Guideline for Writing Scope Notes with Examples

In this document I describe examples of using the Guideline for Writing Scope Notes. Below, I first repeat the Guideline. In the Appendix, I show examples from the current CRM version 7.1. I use highlighting with colors for pointing to the application of the different principles of the Guideline in these scope notes. I prefer this method in order to show that the Guideline does not aim at demanding a structured verbose text, but rather that the author of a scope note has thought about the respective principles and decided that these aspects are either self-evident, non-applicable or sufficiently clear from the created text.

Indeed, many scope notes have not yet been revised thoroughly with respect to the guideline. Wherever I found something missing or being implicit I have added a comment.

Guideline for Writing Scope Notes

A scope note is a textual description of the **intension** of a **class** or **property. Intension refers to the traits serving as criteria to identify items belonging to the class or property.**
Scope notes are provided to help explain the intended meaning of the CIDOC CRM's classes and properties, and where they apply. They refer to a conceptualisation commonly understood by domain experts and disambiguate between different possible interpretations. Illustrative examples of **instances** of classes and properties are also provided in the scope notes for explanatory purposes.

The scope notes for classes should make sure that multiple users communicating information via a machine, rather than via clarifying dialogues, can refer to the same particular item and have a shared understanding of the item's kind, i.e., the kinds of characteristics that it must and that it may have.

For instance, if users enter data about the Mona Lisa, they should be able to distinguish the physical art object from the visual appearance and from the depicted person, just by understanding the scope note and applying the appropriate class. Otherwise, referring to "da Vinci's Mona Lisa" would be ambiguous in all properties assigned to the instance and not comparable to each other as it would be unclear if the subject was the person, painting, or visual contents. The respective ontological distinctions should be sufficient to characterize the instance as **one identifiable item**, so that CRM properties applied in a description may be verified by others[1]. Note, that even though this seems obvious, there exist enough examples from museum documentation confusing depictions with objects, and particularly in gazetteers notoriously confusing administrative units with settlement structures and populations (see also Low & Doerr 2010: "A Postcard is not a Building"). In human communication this problem normally does not arise, as the context of previous speech often disambiguates the intended category and thereby identity, and people would ask back to resolve the ambiguity.

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[1] For the interested reader, a full analysis of this concept of identity can be found in David Wiggin's "Sameness and Substance Renewed", Cambridge University Press; 2nd edition, 12 Jan. 2008

For each class, the ontology formally declares which properties can apply to an instance of that class. Consequently, the property scope notes should make sure that the users have a shared understanding of what these properties mean, and how they differ from other, possibly similar properties, in particular those with similar labels.

The CIDOC CRM has adopted the term "scope note" from terminology systems, in particular the AAT of the Getty Research Institute, rather than talking about a "definition", because for many fundamental concepts, but also for biological species, definitions in a logical sense are hardly possible. Therefore, it is often sufficient in a scope note to remind about widely understood common concepts, to clarify border cases, non-obvious applications and to provide counterexamples. The following guidelines should be understood as a checklist, if the respective aspects are obvious from a given scope or need additional clarification, and not as a formal template.

About the General Format:

The language adopted in the scope note should be comprehensible for a wide range of users from different disciplines. If there exist significant disciplinary differences of terminology or highly specialized terms close to the intended meaning of a class, the scope note should clarify the equivalence or overlap, such as the use of "type" in biology and "prototype" in archaeology.

The criteria for including important traits in the scope note should be precise to the extent that it is useful for the intended discourse. In extensions or local applications, suitable specializations may refine the considerations for a more general discourse. For instance, defining an instance of E21 Person for a general cultural historical discourse to exist until death, does not require precise criteria for determining the conditions of being dead. It would even be counterproductive, as such details may rarely be known. However, a concept more specific than E21 Person, e.g in an application intended for legal disputes, may define more precisely the conditions for the time from which a person is legally, or medically, regarded as being deceased.

The first paragraph of the scope note should provide a summary of the most relevant and general distinctions, which are elaborated, as appropriate, in the following paragraphs into more detail and clarifications. It helps readers to immediately tell them whether or not the class or property they are looking at matches their need, and sets the context for understanding better the following explanations. Descriptions of the traits detailed below are required, although some may be self-evident and thus not requiring detailed elaboration.

