the position of the feature of interest at that time. Alternatively, some material item may be observed moving through a previously determined position at a given time. In case of determining the position of an Event, the approximated position pertains to areas in the spatiotemporal extent of the Event.

This class is not a subclass of S21 Measurement because a position determination normally has to measure more than one dimension. Typically, a position determination consists of a combination of measurements of multiple associated distances and/or angles (instances of E54 Dimension) from a particular spot to certain reference points with previously known position in the same reference space. In some cases, a constituting spatial distance is given by a directed speed and the temporal distance measured from starting from a known position to the actual position, for instance what is registered in a standard log book entry. A particular role is played by the Earth's magnetic field and rotational axis as reference for an angle or direction. Often, the constituting dimensions observed within the context of an instance of S23 Position **D**etermination are not explicitly documented, or hidden in an electronic device**'s** software. Nevertheless, they constitute parts of this activity, which can be documented for future reference by the property *Oxx1 measured dimension (was measured in):* S25 Relative Dimension, or, if they are taken from a previous context, by *Oxx2 used result of (results contributed to):* O27 Observation. Measurements carried out within the course of the instance of S23 Position Determination for part of the latter and can be documented via the property *P9 consists of (forms part of)*: S21 Measurement. Devices used can be documented via *P16 used specific object (was used for)*.

The actual calculation of a position is typically executed following standardized methods as part of the same activity carrying out the necessary observations, in particular by using a GPS device. If the calculation is done later in another context, it should be regarded as a distinct instance of S6 Data Evaluation, with its own history of assumptions and accuracies. Even in this case, it is the results of instance of S23 Position **D**etermination which are determinative for the obtained position. In the simplest case of an item being observed to meet an immobile feature of known position (i.e., at a distance as close to 0 as adequate in the particular context), no calculation is needed.

The determined position may be given as an E94 Space Primitive, which constitutes a declarative place in the sense of CRMgeo (2015). Note that an instance of E94 Space Primitive itself constitutes an area, often implicit by the given digits, and not an infinitesimally small point. Together with the measured time-span covering the time-critical part of the constituting observations it forms a spacetime volume, which ideally should overlap with the spatiotemporal extent of the thing or phenomenon of interest, if adequate error margins are given. Otherwise, the determined position is regarded to approximate the actual one with deviations characteristic for the measurement methods applied. However, instances of this class are regarded as historical facts, which means that they represent the opinion of the actor executing the determination with all its errors and inaccuracies.

Examples:

- the determination of the position of the Titanic for the initial distress call after hitting an iceberg (S23) [The iceberg was hit on 14 April 1912 at 23:40 ship's time. The subsequent position determination was likely done by Capt. Edward Smith and was transmitted 15 April 1912 at 00:27.] (Halpern, 2011)
- the determination of the position of the Titanic by officer Joseph G. Boxhall after the initial distress signal was sent (S23) [done between 00:27 and 00:35, when Boxhall showed the coordinates to Smith] (Halpern, 2011)
- the determination of the position of the Titanic by Robert Ballard's team after the Titanic ship-wreck was found (S23) (Ballard et al., 1987)
- Edmund Hillary and Tenzing Norgay finding themselves on the 29th of May 1953 **at** 11:30 am at the summit of Mount Everest.
- the determination of the position of Messner and Habeler in May 8, 1978 (Messner 1978, Roberts 2003)

In First Order Logic:

$S23(x) \Rightarrow S27(x)$

Properties:

O30 determined position (was determined by): E94 Space Primitive
O31 has validity time-span (is time-span validity for): E52 Time-Span
O32 determined position of (was located by): S15 Observable Entity
O41 measured dimension (was measured in): S25 Relative Dimension
O42 used result of (results contributed to): S27 Observation

OLD DEFINITION

S23 Position Determination

Subclass of:

S27 Observation

Superclass of:

Scope note:

This class comprises activities of determining positions in space and time. The determined position is intended to approximate a part of or all the extent of the presence (instance of E93 Presence) of an instance of E18 Physical Thing or E4 Period of interest, such as the outer walls of an excavated settlement, the position of a ship sailing or the start and end of athlete's run in a competition. Characteristically, a theodolite or GPS device may be positioned on some persistent feature. Determining the position of the device will yield an approximation of the position of the feature of interest. Alternatively, some material item may be observed moving through a determined position at a given time.

This class does not inherit properties from class S21 Measurement. A position determination is an evaluation of a combination of measurement of multiple associated distances and/or angles (instances of E54 Dimension) from a particular spot to certain reference points of previously known position in the same reference space. A particular role is played by the Earth's magnetic field and rotational axis as reference for an angle or direction. Often, the observed constituting dimensions are not documented, or hidden in an electronic device software. The determined position is given as an E94 Space Primitive corresponding to a declarative place. Together with the measured time-span covering the time-critical observations it forms a spacetime volume, which should normally overlap with the spatiotemporal extent of the thing or phenomenon of interest.

