Definition of the **CIDOC Conceptual Reference Model**

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Introduction

This document is the formal definition of the **CIDOC Conceptual Reference Model ("CRM"),** a formal ontology intended to facilitate the integration, mediation and interchange of heterogeneous cultural heritage information. The CRM is the culmination of more than a decade of standards development work by the International Committee for Documentation (CIDOC) of the International Council of Museums (ICOM). Work on the CRM itself began in 1996 under the auspices of the ICOM-CIDOC Documentation Standards Working Group. Since 2000, development of the CRM has been officially delegated by ICOM-CIDOC to the CIDOC CRM Special Interest Group, which collaborates with the ISO working group ISO/TC46/SC4/WG9 to bring the CRM to the form and status of an International Standard.

Objectives of the CIDOC CRM

The primary role of the CRM is to enable information exchange and integration between heterogeneous sources of cultural heritage information. It aims at providing the semantic definitions and clarifications needed to transform disparate, localised information sources into a coherent global resource, be it within a larger institution, in intranets or on the Internet.
Its perspective is supra-institutional and abstracted from any specific local context. This goal determines the constructs and level of detail of the CRM.

More specifically, it defines and is restricted to the **underlying semantics** of database schemata and document **structures** used in cultural heritage and museum documentation in terms of a formal ontology. It does **not** define any of the **terminology** appearing typically as data in the respective data structures; however it foresees the characteristic relationships for its use. It does **not** aim at proposing what cultural institutions **should** document. Rather it explains the logic of what they actually currently document, and thereby enables **semantic interoperability.**

It intends to provide a model of the intellectual structure of cultural documentation in logical terms. As such, it is not optimised for implementation-specific storage and processing aspects. Implementations may lead to solutions where elements and links between relevant elements of our conceptualizations are no longer explicit in a database or other structured storage system. For instance the birth event that connects elements such as father, mother, birth date, birth place may not appear in the database, in order to save storage space or response time of the system. The CRM allows us to explain how such apparently disparate entities are intellectually interconnected, and how the ability of the database to answer certain intellectual questions is affected by the omission of such elements and links.

The CRM aims to support the following specific functionalities:

- Inform developers of information systems as a guide to good practice in conceptual modelling, in order to effectively structure and relate information assets of cultural documentation.
- Serve as a common language for domain experts and IT developers to formulate requirements and to agree on system functionalities with respect to the correct handling of cultural contents.
- To serve as a formal language for the identification of common information contents in different data formats; in particular to support the implementation of automatic data transformation algorithms from local to global data structures without loss of meaning. The latter being useful for data exchange, data migration from legacy systems, data information integration and mediation of heterogeneous sources.
- To support associative queries against integrated resources by providing a global model of the basic classes and their associations to formulate such queries.
- It is further believed, that advanced natural language algorithms and case-specific heuristics can take significant advantage of the CRM to resolve free text information into a formal logical form, if that is regarded beneficial. The CRM is however not thought to be a means to replace scholarly text, rich in meaning, by logical forms, but only a means to identify related data.

Users of the CRM should be aware that the definition of data entry systems requires support of community-specific terminology, guidance to what should be documented and in which sequence, and application-specific consistency controls. The CRM does not provide such notions.

By its very structure and formalism, the CRM is extensible and users are encouraged to create extensions for the needs of more specialized communities and applications.

Scope of the CIDOC CRM

The overall scope of the CIDOC CRM can be summarised in simple terms as the curated knowledge of museums.

However, a more detailed and useful definition can be articulated by defining both the Intended Scope, a broad and maximally-inclusive definition of general application principles, and the Practical Scope, which is expressed by the overall scope of a

reference set of specific identifiable museum documentation standards and practices that the CRM aims to encompass, however restricted in its details to the limitations of the Intended Scope.