A separate section of example instances is foreseen in the format of the definition of the CIDOC CRM after each scope note. A separate guideline explains how to write them. Comments for these examples may refer to which principle described in the scope note is being exemplified.

Guideline for Writing Class Scope Notes

A scope note for the description of a class (let's call it "class A") should make the user understand the traits necessary for recognizing an instance of this class by addressing the following aspects:

A) Substance:

What are instances of class A made of?

Typical substances include: solid-state matter, logical arrangements of symbols, behaviour of things in time, people in their capacity to act intentionally. For instances of many classes, the form is characteristic. In these cases, the substance must be one that supports a persistent form, such as solid-state matter. In other cases, the substance may be one that supports the behaviour characteristic for the instances of a class without being a carrier of a persistent form, such as "communicating". Typically, the substance is the same or a refinement of that of the superclass. For instance, the substance of a living organism is a refinement of that of a physical object, the substance of a digital object is a refinement of a logical arrangement of symbols. The scope note may refer to an intuitive or common sense understanding of the substance of a well-known and understood category of things, such as that of a human being for class E21 Person. Understanding the substance is necessary for providing identity criteria (see item C below).

B) Traits and Potential:

Which traits justify that an item is an instance of class A? With what can an instance of class A interact, have or establish a relationship?

For some classes it is possible to define explicitly the necessary characteristic traits, such as a text consisting of a fixed sequence of characters of a writing system. For other classes, in particular natural kinds, such as biological species, prototypical examples may be more effective. It may be helpful to refer to an enumeration of characteristic subclasses in helping the reader understand the common traits of a class. However, a class **must not** be defined as an enumeration of classes without essential common traits. Necessary traits often have to do with a variety of forms, in which the respective substance of an item may appear, that is determined by its functionality or capabilities for some purpose, such as a "hammer", a "material sample" or an "information object". In the case of processes, necessary traits may have to do with kinds of interactions, involved items, inputs and outcomes, such as in "scientific conferences", "auctions", "business meetings" or "group formation".

The properties of a class are formally declared in the ontology separate from the classes. The property declaration of a class may not be sufficient to understand the context of an instance of class A. Therefore, the scope note of the class should provide an understanding of the general contexts these properties relate to, but not repeat their individual definition.

C) Identity criteria:

What makes two instances of class A distinct? (synchronic or numeric identity).

Identity criteria are one of the most powerful considerations for effective ontological distinctions. This is nearly trivial and intuitive for persons, but can be quite demanding for other classes, such as buildings in an urban conglomerate, with overlapping boundaries, evolving, merging and splitting in the course of their history. It must not be confused with classification, i.e., finding a characteristic class for something at our attention, such as calling "this is a wine glass" to be the item's identity! It must also not be confused with identification criteria, i.e., what known characteristics may be enough to determine an instance, such as a social security number for a citizen of some state, even if these necessarily apply to a single instance of the class (in this example an instance of E21

Person).

What makes an instance remain the same after some time? (diachronic identity).
This is nearly trivial and intuitive for persons between birth and death. The existence of mummies may confuse the answer to this question. For companies, it may be a matter of legal dispute. Similarly, repair, spare part replacement, reconstruction, transformations and decay may confuse the diachronic identity of physical things.

Which changes will be regarded as not affecting identity is not a question of absolute insight into the nature of things, but as a deliberate choice for analyzing certain kinds of problems. Each choice corresponds to a different class, which may coexist for some time on the same item. For instance, if a fork is turned into a bracelet, the reworking and radical change of function can be regarded as creating a new object consuming another one under the definitions of a class centering identity on built-in functionality and the corresponding social contexts. The same bracelet, continuing to exhibit substantial features of the original fork, can be seen as the same object as the fork, under the definitions of a different class focusing on the continuity of a distinct, contiguous piece of matter.

D) Unity criteria:
What makes some extent of substance be part of an instance of class A?
Analyse if something can be part of a bigger thing and explain how. If this is the case, the class of that thing will relate to the class of the bigger thing with a mereological relationship. For instance, a set of chessmen forms a functional whole in the well-known configuration of figures in the same style. In contrast, a single king chessman should be physically coherent and have an integrity of form to be recognizable and stand well. What makes activities be part of a meeting? Is a sleeping participant taking part? Meetings are typically spatially and temporally confined. Therefore, a sleeping participant may be defined as participating. Unity criteria are also necessary for delimiting spatiotemporally and discerning an item from its environment, albeit with fuzzy boundaries.