Examples:

- the determination of the position of the Titanic for the initial distress call after hitting an iceberg [The iceberg was hit on 14 April 1912 at 23:40 ship's time. The subsequent position determination was likely done by Capt. Edward Smith and was transmitted 15 April 1912 at 00:27.] (Halpern, 2011)
- the determination of the position of the Titanic by officer Joseph G. Boxhall after the initial distress signal was sent [done between 00:27 and 00:35, when Boxhall showed the coordinates to Smith] (Halpern, 2011)
- the determination of the position of the Titanic by Robert Ballard's team after the Titanic ship-wreck was found (Ballard et al., 1987)

In first-order logic:

$S23(x) \Rightarrow S27(x)$

Properties:

O30 determined position (was determined by): E94 Space Primitive
O31 has validity time-span (is time-span validity for): E52 Time-Span
O32 determined position of (was located by): S15 Observable Entity

Definition of O30 determined position (was determined by)

NEW DEFINITION

O30 determined position (was determined by)

Domain:

S23 Position Determination

Range:

E94 Space Primitive

Subproperty of:

Superproperty of:

Quantification:

many to many, necessary (1,n:0,n)

Scope note:

This property associates an instance of S23 Position Determination with an instance of E94 Space Primitive that is the result of calculating or concluding an actual position as an integral part of the activity of determining the position. In case the calculation is done later in another context, it should be regarded as the result of a distinct instance of S6 Data Evaluation. The instance of E94 Space Primitive approximates the place occupied by the entity whose position is being determined by the constituting observations.

Full path:

Examples:

- The determination of the position of the Titanic for the initial distress call after hitting an iceberg (S23) *determined position* 41°44′N 50°24′W (E94).
  [This was determined via 'dead reckoning', i.e. based on the distance travelled since the previous known location, extrapolating a previous dead reckoning for 14 April 1912 20:00] (Halpern, 2011; Boxhall, 1962)
- The determination of the position of the Titanic by officer Joseph G. Boxhall after the initial distress signal was sent (S23) *determined position* 41°46′N 50°14′W (E94).
  [This was again determined via dead reckoning but extrapolating Boxhall's own determination shortly after 20:00, and revised the original position.] (Halpern, 2011; Boxhall, 1962)
- The determination of the position of the Titanic by Robert Ballard's team when the Titanic ship-wreck was found (S23) *determined position* 41°43′32″N 49°56′49″W (E94).
  [This was the position of the centre of the 'boiler field', part of the Titanic debris] (Ballard et al., 1987)
- The determination of the position of the Titanic at the time of the collision (S23), by Samuel Halpern in 2007, *determined position* 41°45.5′N 49°55′W (E94).
  [This was based on the position of the boiler field and the ocean drift at the time.] (Halpern, 2007)

In First Oder Logic:

$O30(x,y) \Rightarrow S23(x)$

$O30(x,y) \Rightarrow E94(y)$

OLD DEFINITION

O30 determined position (was determined by)

Domain:

S23 Position Determination

Range:

E94 Space Primitive

Subproperty of:

Superproperty of:

Quantification:

many to many, necessary (1,n:0,n)

Scope note:

This property associates an instance of S23 Position Determination with the instance of E94 Space Primitive which is the result of that determination. The instance of E94 Space Primitive approximates the place occupied by the entity whose position is being determined.

Full path:

Examples:

- The determination of the position of the Titanic for the initial distress call after hitting an iceberg (S23) *determined position* 41°44′N 50°24′W (E94).
  [This was quickly determined via 'dead reckoning', i.e. based on the distance travelled since the previous known location, extrapolating a previous dead reckoning for 14 April 1912 20:00] (Halpern, 2011; Boxhall, 1962)
- The determination of the position of the Titanic by officer Joseph G. Boxhall after the initial distress signal was sent (S23) *determined position* 41°46′N 50°14′W (E94).
  [This was again determined via dead reckoning but extrapolating Boxhall's own determination shortly after 20:00, and revised the original position.] (Halpern, 2011; Boxhall, 1962)
- The calculation of the position of the Titanic by Robert Ballard's team after the Titanic ship-wreck was found (S23) *determined position* 41°43′32″N 49°56′49″W (E94).
  [This was the position of the centre of the 'boiler field', part of the Titanic debris] (Ballard et al., 1987)
- The determination of the position of the Titanic by Robert Ballard's team when the Titanic ship-wreck was found (S23) *determined position* 41°43′32″N 49°56′49″W (E94).
  [This was the position of the centre of the 'boiler field', part of the Titanic debris] (Ballard et al., 1987)
- The determination of the position of the Titanic at the time of the collision (S23), by Samuel Halpern in 2007, *determined position* 41°45.5′N 49°55′W (E94).

