

# The 40th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 33rd FRBR - CIDOC CRM Harmonization meeting

University of Cologne

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Klosterstraße 79 b (222a) (1st floor), 50931 Köln.

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Patrick Le Boeuf (BNF, FR) through Skype

## Monday 15/1/2018

[Prof. Andreas Speer](#), director of Thomas-Institute of Cologne University, opened the meeting.

We started with Martin's HW. He had worked over Pat's LRM-FRBRoo text.

### Deleting F14 Individual Work, F15 Complex Work

The crm-sig decided to merge F14 and F15 and delete R9 realizes and revise R10. Reserve judgment on R50 etc. related to representative expression. Thus the accepted changes results in changing the subclasses of F1 work

Change the Domain and the scope note of R10

Change the Range and the scope note of R50

### Making F22 Self-Contained Expression => F2 Expression, deleting F23 Expression Fragment:

The crm-sig accepted that all expressions are self-contained. The idea is that any Expression is self-contained. Not-self-contained parts are more generally E90 Symbolic Objects or Information Objects. The Expression Fragment is not needed, but the property is useful. An Expression Creation creates only self-contained content. If interrupted or in between, we talk about E65 Creation events as part of the overall Expression Creation.

This decision results in deleting the F23 expression fragment.

This change affect the subclasses of F2 Expression. Thus the subclasses of the F2 are F24 Publication Expression = F3 Manifestation, F25 Performance Plan, F26 Recording, F34 KOS

The F35 Nomen Use Statement and F43 Identifier Rule are not F2. They are probably E90 or E89. It should be discussed in the next meeting

In addition, it is decided the substitution of E90 for places where F23 used. Thus the range of R3 is changed.

A discussion point was if a work have to have an expression. In library world, it is the case that there must have been an expression. It is an open question, in wider historical context is it possible to have a Work that DOES NOT have expression. CEO proposed to make this a separate discussion.

The range of R3 is realised in (realises) [=LRM-R4] changed to F2 Expression

The domain and range of R5 has component (is component of) changed to F2 Expression. In order to cover situations like paging in digitization, we made R5 subproperty of P106 (E90 Symbolic Object. P106 is composed of (forms part of): E90 Symbolic Object). It remains open to add the P106 note in scope note, saying that when it has to do with symbolic decomposition that one ought to use this property and not R5.

The range of R15 has fragment (is fragment of) changed to E90 Symbolic Object

The range of R17 created (was created by) changed to F2 expression and it is decided that the scope note should be formulated such that R17 pertains to a self contained content. Scope note should be consistent with the self contained form of F2. To consider in looking at scope note of F2.

Another discussion point was the idea that a “representative fragment” is a fragment of the supposed-to-be-lost self-contained expression. This means, that the representative manifestation may not carry the whole expression, but only a fragment of it.

For the time being the range of all properties related to representativeness has changed to F2 Expression and the consolidation of these postponed for later discussion along with the consideration of the above statement. The properties related to representativeness are:

- R40 has representative expression (is representative expression for)
- R41 has representative manifestation product type (is representative manifestation product type for)
- R42 is representative manifestation singleton for (has representative manifestation singleton)
- R48 assigned to (was assigned by)
- R51 assigned (was assigned by)

#### Merging F3 Manifestation Product Type with F24 Publication Expression

Martin proposed the idea: Carrier Production Events are more general than the Product Types. F3 and F24 appear as parallel paths. I propose to reuse the properties of F24 for F3, rename properties and rename F3 to Manifestation. If we accept original manuscripts to be Manifestations (not manually copied books), we cannot distinguish the Expression from the Manifestation, as long as we regard it as immaterial. Therefore, Manifestation MUST be a kind of Expression.

The following discussion points are accepted as principles:

- Manifestation pertains to fixing the sensory signal level of the expression (needs to be formulated).
- Manifestation is a kind of expression.

- We need to differentiate the level of symbolic specificity by which the identity of an expression is defined.
- Distinction between manifestation singleton and product type disappears.
- Product type becomes a special aspect of manifestation. Possible specific product types that are also subtypes of manifestations.
- We must reconsider the following CLP properties/statements of the new class F3 Manifestation (previous F3 Manifestation Product Type).

[CLP2](#) should have type (should be type of): [E55](#) Type

[CLP43](#) should have dimension (should be dimension of): [E54](#) Dimension

[CLP45](#) should consist of (should be incorporated in): [E57](#) Material

[CLP46](#) should be composed of (may form part of): [F3](#) Manifestation Product Type

[CLP57](#) should have number of parts: [E60](#) Number

This raises whole questions of whether individual item contains what it should. It should be raised as separate discussion. We should consider epigraphist position.

About the reintroduction of the incorporate property, the sig decided to consider the specialization of p165 incorporates property in order to handle levels of symbolic specificity, and to discuss bearing on concept of carrying and the role of R4 and whether it is deleted, reused or no.

- It is decided to delete R6 carries (is carried by) and rename R7 is example of (has example) to R7 is materialization of (is materialized in).

Question by PLB about how this property can be P128 carries (is carried by) was a discussion point. It is agreed that this potentially a 'should' relation and another discussion should be had related to the deviation that can exist between the individual items and the manifestation. In addition, question of comparing carriers and their defects with the symbolic object is a discussion that could be opened with the epigraphists. Finally, the sig concluded that there are two solutions: Two solutions: either R7 is not a carries relation or we change the definition of property P128 in CRM itself. All carriers are defective. It is decided to postpone to discussion to consider if we should NOT make this subproperty of P128 or if we revise P128. Also P2 is not supeproperty of this 'new' **R7 is materialization of (is materialized in) [=LRM-R4 Is Exemplified by/Exemplifies]**

- The sig reviewed the F32 Carrier Production Event. Additional comments are:
  - o F32 is more general than F3
  - o R26 and R27 could be optionally or necessarily
  - o There is inconsistency between R28, F54 and R27, F3
  - o It is required further elaboration and take into consideration consistency between manifestation and the specificity of the produced things. Possible distinctions between industrial processes, reproduction and other ways to produce carriers.
- The sig reviewed the R26 produced things of type (was produced by) and decided the following:

- The quantification changed from (1,n:0,n) to (0,1:0,n). It becomes optional.
- It leaves open the degree to which the manifestation and the product type are identical.
- The sig decided to change the name of the property from R27 used as source material (was used by) to R27 materialized (was materialized by) and decided the following:
  - The range of property changed from F24 Publication Expression to F3 Manifestation.
  - The scope note changed from:
  - The scope note needs further elaboration with respect to the publisher

**F19 Publication Work and Manifestation Creation must pertain to the optical and material form of a distributable item. Rewrite scope note of F30**

Comments, actions and decisions taken during this discussion are:

- The concept of publication is ill defined in itself. To control this, we should consider as the bringing into the final communicable material form that would contain signals optical, audio etc. that were intended. Must be communicable and persistent.
- We should revised the scope note of F30 Publication Event with respect to being consistent with the new definition of manifestation. How to express the concept of publication independently from the actual process of making a manifestation and what their relations are (between publication and process of making a manifestation).
- If F19 not needed anymore then R23 should be deleted.
- The range of its property R24 created (was created through)changed from [F24](#) Publication Expression to F3 Manifestation. The scope note updated.

We continued with Pat’s HW

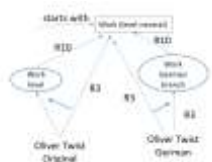
**F1 Work**

1. Pat Riva commented that we usually have intellectual and artistic, should we reverse it in the following sentence?

*“This class comprises distinct concepts or combinations of concepts identified in artistic and intellectual expressions”*

2. Pat Riva suggested that members is not the best term. It is better to say components (as in the super property) or just simply parts. The crm-sig agreed that R10 should be a subproperty for ‘strucural parts’ in the sense of components, distinct from general membership. Thus, we need better examples of R10.

Martin drew on the flipchart the following figure with the translations of Oliver Twist in German



3. The crm-sig discussed that the sentence “A work only exists if at least one expression exists” should be “A work only exists if at least one expression have existed”, since it might be a

confusion of evidence and being. The sig assigned HW to Pat and Maja to revise the whole paragraph: " A Work comes into existence with the creation of its first expression. A work only exists if at least one expression exists. Additional expressions of the work can continue to be created over time. "

4. Revising the scope note of F1 Work we discussed about translations. There was a discussion about the work of a translation.

The marked changes of the above classes and properties are in the appendix A

After the break we continued with Marlet's presentation.

### CRM teaching

On the Question of CRM Teaching (arising from Olivier presentation), MD said that there is a need for organizing training event, teaching the mapping framework, and organizing the family models. Oyvind said about teaching model and mapping. The sig assigned to Oyvind and Christian Emil to make some systematic proposals for tutorials up to the next meeting.

Also the sig will ask all the university partners with graduate students send proposals about potential co supervision of post grad study which should result in skills teaching CRM principles. A call to CRM SIG should be sent.

Martin asked Olivier to discuss some examples from CRMInf and to test the inference chain. Also a special group formed to look at examples of CRMInf. Members of this group are Steve, Thanasis, Olivier

### Issue 321

Achilles presented the examples provide by Eleni Christaki. The crm-sig accepted the examples and decided that in the scope note, we should be more specific on meaning of connectivity, question of what can go through, distinguish between connections that allows humans to move about (human mobility function) and other forms of connectivity

### Tuesday 16/1/2018

We reviewed the proposed LRMer mappings to LRM FRBRoo

### Comments on Entities Mappings

#### LRM-E5 Item

The definition in LRMer of item seems more general than the LRMoo Item. This sense of item as in FRBRoo is not what we need here. This definition here should be mapped to F54.

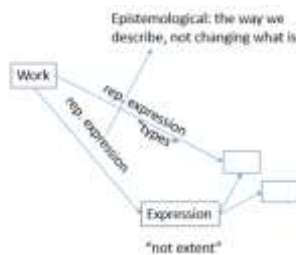
#### LRM-E8 Collective Agent

This works but then intended audiene cannot be mapped as E74 as it is later on. To be reviewed CIDOC-CRM 40

### Comments on Attributes Mappings

#### LRM-E2-A2 Work - Representative expression attribute

This continue to need to be worked out. The cataloguer often will not know what the actual representative expression was. But they know attributes it should have. Not only this but the examples point to different types of attributes which might be given. This would require different paths in CRM. Potentially need a shortcut. Following MD drawing, shortcut would be representative expression "type"



Sometimes we don't even know the original, the types are deducted from analyzing the set. Martin argues that there must have existed at least one which had all the types that are associate to it. The 'has representative expression relation' is epistemological. The way we describe the thing. It does not change what the thing actually is.

LRM-E3-A3 Expression Intended audience

Decision: is to use P103 E55 and make a particular subtype in LRM for Audience Type

Final analysis: this is a long path, which would be hard to explain to users. Since it is an important attribute then we would need some sort of new subtyping in LRM.

The relation here is incorrect. The Range here should be a type for an actor. Make a subtype of P21 or so. To be done.

LRM-E3-A8 Expression Medium of performance

We need a new class called musical expression. It is a subclass of expression. This musical expression is either a performance or an annotation. We decided that this needs more thinking and we can discuss this more. Mapping is fine for now, but we should discuss and see the work Pierre Chofee before making final decision.

Create a subclass of expression musical expression to give these attributes. Then would need to make new properties to express these long paths.

LRM-E4-A3 Manifestation Intended audience

Manifestation will inherit the solution of see P103 specialization can be used as above. Expression mapping that was used above.

LRM-E4-A4 Manifestation Manifestation statement

This can simply be a note and indicate the type of note using typing on the relation. This is because in the source the data is in free text. A Principle is: if original is free text, no more analysis.

LRM-E4-A5 Manifestation Access conditions

MD commented that it is an interesting category of things not accessible to human senses that require some mediation to be rendered to the human being. Can be digital such as in these examples but also mechanical like a hurdie gurdie.

Looking at the LRM standard, the definition and the examples do not seem to be in synch. The one talks about how to obtain the manifestation, the other gives examples of preconditions for running a digital object. Need to know which one to interpret.

Pat said that it seems like the examples are the thing to interpret. MD argued that LRM group should look at this field and make a decision on the definition vs examples. This might be exclusively for digital objects/media.

Potentially this can be dropped given the discussion around what is an access condition.

LRM-E5-A2 [Item](#) [Use rights](#)

Make sure that mapping of the Item in LRMer to LRMoo F5 is contingent on the final definition of F5. The question will be whether the F5 is a physical object or not.

LRM-E9-A1 [Nomen](#) [Category](#)

Case a: the function of the nomen needs example - SS in order for it to make sense

LRM-E9-A4 [Nomen](#) [Intended audience](#)

This mapping has to be reconsidered. We can follow the pattern seen above for intended audience. If Nomen Use Statement is an Expression it could inherit this solution. Pat argued that she is not sure that it is an expression. It has no work. R39 anyhow would need to be revised. MD argues that the intended audience is misleading. The real statement is that it is for these actors that the nomen is appropriate. So R39 really has to be revised. Can this also be related to P103 as a sub relation? Anyhow, the range of Group is definitely not correct.

LRM-E10-A1 [Place](#) [Category](#)

MD should check the mapping E53 Place. P2 has type: E55 Type {Place:Category} against CRMgeo

LRM-E10-A2 [Place](#) [Location](#)

MD should check the mapping E53 Place. P168 is defined by: E94 Space Primitive against CRMgeo

### Comments on Relationships Mappings

LRM-R3 [Expression](#) [is embodied in \(embodies\)](#)

This is an open discussion because this should be some formulation of incorporates. LRM R43 will map to properties still to be defined probably a specialization of incorporates. This will specify a change of symbolic specificity

LRM-R4 [Manifestation](#) [is exemplified by \(exemplifies\)](#) [Item](#)

Anything referencing items has to be considered again once the F5 Item is re defined in LRMoo. not yet done.

LRM-R5 [Work](#) [was created by \(created\)](#) [Agent](#)

For the next meeting MD will consider different possible ways to express the creation of the work

LRM-R13 [Res](#) [has appellation \(is appellation of\)](#) [Nomen](#)

In the specification, the definition and the examples are not in synch. Here we have mapped what the examples say and not what the definition says.

LRM-R14 [Agent](#) [assigned \(was assigned by\)](#) [Nomen](#)

With regards to the LRMer definition it seems that the definition could be sharpened. It seems to refer to a name, but it should refer to an F35. Also the examples have some problems.

This example seems too broad: The term '*proton*' was assigned by Ernest Rutherford to the hydrogen nucleus in 1920

LRM-R18    Work   has part (is part of)    Work

Calls for a specialization in order to indicate structural parts in the sense of the component elements of a work. So we have to create a specialization of membership just for components. We need a good distinction between structural vs temporal component.

MD proposes to keep R10 for any kind of structural OR temporal relationship between works in a hierarchy. Then we should work on a definition in order to be able to create a subproperty which will define a structural component in the sense of temporal simultaneity and how evidence for this is provided. Use of this is not only for FRBRoo but also for buildings and so on. Things that evolve. Also the body and so on.

There is a generic problem here with the part of relation.

LRM-R20    Work   accompanies/complements (is accompanied/complemented by)    Work

We need to formulate a mapping that will be used together this concept of intention. HW unassigned.

LRM-R21    Work   is inspiration for (is inspired by)    Work

The first comment here was to the definition that not necessarily all the content of the first will be used as the source of ideas for the second. F1 Work R16i was initiated by F27 Work Conception P15 was influenced by F1 Work: a shortcut for this will be created in LRMoo

LRM-R24    Expression   is derivation of (has derivation)    Expression

For making this mapping we should create a sub property of P16 in LRM 'derivation source' that would capture just the expressions that were used in an expression concept and are transferred into the product expression, creating derivation chain. Same problem should be faced as in CRMdig and software inputs and outputs etc.

LRM-R25    Expression   was aggregated by (aggregated)    Expression

Postpone IFLA team still working on

LRM-R29    Manifestation   has alternate (has alternate)    Manifestation

Needs a formulation based on intended use

HW is assigned to PAT to look representative and publication event

Scope note of work is HW for Martin

### [Issue 334 scholarly reading](#)

The sig reviewed the figure proposed by Athina. Comments were

To revise the first example of I2 Belief: "My belief that Dragendorff type 29 bowls are from the 1st Century AD" in order to make distinction with the Conviction Class.

It is assigned to the Oyvind to investigate if it could expressed the following phrase without the use of the term "unambiguously" in the scope note of I9 Citation : "in which the interpretation of the source is formulated as a set of formal propositions or regarded to be unambiguously given in a natural language form."

This comment is made under the assumption that the readers will have the same propositional interpretation

The figures and the scope notes are presented in the Appendix C.



## Wednesday 17/1/2018

**Francesco Beretta**(FB) presented a proposal for creating application profiles over the CRMbase and CRM family models. During the presentation, the participants made the following comments:

- MD argued that it is very important to invest in ideas to profiles in order to reduce the complexity of data entry. To exchange format in top of rdf files.
- FB said that the first priority is to develop a UI and that they should be inspired from TEI profiles

The crm-sig concluded that

- we need some utilities that validate the profiles,
- we could have guidelines how to introduce
- We want to have a markup file in a mapping editor – to create a formalism in X3mL or in mapping system.
- We should have a share file somewhere with the dataforhistory.org in order to describe profiles. CEO will take an initiative to cooperate with Francesco on the creation and enrichment of this file.
- MD suggested that we should make use of vocabularies and thesaurus management system like the submission tool of FORTH (BBTtalk).

HW is assigned to CEO will look into making such a markup/schema (could be TEI inspired), FB will be in consultation, GB will contact Wisski and ResearchSpace to tell them about this development

Then **Martijn Va Leusen** presented an extension to CRMbase for CRMsurvey

MD said that it will be nice to have some kind of guidelines in CRMarchaeo. Then the sig proposed to Martijn to discuss with Achille for creating new class and properties to CRMarchaeo. When they have formulated a proposal about them to bring to crm-sig for discussing them.

Then **Petro Liuzzo** presented the Eagle Project and finally **Achille Felliceti** presented some updates to CRMtex.

After the presentations, we started the issues presented in the agenda

### [ISSUE 338 Excavation Area and plans](#)

The issue remains open until it is reviewed by SS

### [ISSUE 302 Examples of A6 Group Declaration Event, A7 Embedding, A8 Stratigraphic Unit](#)

The bibliographic references provided by Eleni Christaki for A6, A7, A9 in the text of CRMarchaeo are accepted. They should be written in Harvard Style. The issue is closed.

### [ISSUE 306 Examples for CRMarchaeo](#)

The proposed examples provided by Eleni Christaki are accepted. These are:

**Example on A2 and A3:** " The relevant photo must be added with corrections at the CRMarchaeo document.

**Example on A4 and A8:** "A The model schema must be added at the introduction of the CRMarchaeo document. The first example must be rephrased in order to include all the relevant information.

**Example on A5:** "The illicit excavation that took part at the '60 at Zominthos Central Building, caused disruption (A5) of archaeological layers and destruction of architectural elements of Rooms 49,28 and 19" (Sakellaraki 2013).

The issue is closed.

#### ISSUE 337: Excavation Interface

The crm-sig reviewed the proposal of GH for the new class *aproximates* and decided the following:

- The new class *Axx Excavation Interface* and the new property *APxx confines* (is confined by) have been accepted. See the definitions in the appendix
- To change of Range for AP4
- There is a inheritance problem since we have too many *confines* properties. The two interface classes should be children of a superclass. The two volumes A2 and S22 should be under a volume superclass. Then the natural volume an interface would children of stratigraphic unit.
- Assigned HW to Achille to put the examples in standard format, to give numbers in the new property and class and to add them in *CRMarchaeo*. In addition, HW assigned to GH to add bibliographic references in the examples.
- Achille should send this version to CB to upload an in progress version to the site.

#### ISSUE 283: Add superproperties to properties of *CRMarcheo*

HW is assigned to Achille and George to make a proposal.

#### ISSUE 282: mappings of *CRMarcheo* and *EH*

The mappings between *CRMarchaeo* and *EH* is still open. It is assigned to Achille to contact Keith May.

#### ISSUE 334 Scholarly reading

The proposed changes from Martin and Athina has been accepted in principle. The crm-sig assigned to Francesco, Oliver Marlet and Achille (if available) to test the model as it is now with their data. An online forum should be created by Francesco for testing between now and next meeting. Need cases of contradicting sources. For the details see the appendix

#### ISSUE 322: Reification of *E13*, *S4* and *I1*

The crm-sig discussed about the old HW assignment of Carlo and CEO for logical representation of named graphs at instance level.

In the flow of this discussion, a comment was posed about "how to describe what can be observed". It is accepted that what we observe is actually a 'situation' a bundle of properties. So class 'observable entity' is wrong. It is needed a logical construct that certain kinds of things can be result of an observation

HW assigned to CEO to communicate with Carlo in order to follow up the proposed by Carlo First Order Theory for the representation of named graphs at instance level. Achilles' reading example in *CRMtex* (TX5 Reading) is good starting point.

#### ISSUE 328 Rights Model

The sig closed this issue since the all the proposed actions have been fulfilled.

### ISSUE 320: quantification of properties in CRMInf

The crm-sig assigned to MD to review CEOs work and by next meeting, MD will give a feedback. The CEO's HW has been posted on the cidoc-crm site in <http://www.cidoc-crm.org/Issue/ID-320-quantification-of-properties-in-crmInf> since 28/3/2017

### ISSUE 329 States and Situations

The crm-sig decided to postpone the HW assignment until observations will have been modelled more explicitly in CRMSci and will have been discussed sampling issues relative to survey extension to CRM proposed by Martijn van Leusen. Also it is decided this text to be saved as accepted background doc

### ISSUE 358 CRMsoc and scope of CRM modules

The crm-sig discussed the proposal by Martin and decided the following actions

#### About Plans model:

The crm sig accepted MD's proposal to withdraw the plans model (classes and properties) from CRMbase. The numbers of classes and properties will be deleted from CRMbase and will not be marked as deprecated since version 6.2.3 of CRMbase is still "In Progress" and it has not been published yet. The crm-sig decided that when classes and properties are deleted from published versions, they will be marked as "deprecated" in all subsequent versions regardless of the version status. In any other case they will be simply deleted.

#### About the CRMsoc:

The crm-sig decided the creation of the CRM Social family model named CRMsoc, for capturing all social documentation. Presently this would include: the new plans classes and the new rights holding classes and relations.

Its scope will be social norms and social life. The Editor will be Francesco Berreta.

Supporters/members of the group will be: Melanie Roche (MR), CEO, Pat Riva (PR) on matters regarding rights and Thanasis Velios (TV) on matters regarding plans.

#### About superproperties in family models:

The sig accepted MD' proposal to terminate the rule currently used in CRMbase that dictates the exclusive maintenance of all superproperties necessary to reach all elements in a CRM compatible graph. Also, the crm-sig provided family models which have "special mark-up and permission" the possibility to explicitly declare additional superproperties, as few as possible, and clearly justified by a distinct subject.

#### About a top-level ontology on which CRM and all its extensions will be depended:

It was decided to create a top-level ontology of super properties that will secure the complete coverage of searchability of the CRMbase and all family models. One special issue is to defend these properties as being out of the scope relative to scope of CRMbase for purpose of keeping compatibility with ISO.

This top-level ontology will be formulated and elaborated by CEO, MD, and Carlo.

#### About Temporality of relationships:

The sig accepted MD's proposal that the temporality of relationships appears to be a separate topic with a set of distinct ontological patterns, which need to be considered separately. Depending on the pattern, it should be decided into which module an explicit description of a temporal validity of a relationship will belong, regardless of the "time agnostic" CRMbase versions.