Unity criteria may interplay with synchronic identity. For instance, a built complex may be one coherent built structure, but distinct habitations. Depending on the criteria given for the class, the complex is considered to be one thing or multiple things. In such cases, the multiple things may be part of the one thing.

E) Existence:
What kinds of processes make an instance of class A come into existence and what makes it stop existing? This may be the most important criterion for ontological distinctions. Ambiguity of the question whether an instance of a class exists or not, according to the criteria given by a scope note beyond the appropriate temporal imprecision, indicates that more than one ontological class is confused in one, such as settlements and administrative units in some gazetteers.

For instance:
Meetings typically start and end by agreement.

A blood sample starts to exist when taken, and may be considered to end existing when its content is consumed in the chemical reactions of the medical analysis or it is rendered useless by preservation failure, i.e. being no longer representative of its source because of its current composition.

A set of chessmen will start to exist when the figures are put together, for packaging or direct use. One may consider that it ceases to exist when it is no longer functional, i.e., when one of the figures is destroyed or lost beyond the reach of its owner. If figures of the same style are available, they may be replaced.
In a museum perspective, it may be regarded to exist as long as all kinds of figures are still present or as long as at least one figure exists. Replacement may not be regarded as permitted.

Existence criteria may interplay with diachronic identity. When the diachronic identity ends, whatever substance remains must be regarded to be something else, possibly constituting instances of other classes.

Existence criteria are also critical for making and understanding ontological distinctions. If multiple classes are applied to the same instances, either via IsA or multiple instantiation, all involved classes must have compatible identity and existence criteria.

F) Further clarifications:
It is often helpful to specify when a class is distinct from other classes for a better understanding of the traits necessary for the instances of a class. Note that distinct classes may nevertheless share some common instances, and the substance of instances of some class may even be instances of another class for some phase of existence or carriers of instances of other classes. For example, the substance of a bottle for liquids may be a labelled blood sample for some period of time. A magnetic disc may be a carrier of some text for some period of time.

It is important to point the reader to non-obvious cases where the class applies, borderline cases, and important applicable contexts.

Examples of instances should be given in the foreseen separate section (see example template instructions) and therefore should, in general, not appear in the scope note proper. The scope note may however refer to some characteristic kinds of things as examples in order to illustrate traits and contexts. In some cases it may nevertheless be useful to include the example of a particular instance in a description of a more complex application context.

Guideline for Writing Property Scope Notes

With respect to the nature of the property itself, writing property scope notes is less complex than writing class scope notes, but often need to justify more formal logical constructs specific to properties. A scope note for the description of a property (let's call it "property A") should make the reader understand the necessary traits for recognizing an instance of this property and its

applicability by addressing the following aspects:

A) Role or Interaction:
What role or interaction describes property A between an instance of its domain and another of its range?
The scope note should clarify: a) the nature of the relation, b) under which circumstances it applies c) which incidental or essential conditions qualify instances to be related by property A and d) in which way it specializes it's superproperties, if any. It is important to differentiate from other, similar properties and properties with similar labels, and closely related cases, including ones out of the scope of this model.
The scope note should further clarify important applications and non-obvious interpretations, such as the presence of immaterial objects in events via possibly anonymous material carriers (see *P12 occurred in the presence of*), or the location of a Move (E9) as the whole trajectory of the thing moved and those moving it.

B) Existence
What brings the property instance into existence, and what limits its existence?
Some properties may be essential to either domain or range, i.e., the property instance must exist as long as the respective class instance exists. E.g., the relationship of a part of a text to the whole text exists as long as the whole exists, because the part forms part of the identity of the whole text (see *P106 is composed of*).

Cases of more limited existence are some forms of parthood of material things. They may come into being either with the emergence of the respective whole, or by later addition. They may end either together with the whole or by earlier removal from the whole. Similarly, ownership may start and end with a business transaction, or start as inheritance and end with the death of the owner.