[This was based on the position of the boiler field and the ocean drift at the time.] (Halpern, 2007)

In first-order logic:

O30(x,y) ⇒ S23(x)
O30(x,y) ⇒ E94(y)

Definition of O31 has validity time-span (is time-span validity of)

NEW DEFINITION

O31 has validity time-span (is time-span validity for)

Domain:

S23 Position Determination

Range:

E52 Time-Span

Subproperty of:

E2 Temporal Entity: P4 has time-span (is time-span of): E52 Time-Span

Superproperty of:

Quantification:

many to one, necessary (1,1:0,n)

Scope note:

This property associates an instance of S23 Position Determination with the instance of E52 Time-Span for which the determination is valid according to the observer at the time of the observation. No inferences can be made in relation to the validity of the determination outside this time-span, despite the fact that some entities are relatively stable, and their positions may remain the same after the determination within the relevant precision.

The time-span of validity should fall within the overall time-span of the process of determination. This property should be instantiated if the overall time-span of the process of determination is not sufficiently precise for the purpose and precision of the determination. An example would be the time that a ship reached an assumed position after running for a measured temporal duration with a measured speed and direction from a known position.

Full path:

S23 Position Determination. *O36 expressed the observed as (was observed by)*: S28 Observable Situation. *J24 held at least for (is at least validity of)*: E52 Time-Span

Examples:

- The determination of the position of the Titanic for the initial distress call after hitting an iceberg (S23) *has validity time-span* the time of the collision (E52).
  [This is a plausible guess based on Boxhall's account; the collision was on 14 April 1912 23:40 ship's time.] (Halpern, 2011; Boxhall, 1962)
- The determination of the position of the Titanic by officer Joseph G. Boxhall after the initial distress signal was sent (S23) *has validity time-span* the time of the collision (E52). [Boxhall

was convinced of the correctness of his position determination until his death.] (Halpern, 2011; Boxhall, 1962)

- The determination of the position of the Titanic by Robert Ballard's team after the Titanic ship-wreck was found (S23) *has validity time-span* the time of the position determination (E52).
  [This period falls within the 1st of September 1985 00:48, i.e. the first encounter of a piece of Titanic debris and 1987] (Ballard et al., 1987)
- The determination of the position of Messner and Habeler in May 8, 1978 (S23) *has validity time-span* 8.5.1978 noon (E52). (Messner 1978, Roberts 2003)

In first-order logic:

$O31(x,y) \Rightarrow S23(x)$
$O31(x,y) \Rightarrow E52(y)$
$O31(x,y) \wedge E52(z) \wedge P4(x,z) \Rightarrow P86(y,z))$

OLD DEFINITION

O31 has validity time-span (is time-span validity for)

Domain:

S23 Position Determination

Range:

E52 Time-Span

Subproperty of:

E2 Temporal Entity: P4 has time-span (is time-span of): E52 Time-Span

Superproperty of:

Quantification:

many to one, necessary (1,1:0,n)

Scope note:

This property associates an instance of S23 Position Determination with the instance of E52 Time-Span for which the determination is valid according to the observer at the time of the observation. No inferences can be made in relation to the validity of the determination outside this time-span, despite the fact that some entities are relatively stable, and their positions may remain the same after the determination. The time-span of validity should fall within the overall time-span of the process of determination.

Full path:

S23 Position Determination. *O36 expressed the observed as (was observed by)*: S28 Observable Situation. *J24 held at least for (is at least validity of)*: E52 Time-Span

Examples:

- The determination of the position of the Titanic for the initial distress call after hitting an iceberg (S23) *has validity time-span* the time of the collision (E52).
  [This is a plausible guess based on Boxhall's account; the collision was on 14 April 1912 23:40 ship's time.] (Halpern, 2011; Boxhall, 1962)

- The determination of the position of the Titanic by officer Joseph G. Boxhall after the initial distress signal was sent (S23) *has validity time-span* the time of the collision (E52). [Boxhall was convinced of the correctness of his position determination until his death.] (Halpern, 2011; Boxhall, 1962)
- The determination of the position of the Titanic by Robert Ballard's team after the Titanic ship-wreck was found (S23) *has validity time-span* the time of the position determination (E52).
  [This period falls within the 1st of September 1985 00:48, i.e. the first encounter of a piece of Titanic debris and 1987] (Ballard et al., 1987)

In first-order logic:

$O31(x,y) \Rightarrow S23(x)$
$O31(x,y) \Rightarrow E52(y)$
$O31(x,y) \wedge E52(t) \wedge P4(x,t) \Rightarrow P86(y,t))$

New example for O32 determined position (was located by)

- The determination of the position of Messner and Habeler in May 8, 1978 (S23) *determined position of* Reinhold Messner and Peter Habeler (E20) (Messner 1978)

Definition of O41 measured dimension (was measured in)

O41 measured dimension (was measured in)

Domain:

S23 Position Determination

Range:

S25 Relative Dimension

Subproperty of:

Superproperty of:

Quantification:

many to many, necessary (1,n:0,n)

Scope note:

This property associates an instance of S23 Position Determination with an instance of S25 Relative Dimension that was the result of a measurement carried out as part of the activity of determining the position in order to obtain or complete the necessary information for determining the position, such the distances of the item to be determined from two immobile items with known position, or the compass directions of two light-houses (angles with the Earth's magnetic field**)** as seen from a boat for determining the boat's position.