This work has been assigned to Francesco

#### About simplifying the template for the description of the family models:

During the discussion about describing the new family model CRMsoc, Thanasis Velios commented that there is no reason to repeat all the explanatory material regarding ontologies in each template. Instead readers should be referred to the to the corresponding sections in CRMbase. The MD explained that the description of each family model should be self-contained. The crm-sig assigned TV to propose simplified template for extensions.

Finally, Francesco commented that it is too complicated to maintain the family models and the extensions and to produce the specification document and the different serializations and we should try to find funding through a call. The crm-sig accepted this statement.

### Thursday 18/1/2018

We started with presentations

**Massoomeh Niknia** presented the application of CIDOC-CRM in modelling grey archaeological literature in Iran

**Omid Hodjati** (via Skype from Iran or presented by Ms. Massoomeh Niknia) presented the Qoqnus, a Heritage Information Management System

Before we start with issues, there was a discussion about updating the CIDOC- CRM and family models text. It is decided to create a document with guidelines for updating the crm texts. For example, how to write examples with bibliographic references, new versions numbers etc..This is assigned to CB.

#### ISSUE 333 Model for Plans

The crm-sig reviewed the examples and comments made by GB and decided:

- To accept the examples except for the end of intention example see the highlighted text blue in the appendix
- To move all classes and properties from CRMbase to CRMsoc and permanently delete the numbers associated in CRMbase with no further mention of these classes/properties.
- To assign HW to (1) MD to revise the highlighted blue examples, (2) Chryssoula Bekiari (CB) to do the above editing and deleting, (3) Francesco Beretta (FB) to add these classes and properties described in the appendix to CRMsoc

#### ISSUE 350: Redefinition of O7 confines (is confined by)

The crm-sig decided to close this issue since this definition has been incorporated in the CRMsci In Progress v.1.2.5

#### ISSUE 332 Properties of S10 Material Substantial of CRMsci

The crm-sig reviewed the comments and the examples about the classes of CRMsci. The outcome is

**S1 Matter Removal:** crm accepted the editorial changes in the example

**S2 Sample Taking:** Examples of S2 provided by Thanasis are accepted. Thanasis should provide bibliographic references

**S3 Measurement by Sampling:** changes made to scope note. HW assigned to TV to add identifying information for the particular measurement in gas chromatography example. MD should revise the phrase in yellow.

**S4 Observation:** the review of the definition of this class has been postponed.

**S5 Inference Making:** The sig reviewed and accepted the examples. Thanasis should provide reference for cupid example. The examination of the relation this class with I5 lference Making of crm-sig has been postponed until reconsideration of S4 Observation.

**S6 Data Evaluation:** The examples accepted but reference needed for Ancient Messini example. This is assigned to TV. Also it is assigned to TV and MD, to take examples from laser department of FORTH

NEW ISSUE: The crm-sig discussed about the TV's comment that we need a property to link S6 with the data with which we make the calculation, decided to open new issue to formulate the belief conditions for the input data of the data evaluation process. Need to add a link of input data AND this has to be conncted to CRMdig.

**S7 Simulation or Prediction:** The examples are accepted and asked TV to add reference for st Catherine example. Also the crm-sig argued that we should add an example of a what if simulation, inputs and outputs are fictitious but comparable to reality. It would be a good idea to add agent based model in CH, Or example from Sahara. It is assigned OE and/or SS.

**S8 Categorical Hypothesis Building:** The fictitious example is deleted, the example Hypothesizing is accepted. TV should add reference to it.

**S9 Property Type:** It is postponed, it should be considered together with the issue related to redoing S4

**S10 Material Substantial:** the examples are accepted.

**S11 Amount of Matter:** The sig considered the comment made by TV, that this class does not have any properties and it is difficult to see the difference with S10 from the scope note, explained that such an amount of matter, in order to be identifiable individual, requires a sort of confinement that supplies a constraint on the constellation of matter and its stability of form which, in practical terms, could be a bottle. In addition, the sig took the decision to add a phrase to encapsulate the above explanation in the S11 scope note. This HW is assigned to MD. The examples are accepted.

**S12 Amount of Fluid:** The current example is accepted, but the sig asked MD to add Armstrong example.

**S13 Sample:**The examples are accepted. TV should give a reference for the second example.

**S14 Fluid Body:** The sig rejected the fictitious example. Added the river. In addition, we should add a reference to the geological definition on which this class is modelled.

**S15 Observable Entity:** It is postponed because the whole entity is under review.

**S17 Physical Genesis:** sig accepted the examples. TV should give reference to his sampling example. (Athina should check the comments)

**S18 Alteration:** The examples are accepted. TV should add ref for example 2

**S19 Encounter Event:** Decision: accepted by for adding references and the name of the trawler (Athina should check the comments)

**S20 Rigid Physical Feature:** sig accepted the examples but asked Athina to improve the syntax of 4th example.

**S21 Measurement:** The Generic example is rejected and it is decided that we need real examples from laser department at FORTH

**S22 Segment of Matter:** the sig reviewed the scope note and decided to ask SS and MD to elaborate it further up to the next meeting. The example is rejected. We need an example of a 'balk' from an archaeological record

#### ISSUE312: Mapping Geopolitical Units to Period

The crm-sig added the text provided by Christian Emil and Gerald Hiebel about the geopolitical unit. In the scope note of E4 Period, in addition added some examples. The new scope note for E4 Period is appeared in the appendix. The issue is closed.

#### ISSUE275 Space primitive

Homework assigned to MD to create the .1 property. GB, OE SS and others will give examples of the actual practice of having approximate locations. This will allow us to check if the accuracy should be a property on property or if the approximation is related to the event itself. In addition, the crm-sig decided that this property is no longer necessarily accepted for CRMbase, it should be determined if should go in CRMgeo or it may still go in base.

#### ISSUE314: The introductory text of CIDOC CRM site

The sig assigned to SS to review in Cologne at OE workshop and then Steve will send for voting by email, in order to be added to the site. The text is appeared in appendix H.

#### ISSUE260 Review specializations of Appellation

The sig reviewed the proposal by Oyvind for E35 Title and accepted it. The revised scope note is in the appendix I.

#### ISSUE295 Digital Libraries as physical objects

The sig reviewed MD's HW and decided the following:

- delete E84 information carrier
- E78 Curated Holding: New examples have been added
- E24 Physical Man-Made Thing
- Changes in scope note
- Examples moved from E84 to E24
- Also we should look for example of well known some sort of information bearing object that does not have information on it. E.g. empty blackboard. This is HW for MD
- E25 Man-Made Feature: scope note extension and two examples have been added

The text of the discussion is appeared in appendix J.

#### ISSUE346: E28 Examples

The sig accepted the explanations and examples provided by MD. They should be added to the standard with explanations in line as is, in order to support understanding of reader/user.

§ Beethoven's "Ode an die Freude" (Ode to Joy) (E73)

§ the definition of "ontology" in the Oxford English Dictionary (E73)

§ the knowledge about the victory at Marathon carried by the famous runner (E89)

explanation: In the following examples we illustrate the distinction between a propositional object, its names and its encoded forms. The Maxwell equations are a good example, because they belong to the fundamental laws of physics and their mathematical content yields identical, unambiguous results regardless formulation and encoding.

§ 'Maxwell equations' [preferred subject access point from LCSH, (E41)

<http://ccn.loc.gov/sh85082387>, as of 19 November 2012]

explanation: This is only the name for the Maxwell equations as standardized by the Library of Congress and NOT the equations themselves.

§ 'Equations, Maxwell' [variant subject access point, from the same source] (E41)

explanation: This is another name for the equation standardized by the Library of Congress and not the equations themselves.

§ Maxwell's equations (E89)

explanation: This is the propositional content of the equations proper, independent of any particular notation or mathematical formalism.

§ The encoding of Maxwells equations as in

<https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Maxwell'sEquations.svg/500px-Maxwell'sEquations.svg.png> (E73)

explanation: This is one possible symbolic encoding of the propositional content of the equations.

## APPENDIX A : Classes and properties of LRM-FRBRoo discussed

### F1 Work

Subclass of: [E89](#) Propositional Object Superclass of: [F21](#) Recording Work

[F17](#) Aggregation Work

[F18](#) Serial Work

Scope note: This class comprises distinct concepts or combinations of concepts identified in artistic and intellectual expressions, such as poems, stories or musical compositions. Such concepts may appear in the course of the coherent evolution of an original idea into one or more expressions that are dominated by the original idea. The conceptual content of a Work can evolve over time, such as through revised editions, translations or other derivatives. A Work may be elaborated by one or more Actors simultaneously or over time. The substance of Work is ideas. A Work may have members that are works in their own right.

A Work comes into existence with the creation of its first expression. A work only exists if at least one expression exists. Additional expressions of the work can continue to be created over time.

A Work is the product of an intellectual process of one or more persons, yet only indirect evidence about it is at our hands. This can be contextual information such as the existence of an order for a work, reflections of the creators themselves that are documented somewhere, and finally the expressions of the work created. As ideas normally take shape during discussion, elaboration and implementation, it is not reasonable to assume that a work starts with a complete concept. In some cases, it can be very difficult or impossible to define the whole of the concept of a work at a particular time. The objective evidence for such a notion can only be based on a stage of expressions at a given time. In this sense, the sets of ideas that constitute particular expressions may be regarded as a kind of “snap-shot” of a work.

Bibliographic and cultural conventions play a crucial role in determining the exact boundaries between similar instances of works. User needs are the basis for determining whether instances of expression are considered to belong to the same instance of work. When the majority of users, for most general purposes, would regard the expression instances as being intellectually equivalent, then these expressions are considered to be expressions of the same work.

Generally, when a significant degree of independent intellectual or artistic effort is involved in the production of an expression, the result is viewed as a new work with a derivation relationship to the source work. Thus paraphrases, rewritings, adaptations for children, parodies, musical variations on a theme and free transcriptions of a musical composition are usually considered to represent new works. Similarly, adaptations of a work from one literary or art form to another (e.g., dramatizations, adaptations from one medium of the graphic arts to another, etc.) are considered to represent new works. Abstracts, digests and summaries are also considered to represent new works.

The essence of the work is the constellation of concepts and ideas that form the shared content of what we define to be expressions of the same work. A work is perceived through the identification of the commonality of content between and among various expressions. However, similarity of factual or thematic content alone is not enough to group several expressions as realizing the same instance of work. For example, two textbooks both presenting an introduction to calculus, or two oil paintings of the same view (even if painted by the same artist), would be considered distinct works if independent intellectual or artistic effort was involved in their creation.

A Work may include the concept of aggregating expressions of other works into a new

**Commented [Pat Riva1]:** We usually have intellectual and artistic, should we reverse it?

**Commented [GB2]:** Consider R10 and a subproperty for ‘structural parts’ in the sense of components, distinct from general membership. And need better examples of R10.

**Commented [Pat Riva3]:** Agree that members is not the best term. Should we say components (as in the property) or just simply parts?

**Commented [GB4]:** To discuss. Should we say ‘have existed’. Is there a confusion of evidence and being? – principles sample

**Commented [GB5]:** Revise whole paragraph. –Pat and Maya HW

**Commented [Pat Riva6]:** In the F2 scope note I tried to change this example to sound less like component parts.



expression. For instance, an anthology of poems is regarded as a work in its own right that makes use of expressions of the individual poems that have been selected and ordered as part of an intellectual process. This does not make the contents of the aggregated expressions part of this work.

Examples: Abstract content of Giovanni Battista Piranesi's 'Carcere XVI: the pier with chains: 1<sup>st</sup> state' (F14)

'La Porte de l'Enfer' by Auguste Rodin conceived between 1880 and 1917 (F15)

'Hamlet' by William Shakespeare (F15)

Properties: R1 is logical successor of (has successor): F1 Work

Rn is inspiration for (was inspired by): F1 Work

R2 is derivative of (has derivative): F1 Work (R2.1 has type: E55 Type)

R3 is realised in (realises): F22 Self-Contained Expression (this is exactly the same)

R40 has representative expression (is representative expression for): F22 Self-Contained Expression we should preserve in some form

#### F2 Expression

Subclass of: E73 Information Object

Superclass of: F24 Publication Expression = F3 Manifestation

F25 Performance Plan

F26 Recording

F34 KOS

Scope note: This class comprises distinct combinations of signs of any form or nature (including visual, aural or gestural signs) intended to convey intellectual or artistic content and identifiable as such. F2 Expressions are the intellectual or artistic realisations of *works* in the form of identifiable immaterial objects, such as texts, poems, jokes, musical or choreographic notations, movement pattern, sound pattern, images, multimedia objects, or any combination of such forms that have objectively recognisable structures. The substance of F2 Expression is signs.

An F2 Expression comes into existence simultaneously with the creation of its first manifestation. Expressions cannot exist without a physical carrier, but do not depend on any specific physical carrier and can exist on one or more carriers simultaneously. Carriers may include human memory.

Inasmuch as the form of an F2 Expression is an inherent characteristic of the F2 Expression, any change in form (e.g., from alpha-numeric notation to spoken word, a poem created in capitals and rendered in lower case) is a new F2 Expression. Similarly, changes in the intellectual conventions or instruments that are employed to express a *work* (e.g., translation of a text from one language to another) result in the creation of a new F2 Expression. Thus, if a text is revised or modified, the resulting F2 Expression is considered to be a new F2 Expression. Minor changes, such as corrections of spelling and punctuation, etc., are normally considered variations within the same F2 Expression. On a practical level, the degree to which distinctions are made between variant *expressions* of a *work* will depend to some extent on the nature of the F1 Work itself, and on the anticipated needs of users. [have not added (from LRM): and on what the cataloguer can reasonably be expected to recognize ...]

The genre of the F1 Work may provide an indication of which features are essential to the F2 Expression. In some cases, aspects of physical form, such as typeface and page layout, are not integral to the intellectual or artistic realisation of the *work* as such, and therefore are not distinctive criteria for the respective expressions. For another work, features such as layout may be essential. For instance, the author or a graphic designer may wrap a poem around an image.

[Notes from October meeting, seem to be covered, do not see any need to add text: The identity of an expression has different levels, and depend on the level at which the symbols are relevant—to cover the criteria varying depending on characteristics. More specific identity criteria can be included in less specific criteria. The level of specificity of symbols cannot be globally defined (typeface, etc is not globally significant, nor is spelling)]

[Expressions may be extant, fragmentary or lost. This affects how we determine identity conditions: if extant, we use the symbolic content of the expression; if fragmentary: we are reconstructing based on the fragments we have; if expressions are lost, we have only evidence in historical sources]

An expression of a work which is composed of structural or logical parts that are themselves works, will realise these works, and the resulting larger expression will be composed of expressions of these component works.

However, the expression of an aggregating work, which consists only of the plan for the selection, arrangement, etc. of specific pre-existing expressions of other works, does not contain those expressions. For instance, an aggregating work behind the creation of an anthology of poems is regarded as a work in its own right. The aggregating expression makes use of expressions of the individual poems that have been selected and ordered as part of an intellectual process. This does not make the aggregated expressions component parts of this expression of an aggregating work, but only parts of the resulting F24 Publication expression(?).

[Notes from October meeting, not done: Critical edition: we should take a position for digital humanities. It is needed to be described that this work is the bridge between library work and scholarly work, we need to find someone to apply FRBRoo to critical editions—Christian-Emil]

If an instance of F2 Expression is of a specific form, such as text, image, etc., it may be simultaneously instantiated in the specific classes representing these forms in CIDOC CRM. Thereby one can make use of the more specific properties of these classes, such as language (which is applicable to instances of E33 Linguistic Object only).

.....

Properties: [R4](#) carriers provided by (comprises carriers of): [F3](#) Manifestation Product Type  
[R5](#) has component (is component of): F2 Expression  
[R15](#) has fragment (is fragment of): E90 Symbolic Object  
[R41](#) has representative manifestation product type (is representative manifestation product type for): [F3](#) Manifestation Product Type (it might be not needed, or should be reworked)

#### *Merging F3 Manifestation Product Type with F24 Publication Expression*

*The idea: Carrier Production Events are more general than the Product Types. F3 and F24 appear as parallel paths. I propose to reuse the properties of F24 for F3, rename properties and rename F3 to Manifestation. If we accept original manuscripts to be Manifestations (not manually copied books), we cannot distinguish the Expression from the Manifestation, as long as we regard it as immaterial. Therefore, Manifestation MUST be a kind of Expression.*

F3 Manifestation

Subclass of: F2 Expression

**CL1 Legal Object**

Scope note: This class comprises the definitions of publication products.

An instance of F3 Manifestation Product Type is the “species”, and all copies of a given object are “specimens” of it. An instance of F3 Manifestation Product Type defines all of the features or traits that instances of F5 Item normally display in order that they may be recognised as copies of a particular publication. However, due to production problems or subsequent events, one or more instances of F5 Item may not exhibit all these features or traits; yet such instances still retain their relationship to the same instance of F3 Manifestation Product Type.

The features that characterise a given instance of F3 Manifestation Product Type include: **one instance of F24 Publication Expression**, containing one or more than one instance of F2 Expression, reflecting the authors’ content of the manifestation and all additional input by the publisher; and the appropriate types of physical features for that form of the object. For example, hardcover and paperback are two distinct publications (i.e. two distinct instances of F3 Manifestation Product Type) even though authorial and editorial content are otherwise identical in both publications. The activity of cataloguing aims at the most accurate listing of features or traits of an instance of F3 Manifestation Product Type that are sufficient to distinguish it from another instance of F3 Manifestation Product Type.

.....

Properties: **CLP2** should have type (should be type of): **E55** Type

**CLP43** should have dimension (should be dimension of): **E54** Dimension

**CLP45** should consist of (should be incorporated in): **E57** Material

**CLP46** should be composed of (may form part of): **F3** Manifestation Product Type

**CLP57** should have number of parts: **E60** Number

**We should reconsider the CLP104/105**

**We should reintroduce the “incorporates” property!** Possibly R4? **Or delete R4**

~~F14 Individual Work deprecated-merged~~

~~F15 Complex Work deprecated-merged~~

*Delete F23 Expression Fragment – replace by E90 Symbolic Object*

~~F23 Expression Fragment (deprecated)~~

~~F24 Publication Expression (is merged with F3 Manifestation Product Type -> F3 Manifestation)~~

F30 Publication Event

Subclass of: **F28** Expression Creation

Scope note: This class comprises the activities of publishing. **Such an event includes the creation of an F24 Publication Expression** and setting up the means of production. The end of this event is regarded as the date of publication, regardless of whether the carrier production is started. Publishing can be either physical or electronic. Electronic publishing is regarded as making an instance of F24 Publication Expression available in electronic form on a public network. Electronic Publishing

does not mean producing a physical instance of F5 Item by partially electronic means. Making an electronic file available on a physical carrier can be regarded as equivalent to setting up the means of production; downloading the file is regarded as the electronic equivalent of F32 Carrier Production Event.

Examples: Publishing Amerigo Vespucci's 'Mundus novus' in Paris ca. 1503-1504

Establishing in 1972 the layout, features, and prototype for the publication of 'The complete poems of Stephen Crane, edited with an introduction by Joseph Katz' (ISBN '0-8014-9130-4'), which served for a second print run in 1978

Making available online the article by Allen Renear, Christopher Phillippe, Pat Lawton, and David Dubin, entitled 'An XML document corresponds to which FRBR Group 1 entity?'  
<<http://conferences.idealliance.org/extreme/html/2003/Lawton01/EML2003Lawton01.html>>

Properties: [R23](#) created a realisation of (was realised through): [F19 Publication Work](#)

[R24](#) created (was created through): [F3 Manifestation](#)

*F32 Carrier Production Event [= LRM-R8 manufactured]*

Subclass of: [E12](#) Production

Scope note: This class comprises activities that result in instances of F54 Utilised Information Carrier coming into existence. Both the production of a series of physical objects (printed books, scores, CDs, DVDs, CD-ROMS, etc.) and the creation of a new copy of a file on an electronic carrier are regarded as instances of F32 Carrier Production Event.

Typically, the production of copies of a publication (no matter whether it is a book, a sound recording, a DVD, a cartographic resource, etc.) strives to produce items all as similar as possible to a prototype that displays all the features that all the copies of the publication should also display, which is reflected in property *R27 used as source material* F24 Publication Expression.

Examples: The printing of copies of the 3<sup>rd</sup> edition of 'Codex Manesse: die Miniaturen der großen Heidelberger Liederhandschrift, herausgegeben und erläutert von Ingo F. Walther unter Mitarbeit von Gisela Siebert', Insel-Verlag, 1988 [a fac-simile edition of an illuminated mediaeval manuscript]

The printing of copies of the 'Ordnance Survey Explorer Map 213, Aberystwyth & Cwm Rheidol', ISBN 0-319-23640-4 (folded), 1:25,000 scale, released in May 2005 [a cartographic resource]

The production of copies of the sound recording titled 'The Glory (????) of the human voice', RCA Victor Gold Seal GD61175, containing recordings of musical works performed by Florence Foster Jenkins [a sound recording; the question marks in parentheses belong to the original title]

My clicking now on the link <[http://cidoc.ics.forth.gr/docs/cidoc\\_crm\\_version\\_4.0.pdf](http://cidoc.ics.forth.gr/docs/cidoc_crm_version_4.0.pdf)>, and thus downloading on my PC a reproduction of the electronic file titled 'Definition of the CIDOC Conceptual Reference Model... version 4.0' that is stored on the ICS FORTH's servers in Heraklion, Crete

The second print run, in 1978, of 'The complete poems of Stephen Crane, edited with an introduction by Joseph Katz' (ISBN '0-8014-9130-4'), a publication dated 1972 [publication of a printed text]

Properties: **R26** produced things of type (was produced by): E99 Product Type  
**R27** materialized (was materialized by) F3 Manifestation  
**R28** produced (was produced by): **F54** Utilised Information Carrier (there is an inconsistency between R28-F54 with R27-F3)

#### **F27 New Release Form**

Subclass of: **E12** Production

Scope note: This class comprises activities that consist in producing items of a new instance of Fn Manifestation that preserve both the content and layout found on items of a pre-existing instance of Fn Manifestation. The individual instance or instances of F5 Item that was or were used as a source for this process may be precisely identified or not. Such activities result in products known as facsimiles, reproductions, reprints, reissues, or new releases.

Examples: The 2014 publication of Daniel Wilson's 'Caliban: the missing link' by Cambridge University Press (a facsimile edition of the 1873 publication by Macmillan)  
The 2015 publication of Harry Partch's 'Two studies on ancient Greek scales' by Schott (which reproduces Harry Partch's holograph manuscript)

Properties:

**R30** produced (was produced by): Fn Manifestation  
Rn reproduced object: E84 Information Carrier  
Rn reproduced publication: Fn Manifestation

#### **F35 Nomen Use Statement**

Subclass of:

**E29** Design or Procedure

Scope note: This class comprises statements relating an instance of E1 CRM Entity with a particular instance of F12 Nomen and its usage in a given context.