The Intended Scope of the CRM may be defined as all information required for the exchange and integration of heterogeneous scientific documentation of museum collections. This definition requires further elaboration:

- The term "scientific documentation" is intended to convey the requirement that the depth and quality of descriptive information that can be handled by the CRM should be sufficient for serious academic research. This does not mean that information intended for presentation to members of the general public is excluded, but rather that the CRM is intended to provide the level of detail and precision expected and required by museum professionals and researchers in the field.
- The term "museum collections" is intended to cover all types of material collected and displayed by museums and related institutions, as defined by ICOM[1]. This includes collections, sites and monuments relating to fields such as social history, ethnography, archaeology, fine and applied arts, natural history, history of sciences and technology.
- The documentation of collections includes the detailed description of individual items within collections, groups of items and collections as a whole. The CRM is specifically intended to cover contextual information: the historical, geographical and theoretical background that gives museum collections much of their cultural significance and value.
- The exchange of relevant information with libraries and archives, and the harmonisation of the CRM with their models, falls within the Intended Scope of the CRM.
- Information required solely for the administration and management of cultural institutions, such as information relating to personnel, accounting, and visitor statistics, falls outside the Intended Scope of the CRM.

The Practical Scope[2] of the CRM is expressed in terms of the current reference standards for museum documentation that have been used to guide and validate the CRM's development. The CRM covers the same domain of discourse as the union of these reference standards; this means that data correctly encoded according to these museum documentation standards there can be a CRM-compatible expression that conveys the same meaning.

Compatibility with the CRM

Utility of CRM compatibility

The goal of the CRM is to enable the integration of the largest number of information resources. Therefore it aims to provide the greatest flexibility of systems to become compatible, rather than imposing one particular solution.

Users intending to take advantage of the semantic interoperability offered by the CRM may want to make parts of their data structures compatible with the CRM. Compatibility may pertain either to the associations by which users would like their data to be accessible in an integrated environment, or to the contents intended for transport to other environments, allowing encoded meaning to be preserved in a target system.

The CRM does not require complete matching of all user documentation structures with the CRM, nor that systems should always implement all CRM concepts and associations; instead it leaves room both for extensions, needed to capture the full richness of cultural information, and for simplifications, required for reasons of economy.

Furthermore, the CRM provides a means of interpreting structured information so that large amounts of data can be transformed or mediated automatically. It does not require unstructured or semi-structured free text information to be analysed into a formal logical representation. In other words, it does not aim to provide more structure than users have previously provided. The interpretation of information in the form of free text falls outside the scope of compatibility considerations. The CRM does, however, allow free text information to be integrated with structured information.

The Information Integration Environment

The notion of CRM compatibility is based on *interoperability*. Interoperability is best defined on the basis of specific communication practices between *information systems*. Following current practice, we distinguish the following types of information integration environments pertaining to information systems:

1. *Local information systems*. These are either *collection management systems* or *content management systems* that constitute institutional memories and are maintained by an institution. They are used for primary data entry, i.e. a relevant part of the information, be it data or metadata, is primary information in digital form that fulfils

[1] The ICOM Statutes provide a definition of the term "museum" at http://icom.museum/statutes.html#2

[2] The Practical Scope of the CIDOC CRM, including a list of the relevant museum documentation standards, is discussed in more detail on the CIDOC CRM website at http://cidoc.ics.forth.gr/scope.html

institutional needs.

2. *Integrated access systems*. These provide an homogeneous access layer to multiple local systems. The information they manage resides primarily on local systems. We distinguish between:
    a. *Materialized access systems*, which physically *import* data provided by local systems, using a data warehouse approach. Such systems may employ so-called metadata harvesting techniques or rely on data submission. Data may be transformed to respect the schema of the access system before being merged.
    b. *Mediation systems*, [Gio Wiederholt] which send out queries, formulated according to a virtual global schema, to multiple local systems and then collect and integrate the answers. The queries may be transformed to a local schema either by the mediation system or by the receiving local system itself.

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Local systems may also *import* data from other systems, in order to complement collections, or to merge information from other systems. An information system may *export* information for migration and preservation.