Only the time-critical measurements need to be carried out of as part of the actual domain instance of this property, such as the time elapsed at which an athlete meets a goal with a predetermined distance from the starting point.

This property needs not be instantiated in cases in which the actual relative dimensions are not known to the user, such as the distances to the satellites when using GPS devices.

Full path:

Examples:

- The determination of the position of Messner and Habeler in May 8, 1978 (S23) *measured dimension* the distance of Reinhold Messner and Peter Habeler from Mount Everest summit 8.5.1978 (S25) (Messner 1978, Roberts 2003)
- The determination of the position of the Titanic by officer Joseph G. Boxhall after the initial distress signal was sent (S23) *measured dimension* the elapsed time from the last fixed star observation 7:30 to the time of the initial distress signal (S25) (Halpern, 2005)
  [Boxhall said that he used the star fix position for 7:30pm (Probably 7:38pm) that night as his base and used a speed of 22 knots from there to a time of 11:45pm.]

In First Oder Logic:

$O41(x,y) \Rightarrow S23(x)$

$O41(x,y) \Rightarrow S25(y)$

Definition of O42 used result of (results contributed to)

O42 used result of (results contributed to)

Domain:

S23 Position Determination

Range:

S27 Observation

Subproperty of:

Superproperty of:

Quantification:

many to many (0,n:0,n)

Scope note:

This property associates an instance of S23 Position Determination with an instance of S27 Observation the results of which were part of the necessary constituting observations of the position determination but carried out earlier, in another context.

Therefore, the observations must not be a critical component of the validity time-span of the position determination, such the measurement of the distance between the start and the finish line in a 100m sprint race competition. In contrast, the measurement of the elapsed time an athlete reaches the finish line needs to fall within the time-span and be part of the domain instance of this property.

Full path:

Examples:

- The determination of the position of the Titanic by officer Joseph G. Boxhall after the initial distress signal was sent (S23) *used results of* the last fixed star observation 7:30 pm (S27) (Halpern, 2005)
  [Boxhall said that he used the star fix position for 7:30pm (Probably 7:38pm) that night as his base and used a speed of 22 knots from there to a time of 11:45pm.]

In First Oder Logic:

$$O42(x,y) \Rightarrow S23(x)$$

$$O42(x,y) \Rightarrow S25(y)$$

New example for S25 Relative Dimension

- the determination of the position of Messner and Habeler in May 8, 1978 (Messner 1978, Roberts 2003)

New examples for O33 is relative to (has relative dimension)

- The distance of Reinhold Messner and Peter Habeler from Mount Everest summit 8.5.1978 (S25) *is relative to* Reinhold Messner and Peter Habeler (E20). (Messner 1978, Roberts 2003)
- The distance of Reinhold Messner and Peter Habeler from Mount Everest summit 8.5.1978 (S25) *is relative to* Mount Everest summit (E27). (Messner 1978, Roberts 2003)

Bibliographic references for the new examples

Halpern, S. (2005) 'A Minute of Time', *THS Titanic Commutator*, No. 171, 2005 and No. 172, 2006.

Halpern, S. (2011) 'Chronology of events with references and notes', in *Report into the loss of the SS Titanic: a centennial reappraisal*. Stroud, Gloucestershire [U.K.]: History Press

Messner, R. (1979) *Everest : expedition to the ultimate*. London : Kaye & Ward ; New York : Oxford University Press. Available at: http://archive.org/details/everestexpeditio00mess (Accessed: 11 May 2026).
50 Years on Everest (2013) *Adventure*. Available at: https://www.nationalgeographic.com/adventure/article/50-years-on-everest-by-phil-powers-american-alpine-club (Accessed: 11 May 2026).

Issue 722:

Definition of R82 is diachronically embodied in (diachronically embodies)

R82 is diachronically embodied in (diachronically embodies)

Domain: F2 Expression

Range: F3 Manifestation

Subproperty of: F2 Expression. R4i is embodied in (embodies): F3 Manifestation

Quantification: many to many (0,n:0,n)

Scope note:

This property associates an instance of F2 Expression which is an iteration of an integrating resource, with the instance of F3 Manifestation in which the iterations successively appear.

The Expressions in the series of iterations appear one at a time in the Manifestation, the most recent Expression replacing the preceding Expression. The same series of iterations may appear in more than one

Manifestation, such as when alternate integrating resource Manifestations in different formats are produced. In addition to the Expressions in the series of iterations, the integrating resource Manifestation may embody other Expressions.

Examples:

- MARC 21 Format for Bibliographic Data, 1999 edition, update no.34 (July 2022) is diachronically embodied in the online MARC 21 Bibliographic at https://www.loc.gov/marc/bibliographic/.