Examples: 'Definition of 'poison'...'1. variable noun: Poison is a substance that harms or kills people or animals if they swallow it or absorb it.' [Part of the definition of the English term 'poison' from the Collins English dictionary, <https://www.collinsdictionary.com/dictionary/english/poison>, as of 2 December 2017]  
'010 \_\_ |a sh 85082387'...'450 \_\_ |a Equations, Maxwell' [MARC 21 encoding of a variant subject access point, from the same source]  
'PTBNP|20891'...'200 1#a Whitman, #b Walt, #f 1819-1892' [UNIMARC encoding of the preferred access point for a personal name, from the authority file of the National Library of Portugal, as found on VIAF, <http://www.viaf.org/processed/PTBNP%7C20891>, on 28 September 2015]

'001 FRBNF119547493'...'100 w.O..barus.\$aGončarova\$mNatal'â Sergeevna\$d1881-1962' [INTERMARC encoding of the preferred access point for a personal name, from the authority file of the National Library of France, <http://catalogue.bnf.fr/ark:/12148/cb119547494/> INTERMARC, as of 15 June 2012]

'001 FRBNF119547493'...'100 w.O..c.rus.\$aГончарова\$mНаталья Сергеевна\$d1881-1962' [INTERMARC encoding of a parallel access point from the same source]

'001 FRBNF119547493'...'400 \$w....b.eng.\$aGoncharova\$mNatalia\$d1881-1962' [INTERMARC encoding of a variant access point from the same source]

'<eac-cpf [...] > <control> <recordId>beinecke.7h44jbj</recordId> [...] </control>' ...  
'<cpfDescription> <identity> <entityType>family</entityType> <nameEntry xml:lang="eng" scriptCode="Latn"><part localType="100a">Boswell family</part> [...] </nameEntry> [...] </identity> </cpfDescription> [...] </eac-cpf>' [EAC encoding of the preferred access point for a family]

Properties: [R32](#) is warranted by (warrants): [F52](#) Name Use Activity

[R35](#) is specified by (specifies): [F34](#) KOS

(R35.1 has status: [E55](#) Type)

[R36](#) uses script conversion (is script conversion used in): [F36](#) Script Conversion

[R37](#) states as nomen (is stated as nomen in): [F12](#) Nomen

[R38](#) refers to thema (is thema of): [E1](#) CRM Entity

[R39](#) is intended for (is target audience in): [E74](#) Group

[R54](#) has nomen language (is language of nomen in): [E56](#) Language

[R55](#) has nomen form (is nomen form in): [E55](#) Type

[R56](#) has related use (is related use for): [F35](#) Nomen Use Statement

(R56.1 has type: [E55](#) Type)

#### *F43 Identifier Rule*

Subclass of: [E29](#) Design or Procedure

[F2](#) Expression

Scope note: This class comprises sets of instructions relating to the formulation of a unique identifier.

Examples: AACR2R 25.25-25.35F1

RAK-Musik (Revidierte Ausgabe 2003), Chapter 6

AFNOR Z 44-079

#### *F54 Utilised Information Carrier*

Subclass of: [E84](#) Information Carrier

Superclass of: [F53](#) Material Copy

[F5](#) Item

[Use of the Storage Unit class to also express the situation when the Item is “smaller” than the physical object, as in multiple digital files on a single medium. It's also the "bound with" situation]

Scope note: This class comprises physical objects that carry one or more instances of Fn Manifestation.

Examples: The physical features created on my PC's hard drive when I clicked on the link <[http://cidoc.ics.forth.gr/docs/cidoc\\_crm\\_version\\_4.0.pdf](http://cidoc.ics.forth.gr/docs/cidoc_crm_version_4.0.pdf)>, and thus downloaded a reproduction of the electronic file titled 'Definition of the CIDOC Conceptual Reference Model... version 4.0' that is stored on the ICS FORTH's servers in Heraklion, Crete (F53)

Any copy of the modern reprint publication of Marin Mersenne's 'Harmonie universelle', Paris, 1986, ISBN '2-222-00835-2' (F5)

Properties: **R6 carries (is carried by): Fn Manifestation**

*[Should we deprecate this class? There is nothing now in its new Scope note that distinguishes it from F5 Item.]*

*R3 is realised in (realises) [=LRM-R4]*

Domain: **F1 Work**

Range: **F2 Expression**

Superproperty of: **F14 Individual Work. R9 is realised in (realises): F22 Self-Contained Expression [deleted]**

**F20 Performance Work. R12 is realised in (realises): F25 Performance Plan**

**F21 Recording Work. R13 is realised in (realises): F26 Recording**

**F1 Work. R40 has representative expression (is representative expression for): F22 Self-Contained Expression**

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

Quantification: (0,n:1, **n**)

Scope note: This property associates an instance of F22 Self-Contained Expression with an instance of F1 Work.

This property expresses the association that exists between an expression (F22) and the work that this expression conveys. The semantics of the association will be different depending on what specific subtype of F1 Work the work is an instance of. If the work is an instance of **F14 Individual Work**, the F22 Self-Contained Expression completely conveys the individual work. If the work is an instance of F15 Complex Work, the F22 Self-Contained Expression conveys an alternative member of the complex work.

Our factual knowledge of how a given work is realised into an expression is often limited and this property makes it possible to express the association between instances of F22 Self-Contained Expression and the work it conveys without using the more developed paths.

The property *R3.1 has type*: E55 Type allows for specifying the role played by the referred to expression in the overall bibliographic history of the work (e.g.,

'progenitor expression', on which all other expressions of the same work are based; 'reference for canonical citations', in the sense of the HuCit ontology developed by Matteo Romanello and Michele Pasin; 'earliest draft', 'intermediate draft', 'final clean draft', 'princeps edition', etc.).

Examples: Dante's work entitled 'Inferno' (F15) *R3 is realised in* the Italian text of Dante's 'Inferno' as found in the authoritative critical edition *La Commedia secondo l'antica vulgata a cura di Giorgio Petrocchi*, Milano: Mondadori, 1966-67 (= *Le Opere di Dante Alighieri, Edizione Nazionale a cura della Società Dantesca Italiana*, VII, 1-4) (F22) *R3.1 has type* authoritative critical edition (E55)

Mozart's work entitled 'Il dissoluto punito ossia il Don Giovanni' (F15) *R3 is realised in* the notated music of the Prague version, as found on manuscript Ms 1548 of the National Library of France (F22) *R3.1 has type* autograph version (E55)

Properties: R3.1 has type: [E55](#) Type

*R5 has component (is component of)*

Domain: [F2](#) Expression

Range: [F2](#) Expression

Subproperty of: [E89](#) Propositional Object. [P148](#) has component (is component of): [E89](#) Propositional Object

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

Quantification: (0,n:0,n)

Scope note: This property associates an F2 Expression X with a structural component Y that conveys in itself the complete concept of a work that [is a component of](#) the overall work realized by X.

the overall work realized by X.

It does not cover the relationship that exists between pre-existing expressions that are re-used in a new, larger expression and that new, larger expression. Such a relationship is modelled by *P165 incorporates*.

Examples: The Italian text of Dante's textual work entitled 'Divina Commedia' (F22) *R5 has component* the Italian text of Dante's textual work entitled 'Inferno' (F22)

The musical notation of Mozart's Singspiel entitled 'Die Zauberflöte' (F22) *R5 has component* the musical notation of Mozart's aria entitled 'Der Hölle Rache', also known as 'The Queen of the Night's Aria' (F22)

The visual content of the map entitled 'Wales – The Midlands – South West England', scale 1:400,000, issued by Michelin in 2005 (F22) *R5 has component* the visual content of the inset entitled 'Liverpool', scale 1:200,000, set within the compass of the map titled 'Wales – The Midlands – South West England', scale 1:400,000, issued by Michelin in 2005 (F22)

~~*R5 carries (is carried by) (deprecated)*~~

*R7 is [F3](#) Manifestation of (is materialized in) [=LRM-R4]*

Domain: [F5](#) Item

Range: [F3](#) Manifestation



Subproperty of: [E1 CRM Entity](#). [P2](#) has type (is type of): [E55 Type](#)

Subproperty of: [E24 Physical Man-Made Thing](#). [P128](#) carries (is carried by): [E23 Information Object](#)

Quantification: (1,1:0,n)

Scope note: This property associates a publication with one of its exemplars.

It is a shortcut of the more developed path: F5 Item *R28i was produced by* F32 Carrier Production *R26 produced things of type (was produced by):* [F3](#) Manifestation Product Type.

Examples: The item held by the National Library of France and identified by shelf mark 'Res 8 P 10' (F5) *R7 is example of* the edition of Amerigo Vespucci's textual and cartographic work entitled 'Mundus novus' issued in Paris ca. 1503-1504 (F3)

~~*R9 is realised in (realises) (deprecate)*~~

Domain: [F14 Individual Work](#)

Range: [F22 Self-Contained Expression](#)

Subproperty of: [F1 Work](#). [R1](#) is realised in (realises): [F22 Self-Contained Expression](#)

Quantification: (1,1:1,1)

Scope note: This property associates an [F14 Individual Work](#) with the unique [F22 Self-Contained Expression](#) that completely conveys it.

It is a shortcut for the more developed path: [F14 Individual Work](#) *R19i was realised through* [F28 Expression Creation](#) *R17 created* [F22 Self-Contained Expression](#).

Examples: Abstract content of Giovanni Battista Piranesi's graphic work entitled 'Carcere XVI: the pier with chains: 2nd state' (F14) *R9 is realised in* Giovanni Battista Piranesi's graphic work entitled 'Carcere XVI: the pier with chains: 2nd state' (F22)

Abstract content of the English text of the 1855 edition of Walt Whitman's textual work entitled 'Leaves of Grass' (F14) *R9 is realised in* the English text of the 1855 edition of Walt Whitman's textual work entitled 'Leaves of Grass' (F22)

*R10 has member (is member of)*

Domain: [F1 Work](#)

Range: [F1 Work](#)

Subproperty of: [E89 Propositional Object](#). [P148](#) has component (is component of): [E89 Propositional Object](#)

Quantification: (0,n:0,n)

Scope note: This property associates an instance of [F1 Work](#) with another instance of [F1 Work](#) that forms part of it.

Examples: Dante's textual work entitled 'Divina Commedia' (F15) *R10 has member* Dante's textual work entitled 'Inferno' (F15)

Dante's textual work entitled 'Inferno' (F15) *R10 has member* the abstract content of the pseudo-old French text of Émile Littré's translation entitled 'L'Enfer mis en vieux

langage françois et en vers' [a 19th century translation of Dante's 'Inferno' into old French] published in Paris in 1879 (F14)

Giovanni Battista Piranesi's graphic work entitled 'Carceri' (F15) *R10 has member* Giovanni Battista Piranesi's graphic work entitled 'Carcere XVI: the pier with chains' (F15)

Giovanni Battista Piranesi's graphic work entitled 'Carcere XVI: the pier with chains' (F15) *R10 has member* the abstract content of Giovanni Battista Piranesi's graphic work entitled 'Carcere XVI: the pier with chains: 2nd state' (F14)

*ISSUE: Deprecate F23 Expression Fragment, use E90 Symbolic Object. Modify property R15 in LRMoo to link an F2 Expression to an E90 Symbolic Object which is its fragment.*

*R15 has fragment (is fragment of)*

Domain: [F2 Expression](#)

Range: [E90 Symbolic Object](#)

Subproperty of: [E90 Symbolic Object](#). [P106](#) is composed of (forms part of): [E90 Symbolic Object](#)

Quantification: (0,n;0,n)

Scope note: This property associates an [E90 Symbolic Object](#) with the [F2 Expression](#) of which it is a fragment. The fragment is not itself an instance of [F2 Expression](#) as it does not express any [F1 Work](#). When the fragment consists of intelligible words it is an instance of [E33 Linguistic Object](#).

An [E90 Symbolic Object](#) can be extracted from an [F2 Expression](#) due to an accident, such as loss of material over time, e.g. the only remaining manuscript of an ancient text being partially eaten by worms, or due to deliberate isolation, such as excerpts taken from a text by the compiler of a collection of excerpts.

An [E90 Symbolic Object](#) is only considered a fragment of an [F2 Expression](#) when related to its occurrence in a known or assumed whole by the [R15](#) property. The size of an instance of the [E90 Symbolic Object](#) ranges from more than 99% of an instance of [F2 Expression](#) to tiny bits (a few words from a text, one bar from a musical composition, one detail from a still image, a two-second clip from a movie, etc.).

Examples: The ancient Greek text of the four stanzas from an ode by Sappho that were quoted by Pseudo-Longinus in his textual work entitled 'On the sublime' ([E33](#)) *R15 is fragment of* the complete ancient Greek text, now irremediably lost, of Sappho's ode currently identified as Sappho's poem #2 ([F2](#))

The statement 'fasc. 111' (abridgement for 'fascicle no. 111') indicating the sequential position of the publication identified by ISBN '2-7018-0037-4' within the series entitled 'Bibliothèque des Écoles françaises d'Athènes et de Rome' and identified by ISSN '0257-4101' ([E33](#)) *R15 is fragment of* the overall content of the publication identified by ISBN '2-7018-0037-4' ([F24](#)) (or [F3??](#))

The phrase 'Beati pauperes spiritu' ([E33](#)) *R15 is fragment of* the Latin text of the Gospel according to St. Matthew (excerpt from Matthew 5,3)

The stanza 'Nel mezzo del cammin di nostra vita / mi ritrovai per una selva oscura / ché la diritta via era smarrita' ([E33](#)) *R15 is fragment of* the Italian text of Dante's 'Inferno' and 'Divina Commedia' ([F2](#))

(add an example of an [E90](#) that is not an [E33](#)?)

(add an example of a single page from a larger text—to show that the fragment breaks at symbol boundaries and not necessarily at word or sentence boundaries)

*See this discussion for why we should add a page example:*

*[Issue of paging, relevant to digitisation, finding the identity criteria—matching the page to the expression that it belongs to. Can use P106 is composed of, to relate the text on a page to the whole. The text found on a page breaks at symbol boundaries, not necessarily at word or sentence boundaries. It is an E90. Relates to the F24 Publication Expression. Two structure systems ongoing: symbolic structuring (pages, lines etc) and also logical structuring (chapters, paragraphs, sections of content)]*

*R17 created (was created by)*

Domain: [F28 Expression Creation](#)

Range: [F2 Expression](#)

Superproperty of: [F29 Recording Event](#). [R21 created \(was created by\): F26 Recording](#)

[F30 Publication Event](#). [R24 created \(was created through\): F24 Publication Expression](#)

Subproperty of: [E65 Creation](#). [P94 has created \(was created by\): E28 Conceptual Object](#)

Quantification: (1,1:1,n)

Scope note: This property associates the F2 Expression that was first externalised during a particular F28 Expression Creation event with that particular creation event.

Examples: Richard Wagner's writing the original manuscript of his opera entitled 'Der fliegende Holländer' (F28) *R17 created* the notational content of the original manuscript of Richard Wagner's opera entitled 'Der fliegende Holländer' (F2)

Oscar Wilde's writing the original manuscript of his poem entitled 'The ballad of the Reading gaol' (F28) *R17 created* the English text of Oscar Wilde's poem entitled 'The ballad of the Reading gaol' (F2)

*R23 created a realisation of (was realised through)*

Domain: [F30 Publication Event](#)

Range: [F19 Publication Work](#)

Subproperty of: [F28 Expression Creation](#). [R19 created a realisation of \(was realised through\): F1 Work](#)

Quantification: (0,1:0,n)

Scope note: This property associates an instance of F30 [Publication Event](#) with the instance of F19 Publication Work it realised.

Examples: Establishing in 1972 the layout, features, and prototype for the publication of Stephen Crane's complete poems (F30) *R23 created a realisation of* Cornell University Press's concepts for an edition of Stephen Crane's complete poems (F19)

*R24 created (was created through)*

Domain: [F30 Publication Event](#)

Range: [F24 Publication Expression](#) [F3 Manifestation](#)

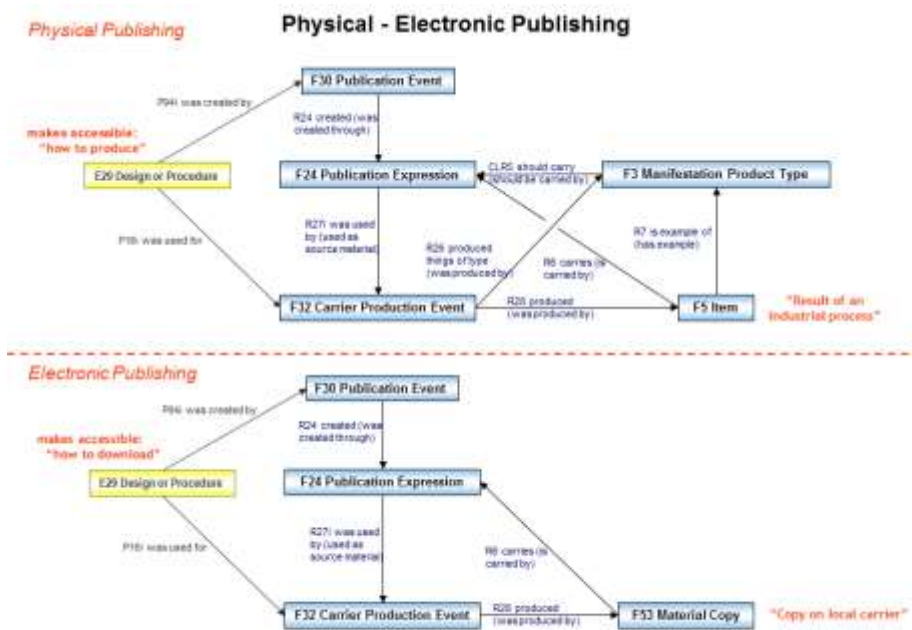
Subproperty of: [F28 Expression Creation](#). [R17 created \(was created by\): F2 Expression](#)

Quantification: (1,n:1,n)

Scope note: This property associates the instance of **F24 Publication Expression** **F3 Manifestation** that was created during a particular **F30 Publication Event** with that **F30 Publication Event**.

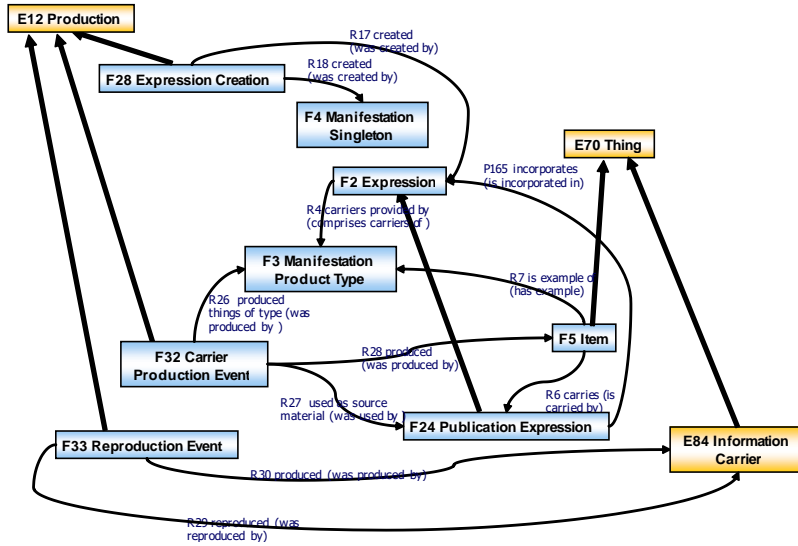
Examples: Establishing in 1972 the layout, features, and prototype for the publication of Stephen Crane's complete poems (F30) *R24 created* the set of signs and instructions as to manufacturing established by Cornell University Press for a publication of Stephen Crane's complete poems (F24)

*The following figure will become symmetric:*



*The following image becomes clear: F24 becomes F3*

## From Expression to Publication



*R26 produced things of type (was produced by)*

Domain: [F32](#) Carrier Production Event

Range: [F3](#) Manifestation Product Type

Subproperty of: [E12](#) Production. [P186](#) produced thing of product type (is produced by): [E99](#) Product Type

Quantification: (1,n;0,n) **becomes optional!**

Scope note: This property associates an instance of [F32](#) Carrier Production Event with the instance of [F3](#) Manifestation Product Type it produced items of.

Examples: The production of copies of the publication entitled 'Codex Manesse: die Miniaturen der großen Heidelberger Liederhandschrift, herausgegeben und erläutert von Ingo F. Walther unter Mitarbeit von Gisela Siebert', 3rd edition, Insel-Verlag, 1988 ([F32](#)) *R26 produced things of type* the publication identified as 'Codex Manesse: die Miniaturen der großen Heidelberger Liederhandschrift, herausgegeben und erläutert von Ingo F. Walther unter Mitarbeit von Gisela Siebert', 3rd edition, Insel-Verlag, 1988 ([F3](#))

The production of copies of the publication entitled 'Ordnance Survey Explorer Map 213, Aberystwyth & Cwm Rheidol', ISBN '0-319-23640-4' (folded), 1:25,000 scale, released in May 2005 ([F32](#)) *R26 produced things of type* the publication identified by ISBN '0-319-23640-4' ([F3](#))

The production of copies of the sound recording entitled 'The Glory (????) of the human voice', RCA Victor Gold Seal GD61175, containing recordings of musical works performed by Florence Foster Jenkins (F32) *R26 produced things of type* the publication entitled 'The Glory (????) of the human voice' and identified by the label and label number 'RCA Victor Gold Seal GD61175' (F3)

The production of a second print run, in 1978, of the publication titled 'The complete poems of Stephen Crane, edited with an introduction by Joseph Katz' (identified by ISBN '0-8014-9130-4') (F32) *R26 produced things of type* the publication, dated 1972, entitled 'The complete poems of Stephen Crane, edited with an introduction by Joseph Katz' (identified by ISBN '0-8014-9130-4') (F3)

*R27* **Production Event**

Domain: [F32](#) Carrier Production Event

Range: [F24](#) Publication Expression [F3](#) Manifestation

Subproperty of: [E7](#) Activity, [P16](#) used specific object (was used for): [E70](#) Thing

Quantification: (0,n;0,n)

Scope note: This property associates an instance of F32 Carrier Production Event with the set of signs provided by the publisher to be carried by all of the produced items **and any other foreseen physical feature..**

Examples: The production of copies of the publication identified by ISBN '1-86197-612-7' (F32) *R27 used as source material* the final set of signs sent by the publisher named 'Profile Books' to their printer for the production of copies of the publication identified by ISBN '1-86197-612-7' (F24)

*The idea: F19 Publication Work and Manifestation Creation must pertain to the optical and material form of a distributable item. Rewrite scope note of F30. I would keep "Publication Work" as label.*

*R40 has representative expression (is representative expression for)*

Domain: [F1](#) Work

Range: [F22](#) Expression

Subproperty of: [F1](#) Work. [R3](#) is realised in (realises): [F22](#) Expression

Quantification: (0,n;0,n)

Scope note: This property identifies an instance of F22 Self-Contained Expression that has been chosen as the most characteristic expression of the instance of F1 Work of which it is an expression. There is no other semantic implication to this notion of being characteristic than to be an adequate candidate to uniquely identify the Work realized by it. Prototypically, this is the instance of F22 Self-Contained Expression that is deemed characteristic of an instance of F15 Complex Work.

Typically, any expression that is not regarded as "representative" for the work it expresses, would require a controlled access point, with qualifiers specifying the differences between that expression and a representative expression, although this may not always be done in practice. The title of a Work may not be one taken from a representative expression.

A given work can have more than one representative expression, provided the differences between these expressions are not deemed “substantial.” If the anticipated needs of users are not considered to call for bibliographic distinctions between variant expressions of a work, then even expressions that differ significantly from each other can be regarded as equally representative for the work. (See *FRBR: Final Report*, p. 19-20).

A given expression can be deemed representative for a work with regard to some of its aspects (e.g., the text contained in an edition the title proper of which reads ‘The tragicall historie of HAMLET Prince of Denmarke’, and the language of that text), and not representative for it with regard to some other aspects (e.g., the title proper ‘The tragicall historie of HAMLET Prince of Denmarke’ itself, which, being different from the title that is regarded as “representative” for Shakespeare’s work, will require the use of a controlled access point).