Compatibility with the CRM pertains to one or more of the following data communication capabilities or *use cases*:

1. data falling within the scope of the CRM can be *exported* from an information system into an encoded form without loss of meaning with respect to CRM concepts;
2. data falling within the scope of the CRM can be *transformed* into another encoded form without loss of meaning with respect to CRM concepts;
3. data falling within the scope of the CRM can be *imported* from an encoded form into an information system without loss of meaning with respect to CRM concepts;
4. data falling within the scope of the CRM that is contained in an information system can be *queried and retrieved exhaustively* in terms of CRM concepts, subject to the expressive power of a particular query language.

Any declaration of CRM compatibility must specify one or more of the above use cases. System and data structure providers shall not declare their products as "CRM compatible" without specifying the appropriate use cases as detailed below.

In the context of this chapter, the expression "without loss of meaning with respect to the CRM concepts" means the following: The CRM concepts are used to classify items of discourse and their relationships. By virtue of this classification, data can be understood as propositions of a kind declared by the CRM about real world facts, such as "Object x. forms part of: Object y". In case the encoding, i.e. the language used to describe a fact, is changed, only an expert conversant with both languages can assess if the two propositions do indeed describe the same fact. If this is the case, then there is no loss of meaning with respect to CRM concepts. Communities of practice requiring fewer concepts than the CRM declares may restrict CRM compatibility with respect to an explicitly declared subset of the CRM.

Users of this standard may communicate CRM compatible data, as detailed below, with data structures and systems that are either more detailed and specialized than the CRM or whose scope extends beyond that of the CRM. In such cases, the standard guarantees only the preservation of meaning with respect to CRM concepts. However, additional information that can be regarded as extending CRM concepts may be communicated and preserved in CRM compatible systems through the appropriate use of controlled terminology. The specification of the latter techniques does not fall under the scope of this standard. Communities of practice requiring extensions to the CRM are encouraged to declare their extensions as CRM-compatible standards.

CRM-Compatible Form

The CRM is a formal ontology which can be expressed in terms of logic or a suitable knowledge representation language. Its concepts can be instantiated as sets of statements that provide a model of reality. We call any encoding of such CRM instances in a formal language that preserves the relations between the CRM *classes*, *properties* and *inheritance rules* a "CRM-compatible form". Hence data expressed in any CRM-compatible form can be automatically transformed into any other CRM-compatible form without loss of meaning. Classes and properties of the CRM are identified by their initial codes, such as "E55" or "P12". The names of classes and properties of a CRM-compatible form *may be translated into any local language*, but the identifying codes must be preserved. A CRM-compatible form *should not implement the quantifiers* of CRM properties as cardinality constraints for the encoded instances. Quantifiers may be implemented in an informative way, or not at all. Statements that violate quantifiers should be treated as *alternative knowledge*.

Any encoding of CRM instances in a formal language that preserves the relations within a consistent *subset* of CRM *classes*, *properties* and *inheritance rules* is regarded a "reduced CRM-compatible form", if:

- all the conditions applicable to a *CRM compatible form* are respected;
- the subset does not violate the rules of subsumption and inheritance;
- any instance of the reduced CRM-compatible form is also a valid instance of a (full) CRM compatible form
- the subset contains at least the following concepts:

E1 CRM Entity
E2 - Temporal Entity
E4 - - Period
E5 - - - Event
E7 - - - - Activity
E11 - - - - - Modification
E12 - - - - - - Production
E13 - - - - - Attribute Assignment
E65 - - - - - Creation
E63 - - - - Beginning of Existence
E12 - - - - - *Production*
E65 - - - - - Creation
E64 - - - - End of Existence
E77 - Persistent Item
E70 - - Thing
E72 - - - Legal Object
E18 - - - - Physical Thing
E24 - - - - - Physical Man-Made Thing
E90 - - - - Symbolic Object
E71 - - - Man-Made Thing
E24 - - - - *Physical Man-Made Thing*
E28 - - - - Conceptual Object
E89 - - - - - Propositional Object
E30 - - - - - - Right
E73 - - - - - - Information Object
E90 - - - - - *Symbolic Object*
E41 - - - - - - Appellation
E73 - - - - - - *Information Object*
E55 - - - - - Type
E39 - - Actor
E74 - - - Group
E52 - Time-Span
E53 - Place
E54 - Dimension
E59 Primitive Value
E61 - Time Primitive
E62 - String