In First Order Logic:

R82(x,y) ⇒ F2(x)

R82(x,y) ⇒ F3(y)

R82(x,y) ⇒ R4(y,x) NOTE: subproperty of the inverse

Definition of R83 is next iteration of (is previous iteration of)

R83 is next iteration of (is previous iteration of)

Domain: F2 Expression

Range: F2 Expression

Subproperty of: F2 Expression. R76 is derivative of (has derivative): F2 Expression

Quantification: one to one (0,1:0,1)

Scope note:

This property associates an instance of F2 Expression to the instance of F2 Expression which is its immediate predecessor in a series of Expressions which are iterations realising the same instance of F1 Work. This property is not transitive. It is asymmetric and irreflexive.

The instances of F2 Expression in the series of iterations of the integrating resource are each derived in turn from their immediate predecessor. This property records the sequence of derivation. This property is declared between an instance of F2 Expression and its immediate predecessor expression, not among all earlier Expressions in the series of iterations. The first Expression in the sequence has no predecessor and the last Expression in the sequence (the latest one published at any point in time, or when the integrating resource ceases publication) has no successor.

Examples:

- MARC 21 Format for Bibliographic Data, 1999 edition, update no.34 (July 2022) is the next iteration of MARC 21 Format for Bibliographic Data, 1999 edition, update no.33 (November 2021).

In First Order Logic:

R83(x,y) ⇒ F2(x)

R83(x,y) ⇒ F2(y)

R83(x,y) ⇒ R76(x,y)

R83(x,y) ⇒ ¬R83(y,x)

R83(x,y) ⇒ (∃z) [F1(z) ∧ R3(z,x) ∧ R3(z,y)] Both F2 Expressions must realize the same F1 Work

Bibliographic references

Format MARC 21 pour les données bibliographiques, édition 1999, mise à jour no 34 (juillet 2022), the French translation of MARC 21 Format for Bibliographic Data, 1999 edition, update no.34 is diachronically embodied in the Canadian MARC 21 website at https://www.marc21.ca/M21/BIB/B001-Sommaire.html.

Issue 684:

Definition of F56 Container

F56 Container

Subclass of: E28 Conceptual Object

E99 Product Type {SIG remarked that the F56 is not a product type, only the F3 members of it}

Scope note:

This class comprises the instances of publisher created venues for issuing manifestations of works that are seen as related to each other by an overarching concept or theme. The instances of F56 Container gain additional members over time with no predetermined end. The manifestations of works that will appear in an instance of F56 Container are not all known when the first member manifestation appears. These works may not even have been created yet.

An instance of F56 Container may have as member only a single F3 Manifestation but normally will have several.

An instance of F56 Container is normally not documented until at least one instance of F3 Manifestation has become a member of it, although the concept for the container may have been first initiated as a proposal, prior to the creation of its member manifestations.

Examples:

- the periodical entitled 'The UNESCO Courier', ISSN '0041-5278'
- the periodical entitled 'Courrier de l'UNESCO', ISSN '0304-3118' [French edition of the periodical titled 'The UNESCO Courier', ISSN '0041-5278']
- the series entitled 'L'évolution de l'humanité', ISSN '0755-1843' [a monograph series comprising volumes that were published by La Renaissance du livre from 1920 on, and some of which were reprinted, with different physical features and rearranged in a different order, from 1968 on, in a distinct series published by Albin Michel also entitled 'L'évolution de l'humanité', ISSN '0755-1770']
- the newspaper entitled 'The Guardian', ISSN '0261-3077'
- the journal entitled 'Cataloging and Classification Quarterly', ISSN '0163-9374'

In First Order Logic:

F56(x) ⇒ E28(x)

F56(x) ⇒ E99(x)

(and properties to see later)

Definition of R84 has member (is member of)

R84 has member (is member of)

Domain: F56 Container

Range: F3 Manifestation

Subproperty of: Outside of CIDOC CRM Scope {SIG, some discussion of using “is type of”}}

Quantification: many to many (0,n:0,n)

Scope note:

This property associates an instance of F3 Manifestation with an instance of F56 Container that it appears in. The property groups instances of manifestations together into a single published container product. Examples include serials of all types that contain articles, such as journals and newspapers, as well as monographic series.

An instance of F56 Container is normally related to at least one instance of F3 Manifestation.