Physical Human-Made Thing (E24) is related to the Production activity (E12) by which it was produced for a time-span up to the end of the Production activity (see *P108 has produced*). Even though the Production activity determines the identity of the object once and forever, as Birth determines the identity of a human being, the property is a historical fact, but nevertheless no longer exists after the respective event. The persistence of historical facts regardless of whether they are remembered or not by someone must not be confused with the period of existence of the respective reality.

In the modelling paradigm of the CIDOC CRM, properties with a period of existence potentially smaller than the coexistence of their domain and range, such as being a physical part of a physical object, are not associated with properties of properties expressing temporal validity. Rather, the CIDOC CRM aims at modelling explicitly the processes that bring a property instance about or ends its validity, such as part addition or   part removal, which initiate or may end a part-of relation, respectively

Existence criteria may interplay with quantification, as described below.

C) Inferences

Which properties or sequences of properties are logically related with property A?
Many properties in the CIDOC CRM are characterized as "shortcuts", i.e., deductions from property paths. The scope note should describe whether property A participates in any such shortcut using another property, or can be inferred as a shortcut from certain property paths. The latter case should also be documented in First Order Logic in the respective section. In some cases, it may be worth noting the likely consequences of other relationships given the existence of property A which are not necessarily logical necessities.

D) Formal traits: Quantification, Symmetry, Transitivity, Reflexivity
The following traits are declared in separate sections of a property description, but the scope note should **include** which phenomena of reality justify these traits, or how they restrict the meaning of property A:

Quantification: How many instances of property A are possible for one domain and one range instance?
This has important implications for understanding the property and the related items. For instance, if a property is necessary and exactly one for an instance of some class, the existence of this instance depends on that of the related item. Vice-versa, the consequences of the nature of property A for the quantification must be carefully investigated.

Symmetry: If the instances of the domain and range classes of property A are swapped, does the property have the same meaning?

Transitivity: For a path consisting of a chain of multiple instances of property A, does property A apply between beginning and end of the path   ?

Reflexivity: Can an instance of property A have the same instance of a class as both domain and range?

LOW, J.T., & Doerr, M. (2010). A Postcard is Not a Building - Why we Need Museum Information Curators. /, In Proc. of the CIDOC 2010 Conference : Museums in intercultural dialogue - New Practices in Knowledge Sharing and Information Integration/, Shanghai, China, November. (<https://publications.ics.forth.gr/_publications/CIDOC_2010_low_martin.pdf>).

APPENDIX

Annotated class scope notes

I use the following colour codes:

Substance | Traits and Potential | Identity | Unity | Existence | Further Clarifications

E28 Conceptual Object

Subclass of: E71 Human-Made Thing
Superclass of: E55 Type
               E89 Propositional Object
               E90 Symbolic Object

Scope note: This class comprises non-material products of our minds and other human produced data that have become objects of a discourse about their identity, circumstances of creation or historical implication. The production of such information may have been supported by the use of technical devices such as cameras or computers.

Characteristically, instances of this class are created, invented or thought by someone, and then may be documented or communicated between persons. Instances of E28 Conceptual Object have the ability to exist on more than one particular carrier at the same time, such as paper, electronic signals, marks, audio media, paintings, photos, human memories, etc.

They cannot be destroyed. They exist as long as they can be found on at least one carrier or in at least one human memory. Their existence ends when the last carrier and the last memory are lost.

E41 Appellation

Subclass of: E90 Symbolic Object
Superclass of: E35 Title
               E42 Identifier

Scope note: This class comprises signs, either meaningful or not, or arrangements of signs following a specific syntax, that are used or can be used to refer to and identify a specific instance of some class or category within a certain context.
Instances of E41 Appellation do not identify things by their meaning, even if they happen to have one, but instead by convention, tradition, or agreement. Instances of E41 Appellation are cultural constructs; as such, they have a context, a history, and a use in time and space by some group of users. A given instance of E41 Appellation can have alternative forms, i.e., other instances of E41 Appellation that are always regarded as equivalent independent from the thing it denotes.
Different languages may use different appellations for the same thing, such as the names of major cities. Some appellations may be formulated using a valid noun phrase of a particular language. In these cases, the respective instances of E41 Appellation should also be declared as instances of E33 Linguistic Object. Then the language using the appellation can be declared with the property P72 has language: E56 Language.