*R40 has representative expression* is a shortcut of the more developed path F1 Work *R50i was assigned by* F42 Representative Expression Assignment *R51 assigned* F2 Expression.

Examples: Richard Brinsley Sheridan’s textual work entitled ‘St. Patrick’s Day’ (F15) *R40 has representative expression* the linguistic content of the 1775 edition of Richard Brinsley Sheridan’s textual work entitled ‘St. Patrick’s Day’, mentioned in the ‘Encyclopaedia Britannica’, 15<sup>th</sup> edition, cited as the source for the authority record created for that work by the Library of Congress (F22)

John Tavener’s musical work entitled ‘The Eternal Sun’ (F15) *R40 has representative expression* the notational content embodied in the 2007 edition of John Tavener’s ‘The Eternal Sun’ cited as the source for the authority record created for that work by the National Library of France (F22)

The series entitled ‘Headline series’ (F18) *R40 has representative expression* the overall content of the publication entitled ‘Vietnam, the war nobody won’ by S. Karnow, which belongs to the series entitled ‘Headline series’ and was used by the Library of Congress as the basis for creating the authority record for that series (F24)

The periodical entitled ‘The New Courier’, released by UNESCO, and described by the National Library of France in a bibliographic record that contains the following statement: ‘Notice réd. d’après le n° d’octobre 2002’ (i.e., ‘description based on the issue dated October 2002’) (F18) *R40 has representative expression* the overall content of the October 2002 issue of UNESCO’s periodical entitled ‘The New Courier’ (F24)

*R41 has representative manifestation product type (is representative manifestation product type for)*

Domain: **F2 Expression**

Range: **F3 Manifestation Product Type**

Subproperty of: **F2 Expression. R4 carriers provided by (comprises carriers of): F3 Manifestation Product Type**

Quantification: (0,n;0,n)

Scope note: This property identifies an instance of F3 Manifestation Product Type that has been chosen as the most characteristic Manifestation Product Type of the instance of F2 Expression of which it is a manifestation.

Identifying an instance of F3 Manifestation Product Type that is representative for an instance of F2 Expression makes it possible in turn to identify an instance of F2 Expression that is representative for an instance of F1 Work, and to decide what should be regarded as the title of the work.

The title of an Expression may not be one taken from a representative Manifestation Product Type or Manifestation Singleton.

A given expression can have more than one Representative Manifestation Product Type.

*R41 has representative manifestation product type* is a shortcut of the more developed path F2 Expression *R48i was assigned by* F41 Representative Manifestation Assignment *R49 assigned* F3 Manifestation Product Type.

Examples: The original text of Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' (F2) *R41 has representative manifestation product type* the 1775 edition of Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day', mentioned in the 'Encyclopaedia Britannica', 15<sup>th</sup> edition, cited as the source for the authority record created for that work by the Library of Congress (F3)

The original notation of John Tavener's musical work entitled 'The Eternal Sun' (F2) *R41 has representative manifestation* the 2007 edition of John Tavener's 'The Eternal Sun' cited as the source for the authority record created for that work by the National Library of France (F3)

The textual content of the series entitled 'Headline series' (F2) *R41 has representative manifestation* the publication entitled 'Vietnam, the war nobody won' by S. Karnow, which belongs to the series entitled 'Headline series' and was used by the Library of Congress as the basis for creating the authority record for that series (F3)

The textual content of the periodical entitled 'The New Courier' (F2) *R41 has representative manifestation* the October 2002 issue of the periodical entitled 'The New Courier' (F3), which was used as the source for the bibliographic record created by the National Library of France

*R42 is representative manifestation singleton for (has representative manifestation singleton)*

Domain: [F4](#) Manifestation Singleton

Range: [F2](#) Expression

Subproperty of: [E24 Physical Man-Made Thing](#), [P128](#) carries (is carried by): [E73 Information Object](#)

Quantification: (0,n;0,n)

Scope note: This property identifies an instance of Manifestation Singleton that has been declared as the unique representative for an instance of F2 Expression by some bibliographic agency.



This property identifies an instance of F4 Manifestation Singleton that has been chosen as the most characteristic Manifestation Singleton of the instance of F2 Expression of which it is a manifestation.

Identifying an instance of F4 Manifestation Singleton that is representative for an instance of F2 Expression makes it possible in turn to identify an instance of F2 Expression that is representative for an instance of F1 Work, and to decide what should be regarded as the title of the work.

The title of an Expression may not be one taken from a representative Manifestation Product Type or Manifestation Singleton.

A given expression can have more than one representative Manifestation Singleton.

It is a shortcut for the more developed path: F2 Expression *R48i was assigned by* F41 Representative Manifestation Assignment *R53 assigned* F4 Manifestation Singleton.

Examples: The musical text of Stanislas Champein's opera 'Vichnou' (F22) *R42 has representative manifestation singleton* the manuscript identified by shelfmark 'MS-8282' within the collections of the National Library of France, Department for Music (F4) [explanation: the BnF's Department for Music holds 3 manuscript scores (identified by shelfmarks 'MS-8282', 'MS-13778', and 'MS-17321') for this opera; the title inscribed on MS-8282 is 'Vichnou', while MS-13778 and MS-17321 are titled 'Vistnou'; the authorised form chosen by cataloguers and reference tools such as the Grove Dictionary for Opera is 'Vichnou', while 'Vistnou' is recorded in the BnF's authority file as a variant form only]

*R48 assigned to (was assigned by)*

Domain: [F41](#) Representative Manifestation Assignment

Range: [Expression](#)

Subproperty of: [E13](#) Attribute Assignment. [P140](#) assigned attribute to (was attributed by): [E1](#) CRM Entity

Quantification: (1,1:0,n)

Scope note: This property associates the event of assigning a representative instance of F3 Manifestation Product Type or F4 Manifestation Singleton with the expression to which it was assigned.

Examples: Selecting the 1775 edition of Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' as the representative manifestation for the text of Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' (F41) *R48 assigned to* the text of Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' (F22)

Selecting the 2007 edition of John Tavener's musical work entitled 'The Eternal Sun' as the representative manifestation for the notation of John Tavener's musical work entitled 'The Eternal Sun' (F41) *R48 assigned to* the notation of John Tavener's musical work entitled 'The Eternal Sun' (F22)

Selecting the 1983 edition of Stanley Karnow's textual work entitled 'Vietnam, the war nobody won' as the representative manifestation for a partial expression of the series entitled 'Headline series' (F41) *R48 assigned to* the content of the series entitled 'Headline series' (F22)

Selecting the issue dated October 2002 of the periodical entitled 'The New Courier' as the representative manifestation for a partial expression of the periodical entitled 'The New Courier' (F41) *R48 assigned to* the content of the periodical entitled 'The New Courier' (F22)

Selecting the manuscript held by the National Library of France and identified by shelf mark 'MS-8282' as the representative Manifestation Singleton for the notation of Stanislas Champein's opera 'Vichnou' (F41) *R48 assigned to* the notation of Stanislas Champein's opera 'Vichnou' (F22)

*R50 assigned to (was assigned by)*

Domain: [F42](#) Representative Expression Assignment

Range: [F1 Work](#)

Subproperty of: [F13](#) Attribute Assignment. [P140](#) assigned attribute to (was attributed by): [E1](#) CRM Entity

Quantification: (1,1:0,n)

Scope note: This property associates the event of assigning a representative instance of F2 Expression with the instance of [F1 Work](#) to which it was assigned.

Examples: Selecting the text embodied in the 1775 edition of Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' as the representative expression for Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' (F42) *R50 assigned to* Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' (F15)

Selecting the musical notation embodied in the 2007 edition of John Tavener's musical work entitled 'The Eternal Sun' as the representative expression for John Tavener's musical work entitled 'The Eternal Sun' (F42) *R50 assigned to* John Tavener's musical work entitled 'The Eternal Sun' (F15)

Selecting the publication expression of the 1983 edition of Stanley Karnow's textual work entitled 'Vietnam, the war nobody won' as the representative expression for the series entitled 'Headline series' (F42) *R50 assigned to* the series entitled 'Headline series' (F18)

Selecting the publication expression of the issue dated October 2002 of the periodical entitled 'The New Courier' as the representative expression of the periodical entitled 'The New Courier' (F42) *R50 assigned to* the periodical entitled 'The New Courier' (F18)

Selecting the content of the manuscript identified by shelfmark 'MS-8282' within the collections of the National Library of France, Department for Music, as the representative expression of Stanislas Champein's musical work entitled 'Vichnou' (F42) *R50 assigned to* Stanislas Champein's musical work entitled 'Vichnou' (F15)

*The idea:*

*An Expression realizes a work, it is not specified if it is the exclusive set of propositions of the expression or a more general set of ideas. This leaves the decision to the curator, which level is relevant. This changes the cardinality of R3.*

*R51 assigned (was assigned by)*

Domain: [F42](#) Representative Expression Assignment

Range: [F2 Expression](#)

Subproperty of: [E13 Attribute Assignment](#). [P141](#) assigned (was assigned by): [E1 CRM Entity](#)

Quantification: (1,n:0,n)

Scope note: This property associates the event of assigning a representative instance of F2 Expression with the F2 Expression which has been assigned.

Examples: Selecting the representative expression for Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' (F42) *R51 assigned* the text embodied in the 1775 edition of Richard Brinsley Sheridan's textual work entitled 'St. Patrick's Day' (F22)

Selecting the representative expression for John Tavener's musical work entitled 'The Eternal Sun' (F42) *R51 assigned* the musical notation embodied in the 2007 edition of John Tavener's musical work entitled 'The Eternal Sun' (F15)

Selecting the representative expression for the series entitled 'Headline series' (F42) *R51 assigned* the publication expression of the volume of the series entitled 'Headline series' that consists of the 1983 edition of Stanley Karnow's textual work entitled 'Vietnam, the war nobody won' (F24)

Selecting the representative expression of the periodical entitled 'The New Courier' (F42) *R51 assigned* the publication expression of the issue dated October 2002 of the periodical entitled 'The New Courier' (F24)

Selecting the representative expression of Stanislas Champein's musical work entitled 'Vichnou' (F42) *R51 assigned* the content of the manuscript identified by shelfmark 'MS-8282' within the collections of the National Library of France, Department for Music (F22)

**The idea:** Any *Expression* is self-contained. Not-self-contained parts are more generally E90 Symbolic Objects or Information Objects. The *Expression Fragment* is not needed, but the property is useful. An *Expression Creation* creates only self-contained content. If interrupted or in between, we talk about E65 Creation events as part of the overall *Expression Creation*.

The "representative fragment" is a fragment of the supposed-to-be-lost self-contained expression. This means, that the representative manifestation may not carry the whole expression, but only a fragment of it.

## APPENDIX B: LMRer to LRMoo mapping

### 1.1 Entities

LRM ID	Name	Definition	Condition	Name	Note/Comment
LRM-E1	Res	Any entity in the universe of discourse		E1 CRM entity	CIDOC-CRM39
LRM-E2	Work	The intellectual or artistic content of a distinct creation		F1 Work	CIDOC-CRM39
				F16 Container work	Previous mapping
				F18 Serial work	Previous mapping
				F19 Publication work	Previous mapping
				F20 Performance work	Previous mapping
				F21 Recording work	Previous mapping
LRM-E3	Expression	A distinct combination of signs conveying intellectual or artistic content		F2 Expression	CIDOC-CRM39
				F26 Recording	Previous mapping
				F25 Performance plan	Previous mapping

LRM-E4	Manifestation	A set of all carriers that are assumed to share the same characteristics as to intellectual or artistic content and aspects of physical form. That set is defined by both the overall content and the production plan for its carrier or carriers	If it is a published item, or something that is produced as multiple copies	F3 Manifestation	CIDOC-CRM39: new class merging F3 and F24.
			If it is a unique manifestation (most particularly a manuscript)		Previous mapping
LRM-E5	Item	An object or objects carrying signs intended to convey intellectual or artistic content		F54 Utilized Information Carrier	Previous mapping
				F5 Item	Previous mapping
LRM-E6	Agent	An entity capable of deliberate actions, of being granted rights, and of being held accountable for its actions		E39 Actor	CIDOC-CRM 39
LRM-E7	Person	An individual human being		E21 Person	CIDOC-CRM39
LRM-E8	Collective Agent	A gathering or organization of <i>persons</i> bearing a particular name and capable of acting as a unit		E74 Group	CIDOC-CRM39 To be reviewed CIDOC-CRM40
LRM-E9	Nomen	An association between an entity and a designation that refers to it		F35 Nomen Use Statement	CIDOC-CRM39
LRM-E10	Place	A given extent of space		E53 Place	CIDOC-CRM39
LRM-E11	Time-span	A temporal extent having a beginning, an end and a duration		E52 Time-span	CIDOC-CRM39

**Commented [GB7]:** definition here in LRMer of item seems more general than the Irmoo Item. These sense of item as in FRBRow is not what we need here. This definition here should be F54.

**Commented [GB8]:** issue: this here works but then intended audiene cannot be mapped as E74 as it is later on.

Discussion : aside from noted issues above, mapping correct

## 1.2 Attributes

LRM ID	Category	Name	Definition	Condition	Mapping	Note/Comment
LRM-E1-A1	Res	Category	A type to which the res belongs		E1 CRM Entity. P2 has type: E55 Type {Res:Category}	Proposition MR
LRM-E1-A2	Res	Note	Any kind of information about a res that is not recorded through the use of specific attributes and/or relationships		E1 CRM Entity. P3 has note: E62 String	Previous FR SAD mapping for Scope note
LRM-E2-A1	Work	Category	A type to which the work belongs		F1 Work. P2 has type: E55 Type {Work:Category}	Based on previous mapping for Form of Work
LRM-E2-A2	Work	Representative expression attribute	An attribute which is deemed essential in characterizing the work and whose values are taken from a representative or canonical expression of the work		F1 Work. R40 has representative expression: F2 Expression	Proposition MR To be discussed - CIDOC-CRM40
LRM-E3-A1	Expression	Category	A type to which the expression belongs		F2 Expression. P2 has type: E55 Type {Expression:Category}	Previous mapping

**Commented [GB9]:** this continue to need to be worked out. The cataloguer often will not know what the actual representative expression was. But they know attributes it would have. Not only this but the examples point to different types of attributes which might be given. This would require different paths in CRM. Potentially need a shortcut. See Martin drawing. shortcut would be representative expression type. Sometimes we don't even know the original, the types are deduced from analyzing the set. Martin argues that there must have existed at least one which had all the types that are associated to it. The 'has representative expression relation' is epistemological. The way we describe the thing. It does not change what the thing actually is.

LRM-E3-A2	Expression	Extent	A quantification of the extent of the expression		F2 Expression. P43 has dimension: E54 Dimension	Previous mapping
LRM-E3-A3	Expression	Intended audience	A class of users for which the expression is intended		F2 Expression P103 was intended for E55 Type {Typ}	Proposition MR
LRM-E3-A4	Expression	Use rights	A class of use restrictions to which the expression is submitted		F2 Expression. P104 is subject to: E30 Right	Previous mapping for Use restrictions on expression
LRM-E3-A5	Expression	Cartographic scale	A ratio of distances in a cartographic expression to the actual distances they represent		F2 Expression (instantiated as E36 Visual Item). P2 has type: E55 Type {Cartographic image}. P138 represents {P138.1 has type E55 Type = "scale"}: E1 CRM Entity	Previous mapping
LRM-E3-A6	Expression	Language	A language used in the expression		F2 Expression (instantiated as E33 Linguistic Object). P72 has language: E56 Language	Previous mapping
LRM-E3-A7	Expression	Key	A pitch structure (musical scale, ecclesiastic mode, raga, maqam, etc.), that characterizes the expression		F2 Expression. P2 has type: E55 Type {key}	Proposition MR To be discussed - CIDOC-CRM40

**Commented [GB10]:** Decision: make a subproperty of P103 particular fo ruadinece type.

LRM-E3-A8	Expression	Medium of performance	A combination of performing tools (voices, instruments, ensembles, etc.) stated, intended, or actually used in the expression	if musical notation or recorded sound	F2 Expression. P2 has type: E55 Type {Medium of performance}	Previous mapping
				if recorded sound	F26 Recording. R21i was created through: F29 Recording Event. R20 recorded: F31 Performance. P125 used object of type: E55 Type {Medium of performance}	Previous mapping
				if musical notation	F2 Expression. P103 was intended for: E55 Type {being performed on medium of performance [insert here relevant name for a type of voice or instrument]}	Previous mapping
LRM-E4-A1	Manifestation	Category of carrier	A type of material to which all physical carriers of the manifestation are assumed to belong		F3 Manifestation. CLP2 should have type: E55 Type {Category of carrier}	Previous mapping for form of carrier
						Previous mapping for form of carrier

**Commented [GB11]:** Final analysis: need a new class called musical expression. It is a subclass of expression. The musical expression is either a performance or an annotation. Decision: final. This needs more thinking and we can discuss this more. Mapping is fine for now. BUT we should discuss and see the work Pierree Choeff before making final decision.

**Commented [GB12]:** create a subclass of expression musical expression to give these attributes. Then would need to make new properties to express these long paths.



LRM-E4-A2	Manifestation	Extent	A quantification of the extent observed on a physical carrier of the manifestation and assumed to be observable on all other physical carriers of the manifestation as well	F3 Manifestation. P3 has note {P3.1 has type: E55 Type = "Extent of the carrier"}: E62 String	Previous mapping for Extent of carrier
				F4 Manifestation Singleton. P3 has note {P3.1 has type: E55 Type = "Extent of the carrier"}: E62 String	Previous mapping for Extent of carrier
				F3 Manifestation. CLP57 should have number of parts: E60 Number	Previous mapping for Extent of carrier
				F4 Manifestation Singleton. P57 has number of parts: E60 Number	Previous mapping for Extent of carrier
LRM-E4-A3	Manifestation	Intended audience	A class of users for which the physical carriers of the manifestation are intended	F3 Manifestation.	Proposition MR
LRM-E4-A4	Manifestation	Manifestation statement	A statement appearing in exemplars of the manifestation and deemed to be significant for users to understand how the resource represents itself	F3 Manifestation. P3 has note P3.1 has type: E55 Type {"Manifestation Statement"}	Proposition MR

**Commented [GB13]:** Manifestation will inherit the solution of see p103 specialization can be used as a above.expression mapping that was used above.

**Commented [GB14]:** This can simply be a note and indicate the type of note using typing on the relation. Why? in the source the data is in free text Principle = if original is free text, no more analysis.

LRM-E4-A5	Manifestation	Access conditions	Information as to how any of the carriers of the manifestation are likely to be obtained	coded form	F3 Manifestation. CLP2 should have type: E55 Type {Access conditions}	proposition MR based on FRBR mapping for "System requirements of manifestation"
				descriptive form	F3 Manifestation. P3 has note {P3.1 has type E55 Type = "Access conditions"}: E62 String	proposition MR based on FRBR mapping for "System requirements of manifestation"
LRM-E4-A6	Manifestation	Use rights	A class of use and/or access restrictions to which all carriers of the manifestation are assumed to be submitted		F3 Manifestation. P104 is subject to: E30 Right	Proposition MR

**Commented [GB15]:** MD: interesting category of things not accessible to human senses that require some mediation to be rendered to the human being. Can be digital such as in these examples but also mechanical like a hurdle gurdie.

**Commented [GB16]:** Looking at the LRM standard the definition and the examples do not seem to be in synch. The one talks about how to obtain the manifestation, the other gives examples of preconditions for running a digital object. Need to know which one to interpret. Pat: seems like the examples are the thing to interpret. MD: LRM group should look at this field and make a decision on the definition vs examples. This might be exclusively for digital objects/media.

**Commented [GB17]:** potentially this can be dropped given the discussion around what is an access condition.

LRM-E5-A1	Item	Location	The collection and/or institution in which the item is held, stored, or made available for access		If normal shelf location documented:	Proposition MR based on FRAD mapping for Item location.
					<p>a) F5 Item. P54 has current permanent location: E53 Place</p> <p>If collection documented:</p> <p>b) F5 Item. P46i forms part of: E78 Collection</p> <p>If institution documented:</p> <p>d) F5 Item. P50 has current keeper: E39 Actor</p>	

**Commented [GB18]:** removed because not necessary for identity of the item

**Commented [GB19]:** removed because not necessary for identity of the item

LRM-E5-A2	Item	Use rights	A class of use and/or access restrictions to which the item is submitted			Previous mapping for Access restrictions on item
					F5 Item. P104 is subject to: E30 Right	Previous mapping for Access restrictions on item
LRM-E6-A1	Agent	Contact information	Information useful for communicating with or getting in contact with the agent		E39 Actor. P76 has contact point: E51 Contact Point	Proposition MR based on FRAD mapping
LRM-E6-A2	Agent	Field of activity	A field of endeavour, area of expertise, etc., in which the agent is engaged or was engaged		a) E39 Actor. P14i performed: F51 Pursuit. P2 has type: E55 Type b) E39 Actor. P14i performed: F51 Pursuit. R59 had typical subject: E1 CRM Entity	From FRAD mapping for Field of activity of Person
LRM-E6-A3	Agent	Language	A language used by the agent when creating an expression		E39 Actor. P14i performed: F51 Pursuit. R60 used to use language: E56 Language	From FRAD mapping for Language of person

**Commented [GB20]:** Make sure that mapping of the Item in LRMer to LRMoo F5 is contingent on the final definition of F5. The question will be whether the F5 is a physical object or not.

LRM-E7-A1	Person	Profession/Occupation	A profession or occupation in which the person works or worked		a) E21 Person. P2 has type: E55 Type b) E21 Person. P14i performed {P14.1 in the role of: E55 Type}: F51 Pursuit. P2 has type: E55 Type	Previous mapping
LRM-E9-A1	Nomen	Category	A type to which the nomen belongs c) the type of thing named (personal name, work title, etc.), b) the source in which the <i>nomen</i> is attested (spine title, running title), a) the function of the <i>nomen</i>		a) F35 Nomen Use Statement P2 has type: E55 Type {Nomen:Category}  { b) F35 Nomen Use Statement R37 states as nomen E41 Appellation c) F35 Nomen Use Statement R38 refers to thema E1 CRM Entity } the bracketed were considered ways of mapping but considered more precise than necessary within the context. Can just mapping a	Proposition MR
LRM-E9-A2	Nomen	Nomen string	The combination of signs that forms an appellation associated with an entity through the nomen		F35 Nomen Use Statement R37 states as nomenE41 Appellation. R33 has content {R33.1 has encoding E55 Type}: E62 String	Proposition based on FRAD mapping for Name string

**Commented [GB21]:** needs example - SS in order for it to make sense

LRM-E9-A3	Nomen	Scheme	The scheme in which the nomen is established		F35 Nomen Use Statement. R35 is specified by: F34 KOS	Previous mapping
LRM-E9-A4	Nomen	Intended audience	A class of users for which the nomen is considered appropriate or preferred		F35 Nomen Use Statement. R39 is intended for: E74 Group	Previous mapping
LRM-E9-A5	Nomen	Context of use	Information as to the context(s) in which a nomen is used by the agent who is referred to through it		F35 Nomen Use Statement R32 is warranted by F52 Name Use Activity. R61 occurred in kind of context: E55 Type	Proposition MR based on FRAD mapping for Scope of usage of Name
LRM-E9-A6	Nomen	Reference source	A source in which there is evidence for the use of the nomen		F35 Nomen Use Statement. R32 is warranted by: F52 Name Use Activity P70i documented in E31 Document	Previous mapping
LRM-E9-A7	Nomen	Language	The language in which the nomen is attested		F35 Nomen Use Statement R37 states as nomen E41 Appellation (instantiated as E33 Linguistic Object). R54 has nomen language: E56 Language	Previous mapping
LRM-E9-A8	Nomen	Script	The script in which the nomen is notated		F35 Nomen Use Statement R37 states as nomen E41 Appellation P2 has type: E55 Type	Previous mapping

**Commented [GB22]:** this mapping has to be reconsidered. Can't follow the pattern seen above for intended audience. If Nomen Use Statement is an Expression it could inherit this solution. But Pat is not sure that it is an expression. It has no work. R39 anyhow would need to be revised. MD argues that the intended audience is misleading. The real statement is that it is for these actors that the nomen is appropriate. So R39 really has to be revised. Can this also be related to P103 as a subrelation? Anyhow the range of Group is definitely not correct.