Property id	Property Name	Entity – Domain	Entity - Range
P1	is identified by (identifies)	E1 CRM Entity	E41 Appellation
P2	has type (is type of)	E1 CRM Entity	E55 Type
P3	has note	E1 CRM Entity	E62 String
P4	has time-span (is time-span of)	E2 Temporal Entity	E52 Time-Span
P7	took place at (witnessed)	E4 Period	E53 Place
P10	falls within (contains)	E92 Spacetime Volume	E92 Spacetime Volume
P12	occurred in the presence of (was present at)	E5 Event	E77 Persistent Item
P11	- had participant (participated in)	E5 Event	E39 Actor
P14	- - carried out by (performed)	E7 Activity	E39 Actor
P16	- used specific object (was used for)	E7 Activity	E70 Thing
P31	- has modified (was modified by)	E11 Modification	E24 Physical Man-Made Thing
P108	- - has produced (was produced by)	E12 Production	E24 Physical Man-Made Thing
P92	- brought into existence (was brought into existence by)	E63 Beginning of Existence	E77 Persistent Item
P108	*- - has produced (was produced by)*	*E12 Production*	*E24 Physical Man-Made Thing*
P94	- - has created (was created by)	E65 Creation	E28 Conceptual Object
P93	- took out of existence (was taken out of existence by)	E64 End of Existence	E77 Persistent Item
P15	was influenced by (influenced)	E7 Activity	E1 CRM Entity
P16	*- used specific object (was used for)*	*E7 Activity*	*E70 Thing*
P20	had specific purpose (was purpose of)	E7 Activity	E5 Event
P43	has dimension (is dimension of)	E70 Thing	E54 Dimension
P46	is composed of (forms part of)	E18 Physical Thing	E18 Physical Thing
P59	has section (is located on or within)	E18 Physical Thing	E53 Place
P67	refers to (is referred to by)	E89 Propositional Object	E1 CRM Entity
P75	possesses (is possessed by)	E39 Actor	E30 Right
P81	ongoing throughout	E52 Time-Span	E61 Time Primitive
P82	at some time within	E52 Time-Span	E61 Time Primitive
P89	falls within (contains)	E53 Place	E53 Place
P104	is subject to (applies to)	E72 Legal Object	E30 Right
P106	is composed of (forms part of)	E90 Symbolic Object	E90 Symbolic Object
P107	has current or former member (is current or former member	E74 Group	E39 Actor

Property id	Property Name	Entity – Domain	Entity - Range
	of)		
P127	has broader term (has narrower term)	E55 Type	E55 Type
P128	carries (is carried by)	E18 Physical Thing	E90 Symbolic Object
P130	shows features of (features are also found on)	E70 Thing	E70 Thing
P140	assigned attribute to (was attributed by)	E13 Attribute Assignment	E1 CRM Entity
P141	assigned (was assigned by)	E13 Attribute Assignement	E1 CRM Entity
P148	has component (is component of)	E89 Propositional Object	E89 Propositional Object

CRM Compatibility of Data Structure

A data structure is *export-compatible* with the CRM if it is possible to transform any data from this data structure into a CRM-compatible form *without loss of meaning*. Implicit concepts may be present in elements of the data structure that are not supported by the CRM. As long as these concepts can be encoded as instances of E55 Type (i.e. as terminology) and attached unambiguously to their respective data items with suitable properties, the data structure is *still regarded as* export compatible.

Note that not all CRM concepts may be represented by elements of an export-compatible data structure. All data from export-compatible data structures can be transported in a CRM-compatible form. In particular any CRM compatible form or *reduced CRM-compatible form* is export-compatible with the CRM.

A data structure is *import-compatible* with the CRM if it is possible to automatically transform any data from a CRM-compatible form into this data structure *without loss of meaning*, simply on the basis of knowledge about the data structure elements being used. This implies that a data record transformed into this data structure from a CRM-compatible form can be transformed back into the CRM-compatible form *without loss of meaning*. Note that the back-transformation into a CRM-compatible form may result in a data record that is semantically equivalent but not identical with the original.