Examples:

- The newspaper ‘The Guardian’, ISSN ‘0261-3077’ (F56) has member the 8 September 2024 issue (F3). [a newspaper issue which is an aggregate of multiple articles]
- The 8 September 2024 issue of the newspaper ‘The Guardian’, ISSN ‘0261-3077’ (F56) has member ‘Paris Paralympics 2024: A closer look – in pictures’ (F3). [https://www.theguardian.com/sport/gallery/2024/sep/08/paris-paralympics-2024-a-closer-look-in-pictures]
- ‘IFLA Series on Bibliographic Control’ (F56) has member ‘Functional Requirements for Authority Data’, published in 2009, ISBN ‘978-3-598-24282-3’ (F3). [it is vol. 34 in the series]
- ‘Cataloging and classification quarterly’, ISSN ‘0163-9374’, a journal published by Taylor & Francis (F56) has member the special issue entitled ‘User Studies in Bibliographic Data and Systems: Insights and Applications’, guest editor: Tanja Merčun (F3). [it constitutes combined issues 3-4 of volume 62, published in 2024, which is an aggregate manifestation consisting of 11 articles]
- ‘Cataloging and classification quarterly’, ISSN ‘0163-9374’, a journal published by Taylor & Francis (F56) has member Volume 59, issue 1 published in 2021 (F3). [an aggregate manifestation consisting of 5 articles]
- The article ‘Extending the LRM Model to Integrating Resources’ by Trond Aalberg, Edward O’Neill & Maja Žumer (F3) is member of ‘Cataloging and classification quarterly’, ISSN ‘0163-9374’, a journal published by Taylor & Francis (F56). [In volume 59, issue 1, pages 11–27. https://doi.org/10.1080/01639374.2021.1876802]
- ‘Le langage’ by Joseph Vendryes, published in Paris in 1921 by La Renaissance du livre (F3) is member of the series entitled ‘L’évolution de l’humanité’, ISSN ‘0755-1843’. [a monograph series comprising volumes that were published from 1920 on, and some of which were reprinted, with different physical features and rearranged in a different order, from 1968 on, in a distinct series also entitled ‘L’évolution de l’humanité’, ISSN ‘0755-1770’ published by Albin Michel] [Volume 3 in the series, https://fr.wikipedia.org/wiki/L%27%C3%89volution_de_l%27humanit%C3%A9]

In First Order Logic:

R84(x,y) ⇒ F56(x)

R84(x,y) ⇒ F3(y)

Definition of R85 has editor (is editor of)

R85 has editor (is editor of)

Domain: F56 Container

Range: E39 Actor

Quantification: many to many (0,n:0,n)

Scope note:

This property associates an instance of E39 Actor with an instance of F56 Container that is edited by that actor. An editor is an actor responsible for the selection and arrangement of the Manifestations that appear in a Container. That is, the editor selects/accepts and orders the articles in a journal or journal issue, or the articles in a newspaper, or the publications in a monographic series. The editor responsible for a particular issue of a journal, a guest editor or special issue editor, is often not the same person as an editor responsible for the journal as a whole.

The actor or actors that edited a particular instance of F56 Container may be unknown or unrecorded.

This property is equivalent to the path: F56 Container. P16i was used for: E7 Activity. P14 carried out by: E39 Actor with P14.1 has type: E55 Type, where the type of actor role is to be the editor of the serial.

Full path:

F56 Container. P16i was used for: E7 Activity. P14 carried out by: E39 Actor (with P14.1 has type: E55 Type = {editor}) {this is more a role for the E39, not a type of E39} {correct name of P14.1 to in the role of}

Properties: R86.1 has type: E55 Type

Scope note:

This property allows for specifying the particular type of responsibility relationship (publisher, sponsoring association, issuing body, funding body) that holds between an instance of E39 Actor and an instance of F56 Container.

Examples:

- 'Cataloging and classification quarterly', ISSN '0163-9374', a journal published by Taylor & Francis (F56) has editor Heather Moulaison Sandy (E21).

In First Order Logic:

$R85(x,y) \Rightarrow F56(x)$

$R85(x,y) \Rightarrow E39(y)$

$R85(x,y) \Leftrightarrow F56(x) \wedge E39(y) \wedge (\exists wz)\ [E7(z) \wedge E55(w) \wedge P16i(x,z) \wedge P14(z,y,w)]$

Definition of R86 has editor (is editor of)

R86 has editor (is editor of)

Domain: F56 Container

Range: E39 Actor

Quantification: many to many (0,n:0,n)

Scope note:

This property associates an instance of E39 Actor with an instance of F56 Container that is edited by that actor. An editor is an actor responsible for the selection and arrangement of the Manifestations that

appear in a Container. That is, the editor selects/accepts and orders the articles in a journal or journal issue, or the articles in a newspaper, or the publications in a monographic series. The editor responsible for a particular issue of a journal, a guest editor or special issue editor, is often not the same person as an editor responsible for the journal as a whole.

The actor or actors that edited a particular instance of F56 Container may be unknown or unrecorded.

This property is equivalent to the path: F56 Container. P16i was used for: E7 Activity. P14 carried out by: E39 Actor with P14.1 has type: E55 Type, where the type of actor role is some form of responsibility of the serial. {correct name of P14.1 to in the role of}

Full path: F56 Container. P16i was used for: E7 Activity. P14 carried out by: E39 Actor (with P14.1 has type: E55 Type = {responsible agent})

Properties: R86.1 has type: E55 Type

This property allows for specifying the particular type of responsibility relationship (publisher, sponsoring association, issuing body, funding body) that holds between an instance of E39 Actor and an instance of F56 Container.