LRM-E9-A9	Nomen	Script conversion	The rule, system, or standard that was used to create a nomen that is derived on the basis of another, distinct nomen notated in another, distinct script		F35 Nomen Use Statement. R36 uses script conversion: F36 Script Conversion	Previous mapping
LRM-E10-A1	Place	Category	A type to which the place belongs		E53 Place. P2 has type: E55 Type {Place:Category}	Proposition MR
LRM-E10-A2	Place	Location	A delimitation of the physical territory of the place		E53 Place. P168 is defined by: E94 Space Primitive	Proposition MR
LRM-E11-A1	Time-span	Beginning	A value for the time at which the time-span started, expressed in a precise way in an authoritative external system to allow temporal positioning of events		E52 Time-Span. P82a begin of the begin: E61 Time Primitive/xsd:DateTime	CIDOC-CRM 39 (MR: not sure) To be discussed - CIDOC-CRM40
LRM-E11-A2	Time-span	Ending	A value for the time at which the time-span ended, expressed in a precise way in an authoritative external system to allow temporal positioning of events		E52 Time-Span. P82b end of the end: E61 Time Primitive/xsd:DateTime	CIDOC-CRM 39 (MR: not sure) To be discussed - CIDOC-CRM40

Commented [GB23]: md to check against CRMgeo

Commented [GB24]: MD to check against CRMgeo

### 1.3 Relationships

LRM ID	Domain	Name (inverse name)	Range	Definition	Condition	Mapping	Note/Comment
LRM-R1	Res	is associated with (is associated with)	Res	This relationship links two res that have an association of any kind			MR: could not find a general relationship between E1 and E1
LRM-R2	Work	is realized through (realizes)	Expression	This relationship links a work with any of the expressions which convey the same intellectual or artistic content		F1 Work. R3 is realized in: F2 Expression	Proposition MR based on previous mapping
LRM-R3	Expression	is embodied in (embodies)	Manifestation	This relationship links an expression with a manifestation in which the expression appears		F2 Expression. R4 carriers provided by: F3 Manifestation	Proposition MR based on previous mapping
LRM-R4	Manifestation	is exemplified by (exemplifies)	Item	This relationship connects a manifestation with any item that reflects the characteristics of that manifestation		F3 Manifestation. R7i has materialization: F5 Item	Proposition MR based on previous mapping
LRM-R5	Work	was created by (created)	Agent	This relationship links a work to an agent responsible for the creation of the intellectual or artistic content		F1 Work. R16i was initiated by: F27 Work Conception. P14 carried out by {P14.1 in the role of: E55 Type = "creator"}: E39 Actor	Previous mapping

**Commented [GB25]:** open discussion because this should be some formulation of incorporates. LRM r43 will map to properties still to be defined probably a specification of incorporates.. this will specify a change of symbolic specificity

**Commented [GB26]:** anything referencing items has to be considered again once the F5 Item is re defined in LRMoo. not yet done.

**Commented [GB27]:** for next meeting MD will consider different possible ways to express the creation of the work



LRM-R6	Expression	was created by (created)	Agent	This relationship links an expression to an agent responsible for the realization of a work		F2 Expression. R17i was created by: F28 Expression Creation. P14 carried out by {P14.1 in the role of: E55 Type = "creator"}: E39 Actor	CIDOC-CRM39
LRM-R7	Manifestation	was created by (created)	Agent	This relationship links a manifestation to an agent responsible for creating the manifestation		F3 Manifestation. R24i was created through: F30 Publication Event. P14 carried out by: E39 Agent. P131 is identified by: E82 Actor Appellation	CIDOC-CRM39 E82 deprecated
LRM-R8	Manifestation	was manufactured by (manufactured)	Agent	This relationship links a manifestation to an agent responsible for the fabrication, production or manufacture of the items of that manifestation		F3 Manifestation R26i was produced by: F32 Carrier Production Event. P14 carried out by: E39 Agent. P131 is identified by: E82 Actor Appellation	Previous mapping for manifestation: Fabricator/manufacturer E82 deprecated
							Previous mapping for manifestation: Fabricator/manufacturer E82 deprecated

Commented [GB28]: skip because reviewing F30

Commented [GB29]: skip reviewing F32 still

LRM-R9	Manifestation	is distributed by (distributes)	Agent	This relationship links a manifestation to an agent responsible for making items of that manifestation available			Model for distribution falls into general model for services to be circulated later.
LRM-R10	Item	is owned by (owns)	Agent	This relationship links an item to an agent that is or was the owner or custodian of that item		F5 Item. P51 has former or current owner: E39 Actor	CIDOC-CRM39
						F5 Item. P50 has current keeper: E39 Actor	Previous mapping
LRM-R11	Item	was modified by (modified)	Agent	This relationship links an item to an agent that made changes to this particular item without creating a new manifestation		F5 Item. P31i was modified by: E11 Modification. P14 carried out by: E39 Actor. P134 is identified by: E82 Actor Appellation	CIDOC-CRM39 E82 deprecated
LRM-R12	Work	has as subject (is subject of)	Res	This relationship links a work to its topic(s)		F1 Work. P129i is about: E1 CRM Entity	Proposition MR
LRM-R13	Res	has appellation (is appellation of)	Nomen	This relationship links an entity with a sign or combination of signs or symbols through which that entity is referred to within a given scheme or context		E1 CRM Entity. is thema of F35 Nomen use statement R37 states as nomen E41 Appellation  E1 CRM Entity P1 is identified by E41 Appellation	Proposition MR based on mapping for Thema

**Commented [GB30]:** in the specification the definition and the examples are not in synch. Here we have mapped what the examples say and not what the definition says.

LRM-R14	Agent	assigned (was assigned by)	Nomen	This relationship links an agent with a particular nomen that was assigned by this agent		E39 p141 performed E65 Creation Event p94 created F35 Nomen Use Statement	CIDOC-CRM39 (MR: not sure)
						F35 Name Use Statement	CIDOC-CRM39 (MR: not sure)
						F52 Nomen Use Activity	CIDOC-CRM39 (MR: not sure)
LRM-R15	Nomen	is equivalent to (is equivalent to)	Nomen	This is the relationship between two nomens which are appellations of the same res		F35 Nomen Use Statement. R56 has related use {R56.1 has type E55 Type = "equivalence"}: F35 Nomen Use Statement	From FRAD mapping for Nomen equivalence
LRM-R16	Nomen	has part (is part of)	Nomen	This relationship indicates that one nomen is constructed using another nomen as a component	Related to	F12 Nomen. P142 used constituent F12 Nomen	CIDOC-CRM39
LRM-R17	Nomen	is derivation of (has derivation)	Nomen	This relationship indicates that one nomen was used as the basis for another nomen, both of which are appellations of the same res		F12 Nomen. P142 used constituent: F12 Nomen	CIDOC CRM 39
LRM-R18	Work	has part (is part of)	Work	This is the relationship between two works, where the content of one is a component of the other		F1 work. R10 has member: F1 Work	Proposition MR

**Commented [GB31]:** With regards to the LRM definition it seems that the definition could be shaped. It seems to refer to a name, but it should refer to an F35. Also the examples have some problems.

This examples seems too broad The term '*proton*' was assigned by Ernest Rutherford to the hydrogen nucleus in 1920

**Commented [GB32]:** calls for a specialization in order to indicate structural parts in the sense of the component elements of a work. So to do = create a specialization of membership just for components. We need a good distinction between structural vs temporal component.

m proposes to keep r10 for any kind of structural OR temporal relationship between works in a hierarchy. Then we should work on a definition in order to be able to create a subproperty which will define a structural component in the sense of temporal simultaneity and how evidence for this is provided. Use of this is not only for FRBRoo but also for buildings and so on. Things that evolve. also the body and so on.

there is a generic problem here with the part of relation.

LRM-R19	Work	precedes (succeeds)	Work	This is the relationship of two works where the content of the second is a logical continuation of the first		F1 work. R1i has successor: F1 Work	Previous mapping
LRM-R20	Work	accompanies/complements (is accompanied/complemented by)	Work	This is the relationship between two works which are independent, but can also be used in conjunction with each other as complements or companions	Related to	F1 Work F1 Work	CIDOC-CRM39
LRM-R21	Work	is inspiration for (is inspired by)	Work	This is the relationship between two works where the content of the first served as the source of ideas for the second		F1 Work R16i was initiated by F27 Work Conception P15 was influenced by F1 Work	CIDOC-CRM39
LRM-R22	Work	is a transformation of (was transformed into)	Work	This relationship indicates that a new work was created by changing the scope or editorial policy (as in a serial or aggregating work), the genre or literary form (dramatization, novelization), target audience (adaptation for children), or style (paraphrase, imitation, parody) of a previous work		F1 Work. R2 is derivative of {R2.1 has type E55 Type = Transformation}: F1 Work	CIDOC-CRM39
LRM-R23	Expression	has part (is part of)	Expression	This is a relationship between two expressions where one is a component of the other		F2 Expression. R5 has component: F2 Expression	Proposition MR

**Commented [GB33]:** need to formulate a mapping that will this concept of intention to be used together. HW unassigned.

**Commented [GB34]:** not necessarily all

**Commented [GB35]:** a shortcut for this will be created in LRMoo

LRM-R24	Expression	is derivation of (has derivation)	Expression	This relationship indicates that of two expressions of the same work, the second was used as the source for the other		F2 Expression. R17i was created by: F28 Expression Creation. P16 used specific object: F2 Expression	CIDOC-CRM39
LRM-R25	Expression	was aggregated by (aggregated)	Expression	This relationship indicates that a specific expression of a work was chosen as part of the plan of an aggregating expression		F2 Expression. P165i is incorporated in: F2 Expression	Proposition MR
LRM-R26	Manifestation	has part (is part of)	Manifestation	This is a relationship between two manifestations where one is a component of the other		F3 Manifestation. CLP46 should be composed of: F3 Manifestation	Previous mapping
							Previous mapping
LRM-R27	Manifestation	has reproduction (is reproduction of)	Manifestation	This is the relationship between two manifestations providing the end-user with exactly the same content and where an earlier manifestation has provided a source for the creation of a subsequent manifestation, such as facsimiles, reproductions, reprints, and reissues	[generic case]	[F3 Manifestation or F4 Manifestation Singleton] P130i features are also found on {P130.1 kind of similarity: E55 Type = "Reproduction"} [F3 Manifestation or F4 Manifestation Singleton]	Previous mapping

**Commented [GB36]:** HW: create a ubproperty of p16 in LRM 'derivation source' that would capture just the expressions that were used in a expression conceptoin and are transferred into the product expression, creating a derivation chain. Same problem as CRMdig and software inputs and outputs etc.

**Commented [GB37]:** postpone IFla team still working on

					[from F3 to F3]	F3 Manifestation. P125 was type of object used in: F33 Reproduction Event. R30 produced: E84 Information Carrier P128 carries E90 Symbolic Object P165i is incorporated in F3 Manifestation	CIDOC-CRM39
					[from F3 to F4]	F3 Manifestation. P125 was type of object used in: F33 Reproduction Event. R30 produced: E84 Information Carrier (also instantiated as F4 Manifestation Singleton)	Previous mapping
					[from F4 to F3]	F4 Manifestation Singleton. P16i was used for {P16.1 mode of use: E55 Type = "reproduced source"}: F33 Reproduction Event. R30 produced: F3 Manifestation	Proposition MR based on previous mapping

					[from F4 to F4]	F4 Manifestation Singleton (also instantiated as E84 Information Carrier). R29i was reproduced by: F33 Reproduction Event. R30 produced: E84 Information Carrier (also instantiated as F4 Manifestation Singleton)	Previous mapping
LRM-R28	Item	has reproduction (is reproduction of)	Manifestation	This is the relationship between an item of one manifestation and another manifestation providing the end-user with exactly the same content and where a specific item has provided a source for the creation of a subsequent manifestation	Generic case	F5 Item. P130i features are also found on {P130.1 kind of similarity: E55 Type = "Reproduction"}: [F3 Manifestation or F4 Manifestation Singleton]	Previous mapping
					From F5 to F3	F5 Item. R29i was reproduced by: F33 Reproduction Event. R30 produced: F3 Manifestation	CIDOC-CRM39

					From F5 to F4	F5 Item. R29i was reproduced by: F33 Reproduction Event. R30 produced: F4 Manifestation Singleton	Previous mapping
LRM-R29	Manifestation	has alternate (has alternate)	Manifestation	This relationship involves manifestations that effectively serve as alternatives for each other		PXX has alternate GB suggests : Eg incorporates Expression incorporated by Manifestation	CIDOC-CRM 39. Maybe subproperty of P130 to categorise the level of similarity
LRM-R30	Agent	is member of (has member)	Collective Agent	This a relationship between an agent and a collective agent that the agent joined as a member		E39 Actor. P107i is current or former member of: E74 Group	Proposition MR based on FRSAD mapping for affiliation of Person
LRM-R31	Collective Agent	has part (is part of)	Collective Agent	This is a relationship between two collective agents where one is a component of the other		E74 Group. P107: has current or former member: E74 Group	Proposition MR To be discussed - CIDOC-CRM40
LRM-R32	Collective Agent	precedes (succeeds)	Collective Agent	This is a relationship between two collective agents where the first was transformed into the second		E74 Group. P124i was transformed by: E81 Transformation. P123 resulted in: E74 Group	Proposition MR

**Commented [GB38]:** needs a formulation based on intended use

**Commented [GB39]:** its okay given how we accepted the def of group above



LRM-R33	Res	has association with (is associated with)	Place	This relationship links any entity with a given extent of space			No high-level relationship found for E1
LRM-R34	Place	has part (is part of)	Place	This is a relationship between two places where one is a component of the other		E53 Place. P172 contains: E53 Place	Proposition MR
LRM-R35	Res	has association with (is associated with)	Time-span	This relationship links any entity with a temporal extent			No high-level relationship found for E1
LRM-R36	Time-span	has part (is part of)	Time-span	This is a relationship between two time-spans where one is a component of the other		E52 Time-Span. P86i contains: E52 Time-Span	Proposition MR

## APPENDIX C: 334 Scholarly Reading: Accepted descriptions, comments and HW assignments

Based on CRMinf ver8

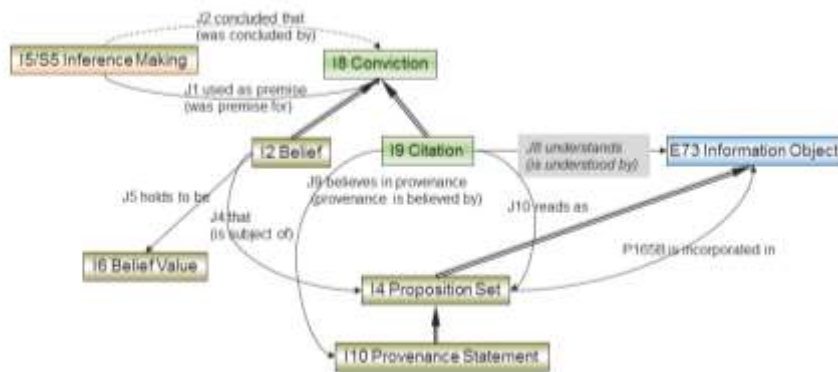


Figure 1: Graphical representation of a case of scholarly reading

### Classes

#### I1 Argumentation

Subclass of: [E13](#) Attribute Assignment

Superclass of: [S4](#) Observation

[I5](#) Inference Making/[S5](#) Inference Making

[I7](#) Belief Adoption

Scope note: This class comprises the activity of making honest inferences or observations. An honest inference or observation is one in which the E39 Actor carrying out the I1 Argumentation justifies and believes that the I6 Belief Value associated with resulting I2 Belief about the I4 Proposition Set is the correct value at the time that the activity was undertaken and that any I3 Inference Logic or methodology was correctly applied.

Only one instance of E39 Actor may carry out an instance of I1 Argumentation, though the E39 Actor may, of course, be an instance of E74 Group.

Properties: [J2](#) concluded that (was concluded by): [I8](#) Conviction

Examples:

- My classification and dating of this bowl (I5)

- My adoption of the belief that Dragendorff type 29 bowls are from the 1<sup>st</sup> Century AD (17)

## I2 Belief

Subclass of: I8 Conviction

Superclass of

Scope note: This class comprises the notion that the associated I4 Proposition Set is held to have a particular I6 Belief Value by a particular E39 Actor. This can be understood as the period of time that an individual or group holds a particular set of propositions to be true, false or somewhere in between.

Properties: I4 that (is subject of): I4 Proposition Set  
I5 holds to be: I6 Belief Value

Examples:

- My belief that Dragendorff type 29 bowls are from the 1st Century AD

[Comment in the 40th meeting: The above example should be revised in order to make distinction with conviction class]

- Dragendorff's belief that type 29 bowls are from the 1st Century AD

In First Order Logic:

$$I2(x) \supset I8(x)$$

## I5 Inference Making

Subclass of: I1 Argumentation

Superclass of: S6 Data Evaluation

S7 Simulation or Prediction

S8 Categorical Hypothesis Building

Equivalent to S5 Inference Making

Scope note: This class comprises the action of making honest propositions and statements about particular states of affairs in reality or in possible realities or categorical descriptions of reality by using inferences from other statements based on hypotheses and any form of formal or informal logic. It includes evaluations, calculations, and interpretations based on mathematical formulations and propositions.

It is characterized by the use of an existing I2 Belief as the premise that together with a set of I3 Inference Logic draws a further I2 Belief as a conclusion.

Documenting instances of I5 Inference Making primarily enables tracing the dependency of knowledge from conclusion to premise through subsequent inferences, possibly back to primary evidence, so that the range of influence of knowledge revision at any intermediate stage of complex inference chains on current convictions can be narrowed down by query. The explicit reference to the applied inference logic further allows scholars or scientists to assess if they can or would follow the documented argument. The class is not intended to promote the use of computationally decidable systems of logic as replacements of scholarly justifications of arguments, even though it allows for documenting the use of decidable logic, if that was deemed

adequate for the problem at hand. Principles of scholarly justifications of arguments are also regarded as kinds of inference logic.

Properties: [J1](#) used as premise (was premise for): [I8](#) Conviction  
[J3](#) applies (was applied by): [I3](#) Inference Logic

Examples:  
▪ My classification and dating of this bowl

In First Order Logic:  
 $I5(x) \supset I1(x)$

#### [I8 Conviction](#)

Subclass of: [E2](#) Temporal Entity

Superclass of: [I2](#) Belief

[I9](#) Citation

Scope note: This class comprises convictions by individuals or groups about the truth or not of some state of affairs.

Examples:  
▪ My belief that Gaius Suetonius Tranquillus was deliberately lying about Nero.

In First Order Logic:  
 $I8(x) \supset E2(x)$

#### [I9 Citation](#)

Subclass of: [I8](#) Conviction

Superclass of:

Scope note: This class comprises beliefs in the correct reading or scholarly interpretation of the overt message intended by an instance of [E73](#) Information Object (“source”), in which the interpretation of the source is formulated as a set of formal propositions or regarded to be unambiguously given in a natural language form. An instance of [I9](#) Citation implies believing the authenticity of the respective instance of [E73](#) Information Object relative to an explicitly stated provenance, but does not mean believing the respective propositions. Rather, the truth of the cited message is subject of another scholarly interpretation process. It further does not pertain to arguing about hidden or cryptic meanings of a source, which is subject of yet another scholarly interpretation process.

[HW to CEO: to look at the scope note and see if it could be expressed without the use of the term ‘unambiguously’ and having the meaning ‘under the assumption that the readers will have the same propositional interpretation’]

Properties: [J8](#) understands (is understood by): [E73](#) Information Object  
[J9](#) believes in provenance (provenance is believed by): [I10](#) Provenance Statement  
[J10](#) reads as: [I4](#) Proposition Set

Examples:  
▪ My citation and belief that the extant book De Vita Caesarum attributed to Gaius Suetonius Tranquillus stated 121AD that Nero was singing in Rome while it was burning

from July 19 in 64 AD<sup>1</sup>.

In First Order Logic:

$I9(x) \supset I8(x)$

#### I10 Provenance Statement

Subclass of: I4 Proposition Set

Superclass of:

Scope note: This class comprises statements about the provenance of an instance of E73 Information Object with known content at the time of making the provenance statements. An instance of I10 Provenance Statement must contain propositions about the presence of a carrier of the respective instance of E73 Information Object in an event or spatiotemporal context of reference. Characteristically, it may pertain to the writing by a known author at a known or unknown date or place, or to the existence of the text known to some public regardless the truth of authorship.

Examples:

- The Latin content of the extant book De Vita Caesarum attributed to Gaius Suetonius Tranquillus was published in Rome 121AD and not alienated in its propositional content by essential transcription errors until its currently known form.
- The exemplar of The Merchant of Venice, Quarto 1 (1600) owned by The British Library, shelf number BL C.34.k.22 was published 1600AD by Thomas Heyes.

In First Order Logic:

$I10(x) \supset I4(x)$

---

<sup>1</sup> [https://en.wikipedia.org/wiki/The\\_Twelve\\_Caesars](https://en.wikipedia.org/wiki/The_Twelve_Caesars)

## Properties

J1 used as premise (was premise for)

Domain: [I5](#) Inference Making

Range: [I8](#) Conviction

Subproperty of: [P17](#) was motivated by (motivated)

Superproperty of:

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

Scope note: This property associates an instance of [I8](#) Conviction with the instance of [I5](#) Inference Making that used it as a premise.

Examples:

- My classification and dating of this bowl ([I5](#)) used as premise my belief that Dragendorff type 29 bowls are from the 1st Century AD ([I](#))
- My classification and dating of this bowl ([I5](#)) used as premise my belief in the observations of this bowl ([I2](#))

In First Order Logic:

$J1(x,y) \supset I5(x)$

$J1(x,y) \supset I8(y)$

$J1(x,y) \supset P17(x,y)$

J2 concluded that (was concluded by)

Domain: [I1](#) Argumentation

Range: [I8](#) Conviction

Subproperty of: [P116](#) starts (is started by)

Superproperty of:

Quantification: one to many, necessary, dependent (1,n:1,1)

Scope note: This property associates an instance of [I8](#) Conviction with the instance of [I1](#) Argumentation that concluded it.

Examples:

- My classification and dating of this bowl ([I5](#)) concluded that my belief that this bowl is from the 1st Century AD ([I2](#))

In First Order Logic:

$J2(x,y) \supset I1(y)$

$J2(x,y) \supset I8(y)$

$J2(x,y) \supset P116(x,y)$

J8 understands (is understood by)

Domain: [I9](#) Citation

Range: [E73](#) Information Object

Subproperty of:

Superproperty of:

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

Scope note: This property associates an instance of I9 Citation with the instance of E73 Information Object it interprets with respect to its intended overt message.