Any CRM-compatible form is automatically import-compatible with the CRM. Note that an import-compatible data structure may be semantically richer than the CRM. It may contain elements that, through the use of a transformation algorithm, can be made to correspond to CRM concepts or specializations thereof or that contain elements with meanings that fall outside the scope of the CRM. However, it must not contain elements that overlap in meaning with CRM concepts and which cannot be subsumed via transformation by a CRM concept other than E1 CRM Entity and E77 Persistent Item.

Import-compatible data structures may be used to transport data for applications that require concepts that lie beyond the scope of the CRM, as well as data from any export-compatible data structure. Note that, in general, applications may *make use* of data from a CRM import-compatible data structure that has been exported into a CRM compatible form by semantic reduction to CRM concepts, i.e. by generalizing all subsumed concepts to the most specific CRM concept applicable, and by discarding elements that fall outside the scope of the CRM.

A data structure is ***partially import-compatible* with the CRM** if the above holds for a reduced CRM-compatible form.

CRM Compatibility of Information Systems

An information system is *export-compatible* with the CRM if it is possible to export all user data from this information system into an import-compatible data structure. This capability is the recommended kind of CRM-compatibility for *local information systems.*

An information system is *partially export compatible* if it is possible to export all user data from this information system into a partially import-compatible data structure. This is not the recommended kind of CRM-compatibility, but it may not be feasible for legacy systems to acquire a higher level of CRM compatibility without unreasonable effort. This reduced level of CRM compatibility is nonetheless highly useful.

Note that there is no minimum requirement for the classes and properties that must be present in the exported user data. Therefore it is possible that the data may pertain to instances of just a single property, such as E21 Person. *P131 is identified by*: E82 Actor Appellation.

An information system is *import-compatible* with the CRM if it is possible to import data encoded in a CRM-compatible form and to access the data in a manner equivalent to and homogeneous with all generic data of this system that fall under the same concepts. This capability is considered as the normal kind of CRM compatibility for *integrated*

access systems that physically copy source data in a *data warehouse* style (materialized access systems).

An information system is *partially import-compatible* with the CRM if it is possible to import data encoded in a reduced CRM-compatible form and to access the data in a manner equivalent to and homogeneous with all generic data of this system that fall under the same concepts. Depending on the functional requirements, it makes sense for integrated access systems to offer access services of reduced complexity by being only partially import-compatible with the CRM.

Note that it makes sense for integrated access systems to import data from extended data structures by semantic reduction to CRM defined concepts.

Note that local information system providers may choose to make their systems import-compatible with the CRM in order to exchange data, for example in the case of museum object loans or for system migration purposes. Communities of practice may choose to agree on import compatibility for extended data structures.

Some local information systems are likely to focus on specialized subject areas, such as inscriptions. For these specialized systems, the ability to import a specific data structure is recommended. This should be export-compatible with the CRM, and encompass the concepts that are required by the subject matter ("dedicated import compatibility").

An information system is *access-compatible* with the CRM if it is possible to access the user data in the information system by querying with CRM classes and properties so that the meaning of the answers to the queries corresponds to the query terms used. It is not regarded as a reduction of compatibility if access is limited to data deemed to be exchanged.

An information system is *partially access-compatible* with the CRM if it is possible to access the user data in the information system by querying with a consistent subset of CRM classes and properties, corresponding to a reduced CRM-compatible form, so that the meaning of the answers to the queries corresponds to the query terms used.

An access-compatible system may be *export-compatible* with respect to the query answers. Note that it may make sense for an access-compatible content management system to return only content items in response to queries rather than being export compatible.