Examples:

- 'Cataloging and classification quarterly', ISSN '0163-9374', a journal published by Taylor & Francis (F56) has responsible agent Taylor & Francis (F11) with has type {publisher} (E55).
- 'IFLA Journal', ISSN '0340-0352' a journal published by Sage Journals on behalf of the International Federation of Library Associations and Institutions (F56) has responsible agent Sage Journals (F11) with has type {publisher} (E55).
- The International Federation of Library Associations and Institutions (F11) is responsible for 'IFLA Journal', ISSN '0340-0352' (F56) with has type {sponsoring association}.

In First Order Logic:

$R86(x,y) \Rightarrow F56(x)$

$R86(x,y) \Rightarrow E39(y)$

$R86(x,y) \Leftrightarrow F56(x) \wedge E39(y) \wedge (\exists wz)\ [E7(z) \wedge E55(w) \wedge P16i(x,z) \wedge P14(z,y,w)]$

Definition of R87 has related container (is container related to)

R87 has related container (is container related to)

Domain: F56 Container

Range: F56 Container

Subproperty of: E70 Thing. P130 shows features of (features are also found on): E70 Thing

Quantification: many to many (0,n:0,n)

Scope note:

This property associates an instance of F56 Container with another instance of F56 Container that is related to it. This property can express that one serial may derive from another. Examples include language editions, earlier/later titles, splits, mergers, supplements and more generally borrowing of an idea.

This is a high-level property that captures the relationship between two instances of F56 Container. It is expected that this property will be subtyped in applications. This property is not necessarily transitive. It is generally not symmetric. It is irreflexive.

Properties: R87.1 has type: E55 Type

This property allows specifying the particular type of relationship between the two Containers, such as expressing the type of derivation. Most subtypes are asymmetric.

Examples:

- The periodical entitled 'Courrier de l'UNESCO' (ISSN '0304-3118') (F56) has related container the periodical entitled 'The UNESCO Courier' (ISSN '0041-5278') (F56) with has type {alternative language} (E55).
- The periodical entitled 'Colloids and surfaces' (ISSN '0166-6622') (F56) has related container the periodical entitled 'Colloids and surfaces. A, Physicochemical and engineering aspects' (ISSN '0927-7757') (F56), with has type {split into} (E55).
- The periodical entitled 'Colloids and surfaces' (ISSN '0166-6622') (F56) has related container the periodical entitled 'Colloids and surfaces. B, Biointerfaces' (ISSN '0927-7765') (F56), with has type {split into} (E55).
- The periodical entitled 'Animal research' (ISSN '1627-3583') (F56) has related container the periodical entitled 'Animal' (ISSN '1751-7311') (F56), with has type {merged into} (E55).
- The periodical entitled 'Animal science' (ISSN '1357-7298') (F56) has related container the periodical entitled 'Animal' (ISSN '1751-7311') (F56), with has type {merged into} (E55).
- The periodical entitled 'Reproduction nutrition development' (ISSN '0926-5287') (F56) has related container the periodical entitled 'Animal' (ISSN '1751-7311') (F56), with has type {merged into} (E55).
- The periodical entitled 'Animal research' (ISSN '1627-3583') (F56) has related container the periodical entitled 'Animal science' (ISSN '1357-7298'), with has type {merged together} (E55).
- The periodical entitled 'Applied economics quarterly' (ISSN '1611-6607') (F56) has related container the periodical entitled 'Applied economics quarterly. Supplement' (ISSN '1612-2127') (F56), with has type {supplement} (E55).

In First Order Logic:

$R87(x,y) \Rightarrow F56(x)$

$R87(x,y) \Rightarrow F56(y)$

$R87(x,y) \Rightarrow P130(x,y)$

$R87(x,y,z) \Rightarrow R87(x,y) \wedge E55(z)$

$\neg R87(x,x)$

Issue 720 :

the examples of P46 is composed of (forms part of)

Proposal to add a new example and deprecate the existing fictitious example for it.

New example:

The "Antique Walrus Tusk Warrior Chessman" (E22) *forms part of* the Lewis Chessmen (E22) .
[The "Lewis Chessmen" were found on the Isle of Lewis in Northwest Scotland in 1831. They were likely made in Trondheim, Norway, in the 12th century. The so-called "Antique Walrus Tusk Warrior Chessman" was bought in

1964 by an Edinburgh antiques dealer, and in 2018 it was recognized as one of five missing major pieces of the Lewis Chessmen. See also E13 Attribute Assignment.] (*Long-lost Lewis Chessman found in Edinburgh family's drawer*, 2019)

Deprecate the fictitious example in P46

The "Hog's Back" (E24) *forms part of* the "Fosseway" (E24)

Substitute the deprecated example in P46 for one making use of the same domain & range

The Throne Room, Knossos (E24) *forms part of* the Palace of Knossos (E24) ('Throne Room, Knossos', 2025)

- 'Throne Room, Knossos' (2025) *Wikipedia*. Available at: https://en.wikipedia.org/w/index.php?title=Throne_Room,_Knossos&oldid=1290115593 (Accessed: 13 May 2026).

reusing the same example for

- E13 Attribute Assignment,
- P140 assigned attribute to (was attributed by),
- P141 assigned (was assigned by),
- P177 assigned property type (is type of property assigned).