- My citation that Nero was singing in Rome while it was burning *understands* the extant book De Vita Caesarum by Gaius Suetonius Tranquillus

In First Order Logic:

$J8(x,y) \supset I7(x)$

$J8(x,y) \supset E73(y)$

J9 believes in provenance (provenance is believed by)

Domain: I9 Citation

Range: I10 Provenance Statement

Subproperty of:

Superproperty of:

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

Scope note: This property associates an instance of I9 Citation with the instance of I10 Provenance Statement that defines the believed provenance of the instance of E73 Information Object referred to in the instance of I9 Citation.

Examples:

- My citation that Nero was singing in Rome while it was burning *believes in provenance* that the content of the extant book De Vita Caesarum by Gaius Suetonius Tranquillus was published in Rome 121AD

In First Order Logic:

$J9(x,y) \supset I9(x)$

$J9(x,y) \supset I10(y)$

J10 reads as

Domain: I9 Citation

Range: I4 Proposition Set

Subproperty of:

Superproperty of:

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

Scope note: This property associates an instance of I9 Citation with the instance of I4 Proposition Set that formulates the interpretation.

Examples:

- My citation that Nero was singing in Rome while it was burning *reads as* “Nero, while watching Rome burn, exclaimed how beautiful it was, and sang an epic poem about the sack of Troy while playing the lyre”

In First Order Logic:

$J9(x,y) \supset I9(x)$

$J9(x,y) \supset I4(y)$



## Referred Classes and Properties

Since our model refers to and reuses parts of the CIDOC Conceptual Reference Model (ISO21127) and CRMsci this section provides a comprehensive list of all constructs used from both ISO21127 and CRMsci. Also included are the definitions from version 5.1.2 of the CRM and version 1.2 of CRMsci. The complete definition of the CIDOC Conceptual Reference Model and CRMsci can be found on the official site: [http://www.cidoc-crm.org/official\\_release\\_cidoc.html](http://www.cidoc-crm.org/official_release_cidoc.html).

### Referred CIDOC CRM Classes

This section contains the complete definitions of the classes of the CIDOC CRM Conceptual Reference Model version 5.1.2 referred to by the model. The additional elements from CRMinf are highlighted in red.

#### *E2 Temporal Entity*

Subclass of: S15 Observable Entity  
Superclass of: E4 Period  
S16 State  
**E8 Conviction**

Scope note: This class comprises all phenomena, such as the instances of E4 Periods, E5 Events and states, which happen over a limited extent in time.

In some contexts, these are also called perdurants. This class is disjoint from E77 Persistent Item. This is an abstract class and has no direct instances. E2 Temporal Entity is specialized into E4 Period, which applies to a particular geographic area (defined with a greater or lesser degree of precision), and E3 Condition State, which applies to instances of E18 Physical Thing.

#### Examples:

- BronzeAge (E4)
- the earthquake in Lisbon 1755 (E5)
- the Peterhof Palace near Saint Petersburg being in ruins from 1944 – 1946 (E3)

#### Properties:

P4 has time-span (is time-span of): E52 Time-Span  
P114 is equal in time to: E2 Temporal Entity  
P115 finishes (is finished by): E2 Temporal Entity  
P116 starts (is started by): E2 Temporal Entity  
P117 occurs during (includes): E2 Temporal Entity  
P118 overlaps in time with (is overlapped in time by): E2 Temporal Entity  
P119 meets in time with (is met in time by): E2 Temporal Entity  
P120 occurs before (occurs after): E2 Temporal Entity

#### *E73 Information Object*

Subclass of: **E89** Propositional Object  
**E90** Symbolic Object  
Superclass of: **E29** Design or Procedure  
**E31** Document  
**E33** Linguistic Object

[E36](#) Visual Item  
[I4](#) Proposition Set

Scope note: This class comprises identifiable immaterial items, such as poems, jokes, data sets, images, texts, multimedia objects, procedural prescriptions, computer program code, algorithm or mathematical formulae, that have an objectively recognizable structure and are documented as single units.

An E73 Information Object does not depend on a specific physical carrier, which can include human memory, and it can exist on one or more carriers simultaneously.

Instances of E73 Information Object of a linguistic nature should be declared as instances of the E33 Linguistic Object subclass. Instances of E73 Information Object of a documentary nature should be declared as instances of the E31 Document subclass. Conceptual items such as types and classes are not instances of E73 Information Object, nor are ideas without a reproducible expression.

Examples:

- image BM000038850.JPG from the Clayton Herbarium in London
- E. A. Poe's "The Raven"
- the movie "The Seven Samurai" by Akira Kurosawa
- the Maxwell Equations

Properties:

[Referred CIDOC CRM Properties](#)

This section contains the complete definitions of the properties of the CIDOC CRM Conceptual Reference Model version 5.1.2 referred to. We apply the same format conventions as in mentioned above.

*P165 incorporates (is incorporated in)*

Domain: [E73](#) Information Object

Range: [E90](#) Symbolic Object

Subproperty of: [E90](#) Symbolic Object. [P106](#) is composed of (forms part of): [E90](#) Symbolic Object

Quantification: (0,n :0,n)

Scope note: This property associates an instance of E73 Information Object with an instance of E90 Symbolic Object (or any of its subclasses) that was included in it.

This property makes it possible to recognise the autonomous status of the incorporated signs, which were created in a distinct context, and can be incorporated in many distinct self-contained expressions, and to highlight the difference between structural and accidental whole-part relationships between conceptual entities.

It accounts for many cultural facts that are quite frequent and significant: the inclusion of a poem in an anthology, the re-use of an operatic aria in a new opera, the use of a reproduction of a painting for a book cover or a CD booklet, the integration of textual quotations, the presence of lyrics in a song that sets those lyrics to music, the presence of the text of a play in a movie based on that play, etc.

In particular, this property allows for modelling relationships of different levels of symbolic specificity, such as the natural language words making up a particular text,

the characters making up the words and punctuation, the choice of fonts and page layout for the characters.

When restricted to information objects, that is, seen as a property with E73 Information Object as domain and range the property is transitive.

A digital photograph of a manuscript page incorporates the text of the manuscript page

Examples:

- The content of Charles-Moïse Briquet's 'Les Filigranes: dictionnaire historique des marques du papier' (E32) P165 incorporates the visual aspect of the watermark used around 1358-61 by some Spanish papermaker(s) and identified as 'Briquet 4019' (E37)
- The visual content of Jacopo Amigoni's painting known as 'The Singer Farinelli and friends' (E38) P165 incorporates the musical notation of Farinelli's musical work entitled 'La Partenza' (E73)
- The visual content of Nicolas Poussin's painting entitled 'Les Bergers d'Arcadie' (E38) P165 incorporates the Latin phrase 'Et in Arcadia ego' (E33)

In First Order Logic:

$P165(x,y) \supset E73(x)$

$P165(x,y) \supset E90(y)$

$P165(x,y) \supset P106(x,y)$

## Bibliography

Doerr, M., Kritsotaki, A., & Boutsika, A. (2011). [Factual argumentation - a core model for assertions making](#). *Journal on Computing and Cultural Heritage (JOCCH)*, 3(3), 34, New York, NY, USA : ACM

CRMsci, version 1.2 - Doerr, M. and Kritsotaki, A. 2014

## Changes on version 8 of CRMInf

The following changes have been made (to the 39<sup>th</sup> CIDOC meeting at Heraklion Crete):

### UPDATED FIGURE 2:

Figure 1 of "Graphical representation of a case of scholarly reading" was updated.

### NEW CLASS RENAME:

New class [I8](#) was renamed from Belief to Conviction. Scope note was updated.

### SCOPE NOTE UPDATE:

Scope note of I9 Citation was updated

The scope note and the example of I10 Provenance Statement were updated.

#### CORRECT RANGE

Range of the property *"J1 used as premise (was premise for)"* changed to *I8 Conviction*

Range of the property *"J2 concluded that"* changed to *I8 Conviction*.

Range of *J9 believes in provenance (provenance is believed by)* was corrected to *I10 Provenance Statement*

#### CARDINALITIES:

Cardinalities of the properties were changed.

#### SCOPE NOTE UPDATE:

Scope note of the property *"J8 understands (is understood by)"* was updated and example is added

Scope note and example of *J9* was updated

#### CHANGE LABEL:

Label of *J9* changed from *"believing.."* to *"believes in provenance (provenance is believed by)"*

*J10* label changed from *"reading"* to *"reads as"*. Scope note was updated and an example was added.

*E2 Temporal Entity* is also superclass of *I8 Conviction*, since the label of *I8* has changed.

## APPENDIX D: 333 Model for Plans

### E100 Activity Plan

Subclass of: E29 Design or Procedure

Superclass of:

**Scope note:** This class comprises plans foreseeing specific predefined activities or kinds of activities taking place. They consist of descriptions of specific constraints, patterns or types of activities that could be realized. They may also foresee that the planned activities are realized at times explicitly foreseen by the actor intending the application of the plan, for instance, to organize a conference, in which case we may talk about “active plans”. Alternatively, times of realization may be foreseen in reaction to external events of a kind foreseen by the plan, for instance the rescue activity after an earthquake following a rescue plan, or a penal action in the case of criminal activity according to a penal code, in which case we may talk about “reactive plans”. The existence of an instance of Activity Plan does not necessarily imply the intention of any Actor to apply it. It may be created together, before or without the will to apply it. For instance, laws are created before they are passed by parliament. Any Activity Plan may require specific conditions for it to be applicable. For example, a plan to excavate a river bank may require that the river is flooded, or my plan to lime plaster my stone wall requires that it is winter (i.e. wet and cold).

**Examples:**

- The disaster plan of Tate Archives in case of the Thames flooding.
- The proposal for conservation work for MS Greek 418 at the Saint Catherine library.
- Provisions of Law 3730/2008 of the Greek Government against smoking in work places

**Properties:** P? requires event of type (is required by) E55 Type

P? is assessed by (assesses) I4 Proposition Set

### E101 Intention to Apply

Subclass of: E2 Temporal Entity

Superclass of:

**Scope note:** This class comprises the mental states of individual instances of E39 Actor that intend to or want to apply a particular instance of Activity Plan. This can be understood as the period of time when an individual or group holds a particular will. It binds the activity plan to the actor. The ‘intention to apply’ may be abandoned before the realization of the plan. When the plan is actually realized, the ‘intention to apply’ must necessarily still exist. Characteristically, the passing of a law initiates the intention of a parliament to apply the law. In many cases, the creation of the plan initiates the intention to apply it, and in the case of “active plans” the completed realization of the plan ends the

intention. Often, the existence of the 'intention to apply' cannot be determined other than by the realization of the plan.

Examples:

- The intention of Nicholas Pickwood to undertake conservation work on MS Greek 418 at the Saint Catherine's Library.
- The intention of the Greek government to enforce Law 3730/2008 against smoking in work places [HW to MD: Add a positive example where the law really was obviously going to be carried out ]

Properties:

P189 is intention of (has intention): E39 Actor

P190 is expressed in (expresses): E31 Document

P191 to apply within: E61 Time Primitive

P192 initiated by (initiates): E5 Event

P193 ended by (ends): E5 Event

P195 intended to apply (was intended by): E100 Activity Plan

### Property Declaration

P189 was the intention of (had intention)

Domain: E101 Intention to Apply

Range: E39 Actor

Quantification: (1,n;0,n)

Scope note: This property associates an instance of E101 Intention to Apply an activity plan with the actors intending it.

Examples:

- The passing of Law 3730/2008 against smoking in work places (E101) was the intention of the Greek government (E39). [HW to MD: to create better formulation]

P190 is expressed in (expresses)

Domain: E101 Intention to Apply

Range: E31 Document

Quantification:

Scope note: This property associates an instance of E101 Intention to Apply with an instance of E31 Document that formally represents and externalizes this intention in a symbolic form.

Examples:

- The Tate Archives disaster planning document (E31) *expresses* the intention of undertaking certain actions (E101 Intention to Apply) to save the collection in the event of the Thames flooding.

[P191 was intended to apply within/from](#)

Domain: E101 Intention to Apply

Range: E61 Time Primitive

Quantification: (0,n:0,n)

Scope note: This property associates an instance of E101 Intention to Apply with the declarative time constraint foreseen by the intending party for the actual application of the activity plan. The intending party may alter the time constraint over time. In case the newly set time constraint narrows a previously set time constraint, one may regard both constraints as being simultaneously true and consistent. In the case that the newly set time constraint does not just narrow the previous one (typically delaying the foreseen time of application), it should be regarded as a modification of the overall 'intention to apply'. The result of this modification should be regarded as an 'intention to apply' in its own right that is part of an overall instance of E101 Intention to Apply, which continues to be held.

Examples:

- The enforcement of Law 3730/2008 against smoking in public/work places (E101) *was intended to apply within/from 1<sup>st</sup> of July, 2009 (E61).*

[P192 was initiated by \(initiated\)](#)

Domain: E101 Intention to Apply

Range: E5 Event

Quantification: (0,1:0,n)

Scope note: This property associates the beginning of an instance of E101 Intention to Apply with an explicit event initiating it. Often, the initiation of the 'intention to apply' is implicit in the creation of the activity plan.

Examples:

- The enforcement of Law 3730/2008 against smoking in public/work places (E101) *was initiated by* the publication of the law (E5) in the government paper FEK 262 on 23/12/2008.

P193 was ended by (ended)

Domain: E101 Intention to Apply

Range: E5 Event

Quantification: (0,1:0,n)

Scope note: This property associates the end of an instance of E101 Intention to Apply with an explicit activity or event terminating it. Often, the termination of the 'intention to apply' is implicit in the realization of the activity plan. In some cases, it may be silently forgotten.

Examples:

- Storing MS Greek 418 into its new phase box (E7 Activity) ends the intention to conserve it (E101)
- (E5). [HW to MD: To add a law that was repealed to the examples to make point more explicitly]

**P194 realized (was realised by)**

Domain: E7 Activity

Range: E100 Activity Plan

Quantification: (0,n:0,n)

Scope note: This property associates an instance of E7 Activity with the instance of E100 Activity Plan of which it is regarded as being a valid execution by the actors holding the 'intention to apply'. To be valid the E61 Time Primitive associated with the instance of E7 Activity must fall within the E61 Time Primitive foreseen in the E101 Intention to Apply.

Examples:

- The delivery of a fine to a citizen in the initial enforcement period of Law 3730/2008 against smoking in public/work places (E7) *realized* provisions of Law 3730/2008 of the Greek Government against smoking in work places (E100)
- The conservation of MS Greek 418 (E7 Activity) realised the proposals for its conservation (Activity Plan)

P195 intended to apply (was intended by)

Domain: E101 Intention to Apply



Range: E100 Activity Plan

Quantification:

Scope note: This property associates an instance of E101 Intention to Apply with the instance of E100 Activity Plan that it intended to realize.

The decision in FEK (E101) *intended to apply* the provisions of the Law 3730/2008 of the Greek Government against smoking in work places (E100)

## APPENDIX E: 332 Properties of S10 Material Substantial of CRMsci

CRMsci In Progress since [22/3/2017] ver 1.2.4, September 2017

### Introduction

#### Scope

This text defines the “Scientific Observation Model”, a formal ontology intended to be used as a global schema for integrating metadata about scientific observation, measurements and processed data in descriptive and empirical sciences such as life sciences, geology, geography, archaeology, cultural heritage conservation and others in research IT environments and research data libraries. Its primary purpose is facilitating the management, integration, mediation, interchange and access to research data by describing semantic relationships, in particular causal ones. It is not primarily a model for processing data in order to produce new research results, even though its representations can be used for processing.

It uses and extends the CIDOC Conceptual Reference Model (CRM, ISO21127) as a general ontology of human activity, things and events happening in spacetime. It uses the same encoding-neutral formalism of knowledge representation (“data model” in the sense of computer science) as the CIDOC CRM, which can be implemented in RDFS, OWL, on RDBMS and in other forms of encoding. Since the model reuses, wherever appropriate, parts of CIDOC CRM, we provide in this document also a comprehensive list of all constructs used from ISO21127, together with their definitions following the version 6.2 maintained by CIDOC.

The Scientific Observation Model has been developed bottom up from specific metadata examples from life sciences, geology, archeology, cultural heritage conservation and clinical studies, such as water sampling in aquifer systems, earthquake shock recordings, landslides, excavation processes, species occurrence and detection of new species, tissue sampling in cancer research, 3D digitization, based on communication with the domain experts and the implementation and validation in concrete applications. It takes into account relevant standards, such as INSPIRE, OBOE, national archaeological standards for excavation, Digital Provenance models and others. For each application, another set of extensions is needed in order to describe those data at an adequate level of specificity, such as semantics of excavation layers or specimen capture in biology. However, the model presented here describes, together with the CIDOC CRM, a discipline neutral level of genericity, which can be used to implement effective management functions and powerful queries for related data. It aims at providing

superclasses and superproperties for any application-specific extension, such that any entity referred to by a compatible extension can be reached with a more general query based on this model.

Besides application-specific extensions, this model is intended to be complemented by CRMgeo, a more detailed model and extension of the CIDOC CRM of generic spatiotemporal topology and geometric description, also currently available in a first stable version [CRMgeo, version 1.0 - Doerr, M. and Hiebel, G. 2013]. Details of spatial properties of observable entities should be modelled in CRMgeo. As CRMgeo links CIDOC CRM to the OGC standard of GeoSPARQL it makes available all constructs of GML of specific spatial and temporal relationships. Still to be developed are models of the structures for describing quantities, such as IHS colors, volumes, velocities etc.

This is an attempt to maintain a modular structure of multiple ontologies related and layered in a specialization – generalization relationship, and into relatively self-contained units with few cross-correlations into other modules, such as describing quantities. This model aims at staying harmonized with the CIDOC CRM, i.e., its maintainers submit proposals for modifying the CIDOC CRM wherever adequate to guarantee the overall consistency, disciplinary adequacy and modularity of CRM-based ontology modules.

### Status

The model presented in this document has been validated in several national and international projects<sup>2</sup> through implementations of slightly different versions together with application-specific extensions and through mapping to and from related standards. This document describes a consolidated version from this experience, with the aim to present it for review and further adoption. The model is not “finished”, some parts such as the subclasses of inference making are not fully developed in terms of properties, and all constructs and scope notes are open to further elaboration.

### Naming Conventions

All classes and properties declared were given both a name and an identifier constructed according to the conventions used in the CIDOC CRM model. For classes, that identifier consists of the letter S followed by a number. For properties that identifier consists of the letter O followed by a number, which in turn is followed by the letter “i” every time the property is mentioned “backwards”, i.e., from target

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2

InGeoCloudS - Inspired GEOdata CLOUD Services 01/02/2012 - 31/07/2014 EU FP7 – PSP,  
ARIADNE - Advanced Research Infrastructure for Archaeological Dataset Networking in  
Europe 01/02/2013 - 31/01/2017 EU FP7-INFRASTRUCTURES-2012-1, Geosemantics for Cultural  
Heritage Documentation – Domain specific ontological modelling and implementation of a Cultural  
Geosemantic Information System based on ISO specifications 01/09/2012 - 31/08/2014 European  
Commission / FP7-PEOPLE-2011-IEF, iMarine - Data e-Infrastructure Initiative for Fisheries Management  
and Conservation of Marine Living Resources 01/11/2011 - 30/04/2014 EU - FP7 - CP & CSA, Standards  
for cultural documentation and support technologies for the integration of digital cultural repositories  
and systems interoperability: Studies, Prototypes and Best-practices guides 14/2/2004 - 15/3/2005 EU -  
Op. Pr. Information Society

to domain (inverse link). “S” and “O” do not have any other meaning. They correspond respectively to letters “E” and “P” in the CIDOC CRM naming conventions, where “E” originally meant “entity” (although the CIDOC CRM “entities” are now consistently called “classes”), and “P” means “property”. Whenever CIDOC CRM classes are used in our model, they are named by the name they have in the original CIDOC CRM.

Letters in red colour in CRM Classes and properties are additions/extensions **defined in** the scientific observation model.

### Class and property hierarchies

The CIDOC CRM model declares no “attributes” at all (except implicitly in its “scope notes” for classes), but regards any information element as a “property” (or “relationship”) between two classes. The semantics are therefore rendered as properties, according to the same principles as the CIDOC CRM model.

Although they do not provide comprehensive definitions, compact monohierarchical presentations of the class and property ISA hierarchies have been found to aid in the comprehension and navigation of the model **significantly**, and are therefore provided below.

The class hierarchy presented below has the following format:

Each line begins with a unique class identifier, consisting of a number preceded by the letter “S”, or “E”.

A series of hyphens (“-”) follows the unique class identifier, indicating the hierarchical position of the class in the ISA hierarchy.

The English name of the class appears to the right of the hyphens.

The index is ordered by hierarchical level, in a “depth first” manner, from the smaller to the larger sub hierarchies.

Classes that appear in more than one position in the class hierarchy as a result of multiple inheritance are shown in an italic typeface.

**Commented [40]:** I think these are obvious can be removed.

The property hierarchy presented below has the following format:

Each line begins with a unique property identifier, consisting of a number preceded by the letter “O”.

A series of hyphens (“-”) follows the unique property identifier, indicating the hierarchical position of the property in the ISA hierarchy.

The English name of the property appears to the right of the hyphens.

The domain class for which the property is declared.

**Commented [41]:** Likewise these are obvious.

## Scientific Observation Model Class Declaration

The classes are comprehensively declared in this section using the following format:

Class names are presented as headings in bold face, preceded by the class's unique identifier;

The line "Subclass of:" declares the superclass of the class from which it inherits properties;

The line "Superclass of:" is a cross-reference to the subclasses of this class;

The line "Scope note:" contains the textual definition of the concept the class represents;

The line "Examples:" contains a bulleted list of examples of instances of this class.

The line "Properties:" declares the list of the class's properties;

Each property is represented by its unique identifier, its forward name, and the range class that it links to, separated by colons;

### Classes

#### S1 Matter Removal

Subclass of: [E7](#) Activity

Superclass of: [E80](#) Part Removal

[S2](#) Sample Taking

Scope note: This class comprises the activities that result in an instance of S10 Material Substantial being decreased by the removal of an amount of matter.

Typical scenarios include the removal of a component or piece of a physical object, removal of an archaeological or geological layer, taking a tissue sample from a body or a sample of fluid from a body of water. The removed matter may acquire a persistent identity of different nature beyond the act of its removal, such as becoming a physical object in the narrower sense. Such cases should be modeled by using multiple instantiation with adequate concepts of creating the respective items.

Examples:

**Commented [42]:** Again these are repeated in every class definition – maybe it is useful to keep them here as rules – although the main CRM document includes all of these as well and we have already mentioned the relevance of the CRMsci to the core CRM.

- The removal of the layer of black overpainting that covered the background of "La Gioconda of the Prado" between 2011 and 2012 by the Prado Museum in Madrid<sup>3</sup>

Decision: accepted.

In First Order Logic:

$S1(x) \supset E7(x)$

Properties:

O1 diminished (was diminished by): S10 Material Substantial

O2 removed (was removed by): S11 Amount of Matter

S2 Sample Taking

Subclass of: S1 Matter Removal

Superclass of S3 Measurement by Sampling

Scope note: This class comprises the activity that results in taking an amount of matter as sample for further analysis from a material substantial such as a body of water, a geological formation or an archaeological object. The removed matter may acquire a persistent identity of different nature beyond the act of its removal, such as becoming a physical object in the narrower sense. The sample is typically removed from a physical feature which is used as a frame of reference, the place of sampling. In case of non-rigid Material Substantials, the source of sampling may regarded not to be modified by the activity of sample taking.

Examples:

- The water sampling (S2) carried out by IGME, sampled from borehole 10/G5 at 419058.03, 4506565 , 95.7 Mygdonia basin on 28/6/2005<sup>4</sup>
- [The collection (S2) of specimen "FHO – Benth. - 1055" (S13) from a plant (E20) of the species "spiciformis" (E55) in Zambia by Bullock, A.A. in 1939]
- [The collection (S2) of micro-sample 7 (S13), from the paint layer (S10) on the area of

Commented [AK43]: missing references

Commented [44]: Example of a rigid sample.