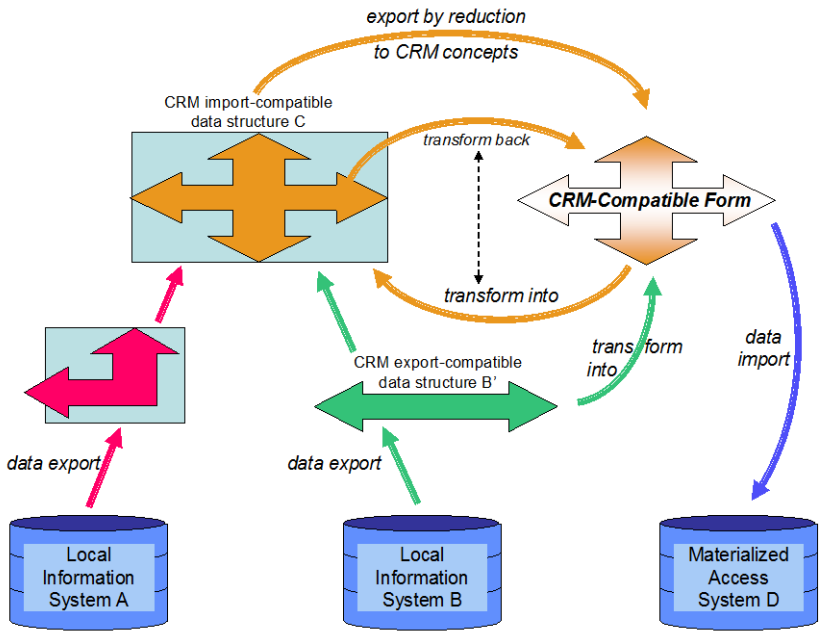


fig. 1: Possible data flow between different kinds of CRM-compatible systems and data structures

Fig. 1 shows a symbolic representation of some of the data flow patterns defined above between different kinds of CRM-compatible systems and data structures. In this figure it is assumed that the Local System B exports data into a CRM export-compatible data structure, which implies that it can be exported into a CRM-compatible form or any other CRM import-compatible data structure. Therefore Local System B is export-compatible with the CRM. For Local System A,

the figure symbolizes the case where the exported data contain elements that correspond to specializations of the CRM or fall out of its scope.

Compatibility claim declaration

A provider of a data structure or information system claiming compatibility with the CRM has to provide a declaration that describes the kind of compatibility and, depending on the kind, the following additional information:

- For export-compatible data structures:
  The subset of CRM concepts directly instantiated by any possible data in this data structure after transformation into a CRM-compatible form.
- For export-compatible systems:
  a. A declaration of configurable user data elements, if any, that are not semantically restricted to a CRM Concept (other than E1 CRM Entity or E77 Persistent Item).
  b. User data elements or units that are not exported.
  c. The subset of CRM concepts directly instantiated by any possible data exported from the system after transformation into a CRM-compatible form.
- For partially or dedicated import-compatible systems:
  The subset of CRM concepts under which data can be imported into the system.
- For access-compatible systems:
  a. The query language by which the system can be queried.
  b. The subset of CRM concepts directly instantiated by any possible query answers exported from the system after transformation into a CRM-compatible form.
  c. For partially access-compatible systems, the subset of CRM concepts by which the system can be queried.

The provider should be able to demonstrate the claim with suitable test data. The provider should be able to demonstrate its claim according to certain procedures included in any applicable certificate practice related statement.

The provider should either make evidence of these procedures publicly available on the Internet on a site nominated by the ISO community of use, so that any third party is able to verify the claim with suitable test data, or acquire a certificate by a certification authority (CA).

A trusted third party recognised and authorised by a competent regulatory authority to act as a CA in this practice area, should be able to verify the credentials of the provider applying for such certificate and thus, of its claim with suitable test data, before issuing the certificate so that the users can trust the information in the CA certificates.

The CA will grant the provider of the certified system the right to use the "CRM compatible" logo..

Applied Form

The CRM is an ontology in the sense used in computer science. It has been expressed as an object-oriented semantic model, in the hope that this formulation will be comprehensible to both documentation experts and information scientists alike, while at the same time being readily converted to machine-readable formats such as RDF Schema, KIF, DAML+OIL, OWL, STEP, etc. It can be implemented in any Relational or object-oriented schema. CRM instances can also be encoded in RDF, XML, DAML+OIL, OWL and others.