E13 Attribute Assignment –add the following:

The assessment in 2019 that the "Antique Walrus Tusk Warrior Chessman" is one of the missing Lewis Chessmen

[The "Lewis Chessmen" were found on the Isle of Lewis in Northwest Scotland in 1831. They were likely made in Trondheim, Norway, in the 12th century. The pieces belong to four chess sets, with many pawns but only five major pieces missing. In 1964 an Edinburgh antiques dealer bought a chess piece and catalogued it as "Antique Walrus Tusk Warrior Chessman" in his purchase ledger. More than 50 years later his family showed it to Sotheby's expert Alexander Kader, who immediately recognized it as one of the missing pieces of the Lewis Chessmen. After the authentication of the find, it was sold at an auction in 2019 to an undisclosed buyer for £735,000 and is now believed to be in a private collection.] (Long-lost Lewis Chessman found in Edinburgh family's drawer, 2019)

P140 assigned attribute to (was attributed by) –add the following:

The assessment of the "Antique Walrus Tusk Warrior Chessman" by Sotheby's expert, A. Kader, in 2018 (E13) *assigned attribute to* Antique Walrus Tusk Warrior Chessman (E22)

[The "Lewis Chessmen" were found on the Isle of Lewis in Northwest Scotland in 1831. They were likely made in Trondheim, Norway, in the 12th century. The so-called "Antique Walrus Tusk Warrior Chessman" was bought in 1964 by an Edinburgh antiques dealer, and in 2018 it was recognized as one of five missing major pieces of the Lewis Chessmen. See also E13 Attribute Assignment.] (*Long-lost Lewis Chessman found in Edinburgh family's drawer*, 2019)

P141 assigned (was assigned by) –add the following:

The assessment of the "Antique Walrus Tusk Warrior Chessman" by Sotheby's expert, A. Kader, in 2018 (E13) *assigned* the Lewis Chessmen (E22).

[The "Lewis Chessmen" were found on the Isle of Lewis in Northwest Scotland in 1831. They were likely made in Trondheim, Norway, in the 12th century. The so-called "Antique Walrus Tusk Warrior Chessman" was bought in 1964 by an Edinburgh antiques dealer, and in 2018 it was recognized as one of five missing major pieces of the Lewis Chessmen. See also E13 Attribute Assignment.] (*Long-lost Lewis Chessman found in Edinburgh family's drawer*, 2019)

P177 assigned property of type (is property of type assigned) –add the following:

The assessment of the "Antique Walrus Tusk Warrior Chessman" by Sotheby's expert, A. Kader, in 2018 (E13) *assigned property of type* 'P46i (forms part of) (consists of))' (E55).

[The "Lewis Chessmen" were found on the Isle of Lewis in Northwest Scotland in 1831. They were likely made in Trondheim, Norway, in the 12th century. The so-called "Antique Walrus Tusk Warrior Chessman" was bought in 1964 by an Edinburgh antiques dealer, and in 2018 it was recognized as one of five missing major pieces of the Lewis Chessmen. See also E13 Attribute Assignment.] (*Long-lost Lewis Chessman found in Edinburgh family's drawer*, 2019)

Bibliographic reference:

Long-lost Lewis Chessman found in Edinburgh family's drawer (2019). Available at: https://www.bbc.com/news/uk-scotland-edinburgh-east-fife-48494885 (Accessed: 25 February 2026)

Deprecate fictitious examples for E13 Properties

P140 assigned attribute to (was attributed by) –deprecate the following:

- The Current Ownership Assessment of Martin Doerr's silver cup February 1997 (E13) *assigned attribute to* Martin Doerr's silver cup (E22). (fictitious)
- The Identifier Assignment on 1st June 1997 of the silver cup donated by Martin Doerr (E15) *assigned attribute to* silver cup 232 (E22). (fictitious)

P141 assigned (was assigned by) –deprecate the following:

- The Current Ownership Assessment of Martin Doerr's silver cup February 1997 (E13) *assigned* Martin Doerr (E21). (fictitious)
- The Identifier Assignment on 1st June 1997 of the silver cup donated by Martin Doerr (E15) *assigned* 232 (E42). (fictitious)

P177 assigned property of type (is type of property assigned) –deprecate the following:

- The Current Ownership Assessment of Martin Doerr's silver cup February 1997 (E13) *assigned property of type* 'P52 has former or current owner (is former or current keeper of)' (E55). (fictitious)
- 01 June 1997 Identifier Assignment of the silver cup donated by Martin Doerr (E15) *assigned property of type* 'P48 has preferred identifier (is preferred identifier of)' (E55). (fictitious)