Instances of E41 Appellation may be used to identify any instance of E1 CRM Entity and sometimes are characteristic for instances of more specific subclasses E1 CRM Entity, such as for instances of E52 Time-Span (for instance "dates"), E39 Actor, E53 Place or E28 Conceptual Object. Postal addresses and E-mail addresses are characteristic examples of identifiers used by services transporting things between clients.

Even numerically expressed identifiers for extents in space or time are also regarded as instances of E41 Appellation, such as Gregorian dates or spatial coordinates, even though they allow for determining some time or location by a known procedure starting from a reference point and by virtue of that fact play a double role as instances of E59 Primitive Value.

E41 Appellation should not be confused with the act of naming something. Cf. E15 Identifier Assignment

E24 Physical Human-Made Thing

Subclass of: E18 Physical Thing
E71 Human-Made Thing
Superclass of: E22 Human-Made Object
E25 Human-Made Feature
E78 Collection

Scope Note: This class comprises all persistent physical items of any size that are purposely created by human activity. This class comprises, besides others, Human-Made objects, such as a swords, and Human-Made features, such as rock art. For example, a "cup and ring" carving on bedrock is regarded as instance of E24 Physical Human-Made Thing.

Instances of Human-Made thing may be the result of modifying pre-existing physical things, preserving larger parts or most of the original matter and structure, which poses the question if they are new or even Human-Made, the respective interventions of production made on such original material should be obvious and sufficient to regard that the product has a new, distinct identity and intended function and is human-made. Substantial continuity of the previous matter and structure in the new product can be documented by describing the production process also as instance of E81 Transformation.

Whereas interventions of conservation and repair are not regarded to produce a new Human-Made thing, the results of preparation of natural history specimen that substantially change their natural or original state should be regarded as physical Human-Made things, including the uncovering of petrified biological features from a solid piece of stone. On the other side, scribbling a museum number on a natural object should not be regarded to make it Human-Made. This notwithstanding, parts, sections, segments, or features of a physical Human-Made thing may continue to be non-Human-Made and preserved during the production process, for example natural pearls used as a part of an eardrop.

Subclass of: E28 Conceptual Object
Superclass of: E73 Information Object
                      E30 Right

Scope note: This class comprises immaterial items, including but not limited to stories, plots, procedural prescriptions, algorithms, laws of physics or images that are, or represent in some sense, sets of propositions about real or imaginary things and that are documented as single units or serve as topic of discourse.

This class also comprises items that are "about" something in the sense of a subject. In the wider sense, this class includes expressions of psychological value such as non-figural art and musical themes. However, conceptual items such as types and classes are not instances of E89 Propositional Object. This should not be confused with the definition of a type, which is indeed an instance of E89 Propositional Object.

Annotated property scope notes:

I use the following color codes:

Role or Interaction | Existence | Inferences | Formal traits: quantification, symmetry, transitivity, reflexivity

P1 is identified by (identifies)

Domain: E1 CRM Entity

Range: E41 Appellation

Superproperty of:
            E1 CRM Entity. P48 has preferred identifier (is preferred identifier of): E42 Identifier
            E71 Human-Made Thing. P102 has title (is title of): E35 Title
            E53 Place. P168 place is defined by (defines place): E94 Space Primitive
            E95 Spacetime Primitive. P169i spacetime volume is defined by: E92 Spacetime Volume
            E61 Time Primitive. P170i time is defined by: E52 Time-Span

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

Scope Note:

This property describes the naming or identification of any real world item by a name or any other identifier.

This property is intended for identifiers in general use, which form part of the world the model intends to describe, and not merely for internal database identifiers which are specific to a technical system, unless these latter also have a more general use outside the technical context. This property includes in particular identification by mathematical expressions such as coordinate systems used for the identification of instances of E53 Place. The property does not reveal anything about when, where and by whom this identifier was used. A more detailed representation can be made using the fully developed (i.e., indirect) path through E15 Identifier Assignment.

This property is a shortcut for the path from E1 CRM Entity through *P140i was attributed by*, E15 Identifier Assignment, *P37 assigned* to E42 Identifier.

It is also a shortcut for the path from E1 CRM Entity through *P1 is identified by*, E41 Appellation, *P139 has alternative form* to E41 Appellation.