<sup>3</sup>Retrieved

from: [https://www.fundacioniberdrolaespana.org/webfund/qc/prod/es\\_ES/contenidos/docs/120221\\_NP\\_Gioconda.pdf](https://www.fundacioniberdrolaespana.org/webfund/qc/prod/es_ES/contenidos/docs/120221_NP_Gioconda.pdf)  
(InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012;D2.3 2013)

the apple (E53, E25) shown on the painting (E22) "Cupid complaining to Venus" (Cranach) by Joyce Plesters in June 1963.

**Commented [45]:** Example of micro sample.

Decision: examples accepted. Put in. Thanais provide biblio if possible.

In First Order Logic:

$S1(x) \supset S3(x)$

Properties:

[O3](#) sampled from (was sample by): [S10](#) Material Substantial

[O4](#) sampled at (was sampling location of): [E53](#) Place

[O5](#) removed (was removed by): [S13](#) Sample

[O20](#) sampled from type of part (type of part was sampled by): [E55](#) Type

S3 Measurement by Sampling

Subclass of: [S2](#) Sample Taking

[S21](#) Measurement

Scope note: This class comprises activities of taking a sample and measuring or analyzing it as one unit of activity, in which the sample is typically not identified and preserved beyond the context of this activity. Instances of this class are constrained to describe the taking of exactly one sample and the dimensions observed by the respective measurement are implicitly understood to describe this particular sample as representative of the place on the instance of [S10](#) Material Substantial from which the sample was taken. Therefore the class S3 Measurement by Sampling inherits the properties of [S2](#) Sample Taking. *O3 sampled from:* [S10](#) Material Substantial and *O4 sampled at:* [E53](#) Place, and the properties of [S21](#)([E16](#)) Measurement. *P40 observed dimension:* [E54](#) Dimension, due to multiple inheritance. It needs not instantiate the properties *O5 removed:* [S13](#) Sample and *O24 measured:* [S15](#) Observable Entity, if the sample is not documented beyond the context of the activity.

**Commented [46]:** We are grouping here [S2](#) and [S21](#). I am not sure what extra semantics are offered by this grouping. Why can't we do the same with multiple instantiation?

Examples:

- The chemical Analysis 1 on 20/4/2004 sampled from layer 50501 and observed 70

- mg of Ca<sup>5</sup>
- The Sphaerosyllislevantina specimen length measurement on 12/3/1999<sup>6</sup>.
- Measurement (S3) of retention times during Gas Chromatography analysis of a paint sample (S13) which identified Linseed oil as the paint medium.

**Commented [47]:** The sample is destroyed but, in conservation, samples always (I think) should get an identity.

In First Order Logic:

$S3(x) \supset S2(x)$

$S3(x) \supset S21(x)$

Decision: add identifying information for the particular measurement in gas chromatography example. MD to revise phrase in yellow.

#### S4 Observation

Subclass of: [E13](#) Attribute Assignment

Superclass of: [S21](#) Measurement

[S19](#) Encounter Event

Scope note: This class comprises the activity of gaining scientific knowledge about particular states of physical reality through empirical evidence, experiments and measurements.

We define observation in the sense of natural sciences, as a kind of human activity: at some place and within some time-span, certain physical things and their behavior and interactions are observed by human sensory impression, and often enhanced by tools and measurement devices.

The output of the internal processes of measurement devices that do not require additional human interaction are in general regarded as part of the observation and not as additional inference. Manual recordings may serve as additional evidence. Measurements and witnessing of events are special cases of observations. Observations result in a belief about certain propositions. In this model, the degree of confidence in

**Commented [48]:** I do not understand this. Evidence of what? And what is a manual recording? As opposed to automatic?

<sup>5</sup> (InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012;D2.3 2013)

<sup>6</sup> **MARINETLO-iMarine - Data e-Infrastructure Initiative for Fisheries Management and Conservation of Marine Living Resources**, Contributors: Bekiar, Chr., Doerr, M., Allocca, C., Barde, J., Minadakis, N. Version 4.0,

January 2014

the observed properties is regarded to be "true" by default, but could be described differently by adding a property *P3 has note* to an instance of *S4 Observation*, or by reification of the property *O16 observed value*.

**Commented [49]:** Isn't reification specific to RDF? Shouldn't we instead propose the use of "O16.1 has confidence" property for O16?

Primary data from measurement devices are regarded in this model to be results of observation and can be interpreted as propositions believed to be true within the (known) tolerances and degree of reliability of the device.

Observations represent the transition between reality and propositions in the form of instances of a formal ontology, and can be subject to data evaluation from this point on. For instance, detecting an archaeological site on satellite images is not regarded as an instance of *S4 Observation*, but as an instance of *S6 Data Evaluation*. Rather, only the production of the images is regarded as an instance of *S4 Observation*.

Examples:

- The excavation of unit XI by the Archaeological Institute of Crete in 2004.
- The observation (S4) of the density (S9) of the X-Ray image of cupid's head from the painting "Cupid complaining to Venus" (S15) as "high density" (E1), on the 19<sup>th</sup> of March 1963.
- The observation (S4) of visible light absorption (S9) of the painting "Cupid complaining to Venus" (S15) as "having red pigment", in 2016.

**Commented [AK50]:** fictionalary

In First Order Logic:

$S4(x) \supset E13(x)$

Properties:

[O8](#) observed (was observed by): [S15](#) Observable Entity

[O9](#) observed property type (property type was observed by): [S9](#) Property Type

[O16](#) observed value (value was observed by): [E1](#) CRM Entity

[O?](#) observed: Situation?

**Commented [AK51]:** new property?

Decision: postpone all work on this.

[S5 Inference Making](#)

**Commented [AK52]:** Είναι και το I5 Inference Making απο το inf model που εκει το αναλύουμε και εχει properties δικα του

Subclass of: [E13](#) Attribute Assignment

**Commented [AK53]:** There is also I5 Inference Making from CRM inf model, which is more analysed and has a list of properties there.



Superclass of: [S6](#) Data Evaluation

[S7](#) Simulation or Prediction

[S8](#) Categorical Hypothesis Building

Scope note: This class comprises the action of making propositions and statements about particular states of affairs in reality or in possible realities or categorical descriptions of reality by using inferences from other statements based on hypotheses and any form of formal or informal logic. It includes evaluations, calculations, and interpretations based on mathematical formulations and propositions.

Examples:

- The inference made by Sakellarakis in 1980 about the sacrifice of a young man (E7) in the Minoan temple of Anemospilia based on the skeleton found (and 2 more) in the west room of the temple and the ritual bronze knife (E22) on it and the hypothesis that he died from loss of blood (the evidence was that his bones (E20) remained white in contrast to the others).<sup>7</sup>

The inference that the underdrawing (E25) of the painting "Cupid complaining to Venus" (E22) was done with red pigment (E57), based on the observation (S4) that red pigment lines appear under the top paint layers.

In First Order Logic:

$$S5(x) \supset E13(x)$$

Properties:

Decision: postpone thought on this until reconsideration of S4 Observation. Consider together with Thanasis will provide ref for the cupid example.

S6 Data Evaluation

Subclass of: [S5](#) Inference Making

Scope note: This class comprises the action of concluding propositions on a respective reality from observational data by making evaluations based on mathematical inference rules and calculations using established hypotheses, such as the calculation of an earthquake epicenter. S6 Data Evaluation is not defined as S21/E16 Measurement; Secondary derivations of dimensions of an object from data measured by different processes are regarded as S6 Data Evaluation and not determining instances of Measurement in its

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<sup>7</sup> Sakellarakis Y, Sapouna-Sakellarakis E .1981. Drama of death in a Minoan temple. Natl Geogr 159, pp 205-222

own right. For instance, the volume of a statue concluded from a 3D model is an instance of S6 Data Evaluation and not of Measurement.

Examples:

- The calculation of the earthquake epicenter of Lokris area in 1989 by IGME<sup>8</sup>.
- The calculation of the intensity distance and assignment of PGA\_N using the gcf2sac software from the Eppo shock wave recording of 2/2/1990 in Athens (S4).<sup>9</sup>
- The calculation of the overall height (E54) of the heavily fragmented statue of Hercules (S15) in Ancient Messini from the measurement of the size of the fragment of the foot.

In First Order Logic:

$$S6(x) \supset S5(x)$$

Decision: examples accepted but reference needed for messini example.

NEW ISSUE: formulate the belief conditions for the input data of the data evaluation process. Need to add a link of input data AND this has to be connected to CRMdig.

HW: TV and MD, take examples from laser department

Properties:

[O10](#) assigned dimension (dimension was assigned by): [E54](#) Dimension

[O11](#) described (was described by): [S15](#) Observable Entity

**Commented [54]:** Don't we need a property to link S6 with the data with which we make the calculation? In my example that would be the size of Hercules's foot. Would that be "J1 used as premise"? If so, a note to explain this would be useful.

S7 Simulation or Prediction

Subclass of: [S5](#) Inference Making

<sup>8</sup> Ganas, A. , Sokos, E. , Agalos, A. ,Leontakianakos, G. ,Pavlidis, S. 2006. Coulomb stress triggering of earthquakes along the Atalanti Fault, central Greece: Two April 1894 M6+ events and stress change patterns, Tectonophysics, Volume 420, Issues 3–4, Pages 357-369

<sup>9</sup> (InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012;D2.3 2013)

Scope note: This class comprises activities of executing algorithms or software for simulating the behavior and the properties of a system of interacting components that form part of reality or not by using a mathematical model of the respective interactions. In particular it implies making predictions about the future behaviors of a system of interacting components of reality by starting simulation from an actually observed state, such as weather forecasts. Simulations may also be used to understand the effects of a theory, to compare theoretical predictions with reality, or to show differences with another theory.

Examples:

- The forecasting of the imminent flooding of Venice in November 2012 by the Hellenic Centre for Marine Research using the Poseidon Sea Level Forecast System. [\[1\] http://www.hcmr.gr/poseidon/](#)
- Predicting the temperature fluctuation during summer months inside the building of the library of the Saint Catherine Monastery in Sinai, Egypt.

In First Order Logic:

$$S7(x) \supset S5(x)$$

Decision: accept examples and add ref for st catherine example.

Continuation of examples: add an example of a what if simulation, inputs and outputs are fictitious but comparable to reality... would be good idea to add agent based model in CH. Or example from Sahara. Assigned OE and/or SS.

Properties:

[§8 Categorical Hypothesis Building](#)

Subclass of: [§5 Inference Making](#)

Scope note: This class comprises the action of making categorical hypotheses based on inference rules and theories; By categorical hypotheses we mean assumptions about the kinds of interactions and related kinds of structures of a domain that have the character of "laws" of nature or human behavior, be it necessary or probabilistic. Categorical hypotheses are developed by "induction" from finite numbers of observation and the absence of observations of particular kinds. As such, categorical hypotheses are always subject to falsification by new evidence. Instances of §8 Categorical Hypothesis Building include making and questioning categorical hypotheses.

**Commented [55]:** The use of "categorical" confuses me. It makes me think of categories as in "E15 Type Assignment". If this is the case, how is S8 related to E15? If it is not, why do we need categorical? In my example unsupported bindings are an E55 Type.

<sup>10</sup> Retrieved from: [http://poseidon.hcmr.gr/article\\_view.php?id=147&cid=28&bc=28](http://poseidon.hcmr.gr/article_view.php?id=147&cid=28&bc=28)

Examples:

- Hypothesizing that “no binding before the 10<sup>th</sup> century is made with spine supports” documented in ....

Decision: accept example and add ref.

In First Order Logic:

$$S8(x) \supset S5(x)$$

Properties:

S9 Property Type

Subclass of: [E55](#) Type

Scope note: This class comprises types of properties. Typically, instances of S9 Property Type would be taken from an ontology or terminological system. In particular, instances of this class can be used to describe in a parametric way what kind of properties the values in scientific data sets are about. By virtue of such descriptions, numeric data can be interpreted as sets of propositions in terms of a formal ontology, such as “concentration of nitrate”, observed in the ground water from a certain borehole.

Examples:

- The velocity (S9) (of a station that is observed, meaning a share-wave velocity over the first 30 m).<sup>11</sup>
- Retention time (S9) (in gas chromatography, meaning the time it takes for a component to pass through the chromatographer's column).

Decision: skip and consider together with issue related to redoing S4

In First Order Logic:

$$S9(x) \supset E55(x)$$

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<sup>11</sup> (InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012;D2.3 2013)

Properties:

S10 Material Substantial

Subclass of: [E70](#) Thing

Superclass of: [S14](#) Fluid Body

[S11](#) Amount of Matter

[E18](#) Physical Thing

Scope note: This class comprises constellations of matter with a relative stability of any form sufficient to associate them with a persistent identity, such as being confined to certain extent, having a relative stability of form or structure, or containing a fixed amount of matter. In particular, it comprises physical things in the narrower sense and fluid bodies. It is an abstraction of physical substance for solid and non-solid things of matter.

Examples:

- The groundwater of the 5-22 basin of Central Macedonia<sup>12</sup>.
- The Mesozoic carbonate sequence with [class S10](#) extracted from the area of Naflion that was mapped and studied by Tattaris in 1970<sup>13</sup>.

Decision: accepted.

In First Order Logic:

$S10(x) \supset E70(x)$

Properties:

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<sup>12</sup> (InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012;D2.3 2013)

<sup>13</sup> Photiades, A. 2010. Geological contribution to the tectono-stratigraphy of the Naflion area (NW Argolis, Greece). Bulletin of the Geological Society of Greece, vol. XLIII, No3, 1495-1507.

<sup>14</sup> Strid, A . 1986. Mountain Flora of Greece, Volume 1. University of Cambridge

[O25](#) contains (is contained in): [S10](#) Material Substantial

*It has been proposed that P44, P45 and P46 are moved from E18 Physical Thing to E70 Thing. Decision of CRM SIG is pending.*

[O15](#) occupied (was occupied by): [E53](#) Place

### [S11](#) Amount of Matter

Subclass of: [S10](#) Material Substantial

Superclass of: [S12](#) Amount of Fluid

[S13](#) Sample

Scope note: This class comprises fixed amounts of matter specified as some air, some water, some soil, etc., defined by the total and integrity of their material content.

Q: what is the difference between S10 and S11

Reasoning is: such an amount of matter, in order to be identifiable individual, requires a sort of confinement that supplies a constraint on the constallation of matter and its stability of form which, in practical terms, could be a bottle.

Decision: need to add a phrase to encapsulate the reasoning above in the S11 scope note. MD to do.

Examples:

- The mass of soil (S11) that was removed from sections 1, 2, 3 and 4 of the central building of Zominthos in order to be sieved, during the excavation in 2006<sup>15</sup>.  
The amount of natural cement (S11) that was added in a proportion of 5% in 2016 for the development of the sample of mortar in the laboratory of Ceramic, in Boumerdes University<sup>16</sup>.

<sup>15</sup> Retrieved from: <https://interactive.archaeology.org/zominthos/2006/08/field-notes-2006/>

<sup>16</sup> Kelouaz khaled , Guebboub lakhdar salim , Deloum said , Hamiene Massouad, Mortar of lime and natural cement for the restoration of built cultural heritage, IJOER, Vol-2, Issue- 1, January- 2016

**Commented [56]:** This does not have any properties. I am finding it difficult to see the difference with S10 from the scope note. Is the difference between "constellation" and "amount" clear?

Decision: accept examples

In First Order Logic:

$$S11(x) \supset S10(x)$$

S12 Amount of Fluid

Subclass of: [S11](#) Amount of Matter

[S14](#) Fluid Body

Scope note: This class comprises fixed amounts of fluid (be they gas or liquid) defined by the total of its material content, typically molecules. They frequently acquire identity in laboratory practice by the fact of being kept or handled together within some adequate containers.

Examples:

– J.K.'s blood sample 0019FCF5 for the measurement of the cholesterol blood level.  
(fictitious)

In First Order Logic:

$$S12(x) \supset S11(x)$$

$$S12(x) \supset S14(x)$$

Properties:

[O6](#) forms former or current part (has former or current part ): [S14](#) Fluid Body

Decision: current example accepted But to add Armstrong example MD

S13 Sample

Subclass of: [S11](#) Amount of Matter

**Commented [57]:** Apologies, this must have been discussed, but I am not getting it from the scope notes . S12 does not have properties either (in that O6 is a weak subproperty) and I still do not see the real difference from S11 or S10. Why don't we simply assign different E55 Types to S10, i.e. type: "solid", type: "fluid", type: "gas".

**Commented [AK58]:** fictitious

Scope note: This class comprises instances of S11 Amount of Matter taken from some instance of S10 Material Substantial with the intention to be representative for some material qualities of the instance of S10 Material Substantial or part of it was taken for further analysis. We typically regard a sample as ceasing to exist when the respective representative qualities become corrupted, such as the purity of a water sample or the layering of a bore core.

Examples:

- The ground water sample with ID 105293 that was extracted from the top level of the intake No32 under terrain.<sup>17</sup> (S13, S12)
- The micro-sample 7, taken from the painting (S10) “Cupid complaining to Venus” (Cranach) by Joyce Plesters in June, 1963.

In First Order Logic:

$$S13(x) \supset S11(x)$$

Decision: examples accepted. TV to give example 2 a reference.

S14 Fluid Body

Subclass of: [S10](#) Material Substantial

Superclass of: [S12](#) Amount of Fluid

Scope note: This class comprises a mass of matter in fluid form environmentally constraint in some persistent form allowing for identifying it for the management or research of material phenomena, such as a part of the sea, a river, the atmosphere or the milk in a bottle. Fluids are generally defined by the continuity criterion which is characteristic of their substance: their amorphous matter is continuous and tends to flow. Therefore, contiguous amounts of matter within a fluid body may stay contiguous or at least be locally spatially confined for a sufficiently long time in order to be temporarily identified and traced. This is a much weaker concept of stability of form than the one we would apply to what one would call a physical object. In general, an instance of Fluid Body may gain or lose matter over time through so-called sources or sinks in its surface, in contrast to physical things, which may lose or gain matter by exchange of pieces such as spare

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<sup>17</sup> (InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012;D2.3 2013)



parts or corrosion.

Examples:

- The Rhine River

Decision: rejected the ficitonal example. Added the river. Should add a reference to the geological definition on which this class is modelled.

In First Order Logic:

$$S14(x) \supset S10(x)$$

#### S15 Observable Entity

Subclass of: [E1](#) CRM Entity

Superclass of: [E2](#) Temporal Entity

[E77](#) Persistent Item

Scope note:

This class comprises instances of E2 Temporal Entity or E77 Persistent Item, i.e. items or phenomena, such as physical things, their behavior, states and interactions or events, that can be observed by human sensory impression, often enhanced by using tools and measurement devices.

Conceptual objects manifest through their carriers such as books, digital media, or even human memory. Attributes of conceptual objects, such as number of words, can be observed on their carriers. If the respective properties between carriers differ, either they carry different instances of conceptual objects or the difference can be attributed to accidental deficiencies in one of the carriers. In that sense even immaterial objects are observable. By this model we address the fact that frequently, the actually observed carriers of conceptual objects are not explicitly identified in documentation, i.e., they are assumed to have existed but they are unknown as individuals.

Examples:

- The domestic goose from Guangdong/1/1996 (H5N1) (S15) that was identified in 1996 in farmed geese in southern China as circulating highly pathogenic H5N1<sup>18</sup>

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<sup>18</sup> Wan XF. 2012. Lessons from Emergence of A/Goose/Guangdong/1996-Like H5N1 Highly Pathogenic Avian Influenza Viruses and Recent Influenza Surveillance Efforts in Southern China. *Zoonoses and public health*. 2012;59(0 2):32-42.

- The crow flight he observed over the waters of Minamkeak Lake during the summer. of 2015.
- The eruption of Krakatoa volcano at Indonesia in 1883<sup>19</sup>
- The density of the cupid head area in the X-Ray of the painting "Cupid complaining to Venus".

Commented [AK59]: fictionalary

Decision: postponed because the whole entity under review.

In First Order Logic:

$$S15(x) \supset E1(x)$$

Properties:

[O12](#) has dimension (is dimension of): [E54](#) Dimension

S17 Physical Genesis

Subclass of: [E63](#) Beginning of Existence

[S18](#) Alteration

Superclass of: [E12](#) Production

Scope note: This class comprises events or processes that result in (generate) physical things, man-made or natural, coming into being in the form by which they are later identified. The creation of a new physical item, at the same time, can be a result of an alteration (modification) – it can become a new thing due to an alteration activity.

Examples:

- The desertification process that resulted in the spatial 'tiger bush' pattern on the gradually sloped terrain in Western Africa, as it was studied in 1994.<sup>20</sup>
- The landslide event, near the epicentre of the 1999 earthquake, along the road leading to the peak of the Parnitha Mountain.
- The corrosion process affecting my copper samples (S13) in the artificial aging salt-spray apparatus after 10 cycles which produced layers (E25) of cuprite and malachite. (E12)

Commented [GB60]: ATH to check if was spatial or special

Commented [GB61]: If it is real, put reference. If it is not then delete.

Commented [AK62]: fictionalary

Decision: examples accepted. TV to give reference to his sampling example.

<sup>19</sup> Symons, G.J. (ed) 1888. *The Eruption of Krakatoa and Subsequent Phenomena* (Report of the Krakatoa Committee of the Royal Society. London

<sup>20</sup> Thiéry, J.-M. d'Herbès, C. Valentin A model for simulating the genesis of banded patterns in Niger, *Journal of Ecology*, 83 (1995), pp. 497-507

In First Order Logic:

$S17(x) \supset E63(x)$

$S17(x) \supset S18(x)$

Properties:

[O17](#) generated (was generated by): [E18](#) Physical Thing

S18 Alteration

Subclass of: [E5](#) Event

Superclass of: [S17](#) Physical Genesis

[E11](#) Modification

Scope note: This class comprises natural events or man-made processes that create, alter or change physical things, by affecting permanently their form or consistency without changing their identity. Examples include alterations on depositional features-layers by natural factors or disturbance by roots or insects, organic alterations, petrification, etc.

#### Examples:

- The petrification process of the Lesvos forest related to the intense volcanic activity in Lesvos island during late Oligocene - middle Miocene period<sup>21</sup>
- The stretching of cockled parchment leaves (E18) after humidification which results in these leaves being flattened.

In First Order Logic:

$S18(x) \supset E5(x)$

Decision: examples good. TV will send ref for example 2

Properties:

[O18](#) altered (was altered by): [E18](#) Physical Thing

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<sup>21</sup> [Marinos, P.G.](#) Engineering Geology and the Environment, Volume 3, CRC Press, 1997

### S19 Encounter Event

Subclass of: [S4 Observation](#)

Scope note: This class comprises activities of S4 Observation (substance) where an E39 Actor encounters an instance of E18 Physical Thing of a kind relevant for the mission of the observation or regarded as potentially relevant for some community (identity). This observation produces knowledge about the existence of the respective thing at a particular place in or on surrounding matter. This knowledge may be new to the group of people the actor belongs to. In that case we would talk about a discovery. The observer may recognize or assign an individual identity of the thing encountered or regard only the type as noteworthy in the associated documentation or report.

In archaeology there is a particular interest if an object is found “in situ”, i.e. if its embedding in the surrounding matter supports the assumption that the object was not moved since the archaeologically relevant deposition event. The surrounding matter with the relative position of the object in it as well as the absolute position and time of the observation may be recorded in order to enable inferences about the history of the object.

In Biology, additional parameters may be recorded like the kind of ecosystem, if the biological individual survives the observation, what detection or catching devices have been used or if the encounter event supported the detection of a new biological kind (“taxon”).

#### Examples:

- [The finding, by Prof. Stampolidis, of a complete skeleton, *in situ*, at the site of Eleutherna during the archaeological excavation carried out by the University of Crete in 2000.]
- The detection of *Iagocephalos\_Scleratus* in the catch of trawler XXX in Mediterranean sea, during the first week of August 2014<sup>22</sup>

Commented [GB63]: needs reference document.

Commented [AK64]: fictionary

Commented [GB65]: Requires reformulation to more standard English. Difficult to comprehend.

Decision: accepted by for adding references and the name of the trawler

<sup>22</sup> MARINETLO-iMarine - Data e-Infrastructure Initiative for Fisheries Management and Conservation of Marine Living Resources, Contributors: Bekiani, Chr., Doerr, M., Allocca, C., Barde, J., Minadakis, N. Version 4.0, January 2014

In First Order Logic:

$$S19(x) \supset S4(x)$$

Properties:

[O19](#) has found object (was object found by): [E18](#) Physical Thing

[O21](#) has found at (witnessed): [E53](#) Place

### [S20 Rigid Physical Feature](#)

Subclass of: [E26](#) Physical Feature

[E53](#) Place

Superclass of: [E27](#) Site

[S22](#) Segment of Matter

Scope Note: Any instance of this class is a physical feature with sufficient stability of form in itself and with respect to the physical object bearing it in order to associate a permanent reference space within which its form is invariant and at rest. The maximum volume in space that an instance of S20 Rigid Physical Feature occupies defines uniquely a place for the feature with respect to its surrounding matter.

Therefore we model S20 Rigid Physical Feature as a subclass of E26 Physical Feature and of [E53](#) Place. The latter is intended as a phenomenal place as defined in CRMgeo (Doerr and Hiebel 2013). By virtue of this multiple inheritance we can discuss positions relative to the extent of an instance of S20 Rigid Physical Feature without representing each instance of it together with an instance of its associated place. However, since the identity and existence of this place depends uniquely on the identity of the instance of S20 Rigid Physical Feature as matter, this multiple inheritance is unambiguous and effective and furthermore corresponds to the intuitions of natural language. It shortcuts an implicit self-referential path from E26 Physical Feature through *P156 occupies*, [E53](#) Place, *P157 is at rest relative to* E26 Physical Feature.

In cases of instances of S20 Rigid Physical Feature on or in the surface of earth, the default reference is typically fixed to the closer environment of the tectonic plate or sea floor. In cases of features on mobile objects, the reference space is typically fixed to the geometry of the bearing object. Note that the reference space associated with the instance of S20 Rigid Physical Feature may quite well be deformed over time, as long the

**Commented [66]:** This does not have properties, it is not a leafclass either. Why can't we achieve the same with multiple instantiation of an entity as E26 and E53 and assign an E55 Type "rigid" or "stable form"?

continuity of its topology does not become unclear, such as the compression of dinosaur bones in geological layers, or the distortions of the hull of a ship by the waves of the sea. Defined in this way, the reference space can be used as a means to infer from current topological relationships past topological relationships of interest

Examples:

- The temple in Abu Simbel before its removal, which was carved out of solid rock
- Albrecht Duerer's signature on his painting of Charles the Great
- The damaged form of the nose of the Great Sphinx in Giza
- The "Central Orygma" pit-house that marks the excavated built area of the settlement of Mavropigi., representing phases I-III.<sup>23</sup>
- The surface Surf313 (created by the excavation process on 3/3/2003.) (fictitious)

**Commented [GB67]:** Ss to confer with Athina on the phrasing.

**Commented [AK68]:** fictinary

In First Order Logic:

$S20(x) \supset E18(x)$

$S20(x) \supset E53(x)$

Decision: accept examples but phrasing needed to be improved on 4.

Properties:

O7 confines (is confined by) :[S10](#) MaterialSubstantial

[S21 Measurement](#)

**Commented [69]:** It would be useful to explain the difference with E16 here. The current scope notes does not make it obvious. Is it only to allow the sub-property O24? This replication for the benefit of a property may be confusing.

Answer: It's a technical kludge while sorting out the modelling of observation.

Subclass of: [S4](#) Observation

[E16](#) Measurement

Superclass of: [S3](#) Measurement by Sampling

Scope note: This class comprises actions measuring instances of E2 Temporal Entity or E77 Persistent Items, properties of physical things, or phenomena, states and interactions or events,

<sup>23</sup> Karamitrou-Mentessidi, G et al. 2013 .New evidence on the beginning of farming in Greece: the Early Neolithic settlement of Mavropigi in western Macedonia (Greece). Antiquity Project 87 (336).

that can be determined by a systematic procedure. Primary data from measurement devices are regarded to be results of an observation process.

Examples:

- JOC chemical analysis of pH with ID 1234.

Commented [AK70]: fictinary

Decision: need examples from laser department. Generic example rejected.

In First Order Logic:

$S21(x) \supset S4(x)$

$S21(x) \supset E16(x)$

Properties:

[O24](#) measured (was measured by): [S15](#) Observable Entity

S22 Segment of Matter

Subclass of: [S20](#) Physical Feature

Scope Note: This class comprises physical features in a relative stability of form within a specific spacetime volume. The spatial extent of an instance of S22 Segment of Matter is defined by humans usually because the geometric arrangement of physical features or parts of them on or within it are of interest. An instance of S22 Segment of Matter exists as long as there is no modification of the geometric arrangement of its parts. Therefore the temporal boundaries of the defining spacetime volume are given by two S18 Alteration events. It comes into existence as being an object of discourse through an instance of S4 Observation or declaration and is restricted to the time span starting after the last change caused by an instance of S18 Alteration before the observation or declaration and ending with an instance of another S18 Alteration Event.

The history of a S22 Segment of Matter started with a S17 Physical Genesis event that deposited still existing matter within the defined spatial extent. The collection of all S18 Alteration events represent its history. Some of the events will not leave any physical material within the S22 Segment of Matter.

Commented [71]: Does n't this contradict the fact that it is the S4 Observation which brings it into existence? See further up in this paragraph.

In other words, this is a fiat object (B. Smith sense) that has declarative boundaries in 3 dimensions but natural boundaries in time (the 4<sup>th</sup> dimension).

Decision: reflect on scope note before next time. SS and MD

#### Examples:

- The borehole collar 74001 part of the borehole 74001 of GR central Macedonia.<sup>24</sup>

Decision: example rejected. Need example of a 'balk' from an archaeological record.

In First Order Logic:

$$S22(x) \supset S20(x)$$

Properties:

[O23](#) is defined by (defines): [E92](#) Spacetime Volume

## Appendix F- 337: Excavation Interface

### Axx Excavation Interface

Subclass of: S20 Rigid Physical Feature

Scope Note: This class comprises instances of S20 Rigid Physical Feature that constitutes a surface produced through one or several A1 Excavation Process Units. Instances are often documented through drawing and/or measured by technical means such as photography, tachymetry or laser scanning. Using a planar excavation methodology this is typically the surface of a planum or the surface of a profile/section. Using a stratigraphic excavation methodology the Axx Excavation Interface would have the intention to approximate an A3 Stratigraphic Interface. The drawing and measurement of profiles is also common practice when a stratigraphic excavation methodology is used.

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<sup>24</sup> (InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012;D2.3 2013)



Examples:

The Excavation Interface Planum 6 of square I22 in Area F-I is documented in the field drawing "Planum 6 F-I i22 " created in Fall 1982

Properties:

APxx confines (is confined by): [S22](#) Segment of Matter

[APxx](#) confines (is confined by)

Domain: Axx Excavation Interface

Range: [S22](#) Segment of Matter

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

Scope note: This property identifies partly or completely the surface (Axx Excavation Interface) of a [S22](#) Segment of Matter that was excavated during one or several A1 Excavation Process Units. In case of a planar excavation methodology this may be the S22 Segment of Matter contained between two planums as upper and lower boundaries and limited by e.g. four Profiles to the north, east, south and west. The documentation of the excavation interfaces should help to document the structure and composition of the S22 Segment of Matter that they confine. Using a stratigraphic excavation methodology the S22 Segment of Matter is intended to approximate an A2 Stratigraphic Volume Unit.

Examples:

- [The Excavation Interface Eastern profile of square I22 in Area F-I is documented in field drawing "Ostprofil F-I i22" confines the excavation square I22 to the east.](#)

[HW to GH: References to the examples are needed]

AP4 produced surface (was surface produced by)

Domain: [A1](#) Excavation Process Unit

Range: Axx Excavation Interface

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

Scope note: This property identifies the instance of an Axx Excavation Interface that constitutes the new surface produced during one or several A1 Excavation Process Units in the excavated area. Frequently this surface or parts of it are documented through drawing and/or measured by technical means such as photography, tachymetry or laser scanning.

Examples:

The stratigraphic Excavation Process Unit excavating the Stratigraphic Volume Unit (2) produced surface S1.

The stratigraphic Excavation Process Unit excavating the volume (S22 Segment ) between Planum 5 and Planum 6 produced surface Planum 6

## Appendix G– 312 geopolitical unit

### E4 Period

Subclass of: [E2](#) Temporal Entity  
Subclass of [E92](#) Spacetime volume  
Superclass of: [E5](#) Event

**Scope note:** This class comprises sets of coherent phenomena or cultural manifestations occurring in time and space.

It is the social or physical coherence of these phenomena that identify an E4 Period and not the associated spatiotemporal extent. This extent is only the “ground” or space in an abstract physical sense that the actual process of growth, spread and retreat has covered. Consequently, different periods can overlap and coexist in time and space, such as when a nomadic culture exists in the same area and time as a sedentary culture. This also means that overlapping land use rights, common among first nations, amounts to overlapping periods.

Often, this class is used to describe prehistoric or historic periods such as the “Neolithic Period”, the “Ming Dynasty” or the “McCarthy Era”, but also geopolitical units and activities of settlements are regarded as special cases of E4 Period. However, there are no assumptions about the scale of the associated phenomena. In particular all events are seen as synthetic processes consisting of coherent phenomena. Therefore E4 Period is a superclass of E5 Event. For example, a modern clinical E67 Birth can be seen as both an atomic E5 Event and as an E4 Period that consists of multiple activities performed by multiple instances of E39 Actor.

As the actual extent of an E4 Period in spacetime we regard the trajectories of the participating physical things during their participation in an instance of E4 Period. This includes the open spaces via which these things have interacted and the spaces by which they had the potential to interact during that period or event in the way defined by the type of the respective period or event. Examples include the air in a meeting room transferring the voices of the participants. Since these phenomena are fuzzy, we assume the spatiotemporal extent to be contiguous, except for cases of phenomena spreading out over islands or other separated areas, including geopolitical units distributed over disconnected areas such as islands or colonies.

Whether the trajectories necessary for participants to travel between these areas are regarded as part of the spatiotemporal extent or not has to be decided in each case based on a concrete analysis, taking use of the sea for other purposes than travel, such as fishing, into consideration. One may also argue that the activities to govern disconnected areas imply travelling through spaces connecting them and that these areas hence are spatially connected in a way, but it appears counterintuitive to consider for instance travel routes in international waters as extensions of geopolitical units.

Consequently, an instance of E4 Period may occupy a number of disjoint spacetime volumes, however there must not be a discontinuity in the timespan covered by these spacetime volumes. This means that an instance of E4 Period must be contiguous in time. If it has ended in all areas, it has ended as a whole. However it may end in one area before another, such as in the Polynesian migration, and it continues as long as it is ongoing in at least one area.

We model E4 Period as a subclass of E2 Temporal Entity and of E92 Spacetime volume. The latter is intended as a phenomenal spacetime volume as defined in CRMgeo (Doerr and Hiebel 2013). By virtue of this multiple inheritance we can discuss the physical extent of an E4 Period without representing each instance of it together with an instance of its associated spacetime volume. This model combines two quite different kinds of substance: an instance of E4 Period is a phenomena while a spacetime volume is an aggregation of points in spacetime. However, the real spatiotemporal extent of an instance of E4 Period is regarded to be unique to it due to all its details and fuzziness; its identity and existence depends uniquely on the identity of the instance of E4 Period. Therefore this multiple inheritance is unambiguous and effective and furthermore corresponds to the intuitions of natural language.

There are two different conceptualisations of 'artistic style', defined either by physical features or by historical context. For example, "Impressionism" can be viewed as a period lasting from approximately 1870 to 1905 during which paintings with particular characteristics were produced by a group of artists that included (among others) Monet, Renoir, Pissarro, Sisley and Degas. Alternatively, it can be regarded as a style applicable to all paintings sharing the characteristics of the works produced by the Impressionist painters, regardless of historical context. The first interpretation is an instance of E4 Period, and the second defines morphological object types that fall under E55 Type.

*A geopolitical unit as a specific case of an E4 Period is the set of activities and phenomena related to the claim of power, the consequences of belonging to a jurisdictional area and an administrative system that establishes a geopolitical unit. Examples from the modern period are countries or administrative areas of countries such as districts whose actions and structures define activities and phenomena in the area that they intend to govern. The borders of geopolitical units are often defined in contracts or treaties although they may deviate from the actual practice. The spatiotemporal properties of Geopolitical units can be modelled through the properties inherited from E92 Spacetime volume.*

Another specific case of an E4 Period is the actual extent of the set of activities and phenomena as evidenced by their physical traces that define a settlement, such as the populated period of Nineveh.

Examples:

- Jurassic
- Populated Period of Nineveh
- Imperial Rome under Marcus Aurelius
- European Bronze Age
- Italian Renaissance
- Thirty Years War
- Sturm und Drang
- Cubism

In First Order Logic:

$$E4(x) \supset E2(x)$$

$$E4(x) \supset E92(x)$$

Properties:

[P7](#) took place at (witnessed): [E53](#) Place

[P8](#) took place on or within (witnessed): [E18](#) Physical Thing

[P9](#) consists of (forms part of): [E4](#) Period

## Appendix H– 314 the introductory text

### What is the CIDOC CRM?

The CIDOC Conceptual Reference Model (CRM) is a theoretical and practical tool for information integration in the field of cultural heritage. It can help researchers, administrators and the public explore complex questions with regards to our past across diverse and dispersed datasets. The CIDOC CRM achieves this by providing definitions and a formal structure for describing the implicit and explicit concepts and relationships used in cultural heritage documentation and of general interest for the querying and exploration of such data. Such models are also known as formal ontologies. These formal descriptions allow the integration of data from multiple sources in a software and schema agnostic fashion.

The CIDOC CRM has been developed in a manner that is intended to promote a shared understanding of cultural heritage information by providing a common and extensible semantic framework for evidence-based cultural heritage information integration. It is intended to be a common language for domain experts and implementers to formulate requirements for information systems and to serve as a guide for good practice of conceptual modelling. In this way, it can provide the "semantic glue" needed to mediate between different sources of cultural heritage information, such as that published by museums, libraries and archives.

The CIDOC CRM is the outcome of over 20 years of development and maintenance work, originally by the CIDOC Documentation Standards Working Group and, presently, by the CIDOC CRM SIG, both of which are working groups of CIDOC. Since December, 2006, it has been recognized as an official ISO standard. This status was renewed in 2014 and can be found at [ISO 21127:2014](#).

The CIDOC CRM is a living standard that is designed in such a way as to provide both high level information retrieval and the formulation and documentation of very specific data points and questions. The CIDOC CRM thus consists of the CRMbase standard which provides the basic classes and relations devised for the cultural heritage world. This base ontology is complemented by a series of modular extensions to the basic model. Such extensions are designed to support different types of specialized research questions and documentation such as bibliographic documentation or geoinformatics. The CIDOC CRM extensions are developed in partnership with the research communities in question. These extensions are formulated in a manner that is harmonized with the base ontology such that data expressed in any extension is compatible with the base system of concepts and relations. This harmonized development process leads to a high level of information integrity and integration not available in other information systems.

### How can I use the CIDOC CRM?

**Commented [72]:** we should have bigger font and pictures on the home page? Maybe all this is too wordy?

**Commented [73]:** is this actually true? Do we have to reference them?

**Commented [74]:** make a hyper link?

The CIDOC CRM is, first of all, an intellectual system for organizing and integrating cultural heritage data. This system is officially expressed in specification documents. These documents are available in the [resource](#) section of this website. These are the official reference documents for the CIDOC CRM and are actively maintained by the CIDOC CRM SIG and updated according to user needs and the organic growth of the standard.

Commented [75]: hyperlink

Using CIDOC CRM in practical data integration scenarios can be achieved in a number of ways. In information integration scenarios it can be used to implementat of RDF or OWL based knowledge bases to the implementation of cross database query interpreters. It can also be used as an intellectual guide in order to build more effective traditional relational databases.

In order to begin the adoption of CIDOC CRM in different use scenarios, potential adopters are encouraged to consult the teaching section of this website to consult the available tutorials and information there. There are also a series of FAQ documents designed to help answer well known questions of CRM adopters. Potential users/members of the CRM community are also welcomed to contact the CIDOC CRM SIG for advice and [information](#). If you are already using CIDOC CRM and have questions or issues that are not resolved by the documentation and tutorials, you may always join the CIDOC CRM SIG mailing list and post questions there on specific topics. The results of past questions and issues are collected on the website here and form a useful archive to consult in order to answer previously asked questions.

Commented [76]: email here?

As mentioned above, the CIDOC CRM now encompasses both the basic standard, CRMbase, as well as a family of modular extensions. Each of these extensions has its own specific website to support its use in the same manner as above. To see the present list of extensions, please click [here](#).

Commented [77]: link to extension part here

### Who are we?

CIDOC CRM is developed by the CIDOC CRM Special Interest Group. This is a volunteer community dedicated to the development and maintenance of a common standard for integrating cultural heritage data. The SIG works under the aegis of CIDOC, the International Council for Documentation, which, in turn, is a committee of the International Council of Museums (ICOM). Membership in the CIDOC CRM SIG is on an institutional basis and its membership includes private and public institutions associated with the research and documentation of the human past. The work of the SIG is done on a volunteer basis and funding comes from the contributions in kind of the member institutions in supporting the work of their staff in contributing to this project. The SIG meets three or four times a year, the meetings being hosted by the member institutions of the SIG. As an active working group of ICOM, the SIG also participate in the annual CIDOC conference and the triannual meetings of ICOM. The present membership of the CIDOC CRM SIG can be consulted [here](#).

## Appendix I- 260 Review specializations of Appellation

This class comprises textual strings that within a cultural context can be clearly identified as titles due to their form. Being a subclass of E41 Appellation, E35 Title can only be used when such a string is actually used as a title of a work, such as a text, an artwork, or a piece of music.

Titles are proper noun phrases or verbal phrases, and should not be confused with generic object names such as “chair”, “painting” or “book” (the latter are common nouns that stand for instances of E55 Type). Titles may be assigned by the creator of the work itself, or by a social group.

This class also comprises the translations of titles that are used as surrogates for the original titles in different social contexts.

## Appendix J – 295 Digital Libraries as physical objects

### Delete:

#### **E84 Information Carrier**

Subclass of: [E22 Man-Made Object](#)

**Scope note:** This class comprises all instances of E22 Man-Made Object that are explicitly designed to act as persistent physical carriers for instances of E73 Information Object.

An E84 Information Carrier may or may not contain information, e.g., a diskette. Note that any E18 Physical Thing may carry information, such as an E34 Inscription. However, unless it was specifically designed for this purpose, it is not an Information Carrier. Therefore the property *P128 carries (is carried by)* applies to E18 Physical Thing in general.

#### Examples:

- the Rosetta Stone
- my paperback copy of Crime & Punishment
- the computer disk at ICS-FORTH that stores the canonical Definition of the CIDOC CRM



### In First Order Logic:

$E84(x) \supset E22(x)$

### New examples in:

#### E78 Curated Holding

Subclass of: [E24](#) Physical Man-Made Thing

Scope note: This class comprises aggregations of instances of E18 Physical Thing that are assembled and maintained (“curated” and “preserved,” in museological terminology) by one or more instances of E39 Actor over time for a specific purpose and audience, and according to a particular collection development plan. Typical instances of curated holdings are museum collections, archives, library holdings and digital libraries. A digital library is regarded as an instance of E18 Physical Thing because it requires keeping physical carriers of the electronic content.

Items may be added or removed from an E78 Curated Holding in pursuit of this plan. This class should not be confused with the E39 Actor maintaining the E78 Curated Holding often referred to with the name of the E78 Curated Holding (e.g. “The Wallace Collection decided...”).

Collective objects in the general sense, like a tomb full of gifts, a folder with stamps or a set of chessmen, should be documented as instances of E19 Physical Object, and not as instances of E78 Curated Holding. This is because they form wholes either because they are physically bound together or because they are kept together for their functionality.

Examples:

- the John Clayton Herbarium
- the Wallace Collection
- Mikael Heggelund Foslie’s coralline red algae Herbarium at Museum of Natural History and Archaeology, Trondheim, Norway
- The Digital Collections of the Munich Digitization Center (MDZ) accessible via <https://www.digital-sammlungen.de> at least in January 2018.

Decision: agreed

In First Order Logic:

$E78(x) \supset E24(x)$

#### E24 Physical Man-Made Thing

Subclass of: [E18](#) Physical Thing

[E71](#) Man-Made Thing

Superclass of: [E22](#) Man-Made Object

[E25](#) Man-Made Feature

[E78](#) Collection

Scope Note: This class comprises all persistent physical items that are purposely created by human activity.

This class comprises man-made objects, such as a swords, and man-made features, such as rock art. No assumptions are made as to the extent of modification required to justify regarding an object as man-made. For example, a “cup and ring” carving on bedrock is regarded as instance of E24 Physical Man-Made Thing.

Instances of this class may act as carriers of instances of E73 Information Object.

Examples:

- the Forth Railway Bridge (E22)
- the Channel Tunnel (E25)
- the Historical Collection of the Museum Benaki in Athens (E78)
- the Rosetta Stone (E22)
- my paperback copy of Crime & Punishment (E22) (fictitious)
- the computer disk at ICS-FORTH that stores the canonical Definition of the CIDOC CRM v.3.2 (E22)
- my empty DVD disk (E22) (fictitious)

Decision: agreed although will look for example of well known some sort of information bearing object that does not have information on it. E.g. empty blackboard HW to MD

Addition of ref to E73 accepted.

In First Order Logic:

$E24(x) \supset E18(x)$

$E24(x) \supset E71(x)$

Properties:

[P62](#) depicts (is depicted by): [E1](#) CRM Entity  
(P62.1 mode of depiction: [E55](#) Type)

[P65](#) shows visual item (is shown by): [E36](#) Visual Item

### Scope Note extension:

#### E25 Man-Made Feature

Subclass of: [E24](#) Physical Man-Made Thing  
[E26](#) Physical Feature

Scope Note: This class comprises physical features that are purposely created by human activity, such as scratches, artificial caves, artificial water channels, etc. In particular, it includes the information encoding features on mechanical or digital carriers.

No assumptions are made as to the extent of modification required to justify regarding a feature as man-made. For example, rock art or even “cup and ring” carvings on bedrock a regarded as types of E25 Man-Made Feature.

Examples:

- the Manchester Ship Canal

- Michael Jackson's nose following plastic surgery
- The laser-readable "pits" engraved June 2014 on Martin Doerr's CD-R, copying songs of Edith Piaf's.
- The carved letters on the Rosetta Stone

decision: agreed

In First Order Logic:

$$E25(x) \supset E26(x)$$

$$E25(x) \supset E24(x)$$