P2 has type (is type of)

Domain: E1 CRM Entity

Range: E55 Type

Superproperty of:
E1 CRM Entity. P137 exemplifies (is exemplified by): E55 Type
E13 Attribute Assignment. P177 assigned property of type: E55 Type

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

Scope Note:

This property allows sub typing of CIDOC CRM entities –a form of specialisation – through the use of a terminological hierarchy, or thesaurus.

The CIDOC CRM is intended to focus on the high-level entities and relationships needed to describe data structures. Consequently, it does not specialise entities any further than is required for this immediate purpose. However, entities in the isA hierarchy of the CIDOC CRM may by specialised into any number of sub entities, which can be defined in the E55 Type hierarchy. E41 Appellation, for example, may be specialised into "e-mail address", "telephone number", "post office box", "URL" etc. none of which figures explicitly in the CIDOC CRM hierarchy. A comprehensive explanation about refining CIDOC CRM concepts by

E55 Type is given in the section "About Types" in the section on "Specific Modelling Constructs" of this document.

This property is a shortcut for the path from E1 CRM Entity through *P41i was classified by,* E17 Type Assignment, *P42 assigned* to E55 Type.

P9 consists of (forms part of)

Domain: E4 Period

Range: E4 Period

Subproperty of:
            E92 Spacetime Volume. P10i contains: E92 Spacetime Volume

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

Scope Note:

This property associates an instance of E4 Period with another instance of E4 Period that is defined by a subset of the phenomena that define the former. Therefore, the spacetime volume of the latter must fall within the spacetime volume of the former.

This property is transitive and non-symmetric.

P11 had participant (participated in)

Domain:
            E5 Event

Range:
            E39 Actor

Subproperty of:
            E5 Event. P12 occurred in the presence of (was present at): E77 Persistent Item

Superproperty of:
            E7 Activity. P14 carried out by (performed): E39 Actor
            E67 Birth. P96 by mother (gave birth): E21 Person
            E68 Dissolution. P99 dissolved (was dissolved by): E74 Group
            E85 Joining. P143 joined (was joined by): E39 Actor

E85 Joining. P144 joined with (gained member by): E74 Group

E86 Leaving. P145 separated (left by): E39 Actor

E86 Leaving. P146 separated from (lost member by): E74 Group

E66 Formation. P151 was formed from (participated in): E74 Group

Quantification:

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

Scope Note:

This property describes the active or passive participation of instances of E39 Actors in an instance of E5 Event.

It documents known events in which an instance of E39 Actor has participated during the course of that actor's life or history. The instances of E53 Place and E52 Time-Span where and when these events happened provide us with constraints about the presence of the related instances of E39 Actor in the past. Collective actors, i.e., instances of E74 Group, may physically participate in events via their representing instances of E21 Persons only. The participation of multiple actors in an event is most likely an indication of their acquaintance and interaction.

The property implies that the actor was involved in the event but does not imply any causal relationship. For instance, someone having been portrayed can be said to have participated in the creation of the portrait.

P46 is composed of (forms part of)

Domain: E18 Physical Thing

Range: E18 Physical Thing

Superproperty of:

E19 Physical Object. P56 bears feature (is found on): E26 Physical Feature

Quantification:

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

Scope Note:

This property associates an instance of E18 Physical Thing with another instance of Physical Thing that forms part of it. The spatial extent of the composing part is included in the spatial extent of the whole.

Component elements, since they are themselves instances of E18 Physical Thing, may be further analysed into sub-components, thereby creating a hierarchy of part decomposition. An instance of E18 Physical Thing may be shared between multiple wholes, for example two buildings may share a common wall. This property does not specify when and for how long a component element resided in

the respective whole. If a component is not part of a whole from the beginning of existence or until the end of existence of the whole, the classes E79 Part Addition and E90 Part Removal can be used to document when a component became part of a particular whole and/or when it stopped being a part of it. For the time-span of being part of the respective whole, the component is completely contained in the place the whole occupies.

This property is intended to describe specific components that are individually documented, rather than general aspects. Overall descriptions of the structure of an instance of E18 Physical Thing are captured by the *P3 has note* property.

The instances of E57 Material of which an instance of E18 Physical Thing is composed should be documented using *P45 consists of (is incorporated in)*.

This property is transitive and non-reflexive