Although the definition of the CRM provided here is complete, it is an intentionally compact and concise presentation of the CRM's 89 classes and 151 unique properties. It does not attempt to articulate the inheritance of properties by subclasses throughout the class hierarchy (this would require the declaration of several thousand properties, as opposed to 137). However, this definition does contain all of the information necessary to infer and automatically generate a full declaration of all properties, including inherited properties.

Terminology

The following definitions of key terminology used in this document are provided both as an aid to readers unfamiliar with object-oriented modelling terminology, and to specify the precise usage of terms that are sometimes applied inconsistently across the object oriented modelling community for the purpose of this document. Where applicable, the editors have tried to consistently use terminology that is compatible with that of the Resource Description Framework (RDF)[3], a recommendation of the World Wide Web Consortium. The editors have tried to find a language which is comprehensible to the non-computer expert and precise enough for the computer expert so that both understand the intended meaning.

Class A class is a category of items that share one or more common traits serving as criteria to

[3] Information about the Resource Description Framework (RDF) can be found at http://www.w3.org/RDF/

identify the items belonging to the class. These **properties** need not be explicitly formulated in logical terms, but may be described in a text (here called a **scope note**) that refers to a common conceptualisation of domain experts. The sum of these traits is called the **intension** of the class. A class may be the **domain** or **range** of none, one or more properties formally defined in a model. The formally defined properties need not be part of the intension of their domains or ranges: such properties are optional. An item that belongs to a class is called an **instance** of this class. A class is associated with an open set of real life instances, known as the **extension** of the class. Here "open" is used in the sense that it is generally beyond our capabilities to know all instances of a class in the world and indeed that the future may bring new instances about at any time (**Open World**). Therefore a class cannot be defined by enumerating its instances. A class plays a role analogous to a grammatical noun, and can be completely defined without reference to any other construct (unlike properties**,** which must have an unambiguously defined domain and range). In some contexts, the terms individual class, entity or node are used synonymously with class.
For example:
Person is a class. To be a Person may actually be determined by DNA characteristics, but we all know what a Person is. A Person may have the property of being a member of a Group, but it is not necessary to be member of a Group in order to be a Person. We shall never know all Persons of the past. There will be more Persons in the future.

subclass

A subclass is a **class** that is a specialization of another class (its **superclass**). Specialization or the IsA relationship means that:

1. all **instances** of the subclass are also instances of its superclass,
2. the **intension** of the subclass extends the intension of its superclass, i.e. its traits are more restrictive than that of its superclass and
3. the subclass inherits the definition of all of the **properties** declared for its superclass without exceptions (**strict inheritance**), in addition to having none, one or more properties of its own.

A subclass can have more than one immediate superclass and consequently inherits the properties of all of its superclasses (**multiple inheritance**). The IsA relationship or specialization between two or more classes gives rise to a structure known as a class hierarchy. The IsA relationship is transitive and may not be cyclic. In some contexts (e.g. the programming language C++) the term derived class is used synonymously with subclass.

For example:
Every Person IsA Biological Object, or Person is a subclass of Biological Object.
Also, every Person IsA Actor. A Person may die. However other kinds of Actors, such as companies, don't die (c.f. 2).
Every Biological Object IsA Physical Object. A Physical Object can be moved. Hence a Person can be moved also (c.f. 3).

superclass

A superclass is a **class** that is a generalization of one or more other classes (its **subclasses**), which means that it subsumes all **instances** of its subclasses, and that it can also have additional instances that do not belong to any of its subclasses. The **intension** of the superclass is less restrictive than any of its subclasses. This subsumption relationship or generalization is the inverse of the IsA relationship or specialization.
In some contexts (e.g. the programming language C++) the term parent class is used synonymously with superclass.

For example:
"Biological Object subsumes Person" is synonymous with "Biological Object is a superclass of Person". It needs fewer traits to identify an item as a Biological Object than to identify it as a Person.

intension

The intension of a **class** or **property** is its intended meaning. It consists of one or more common traits shared by all **instances** of the class or property. These traits need not be explicitly formulated in logical terms, but may just be described in a text (here called a **scope note**) that refers to a conceptualisation common to domain experts. In particular the so-called **primitive** concepts, which make up most of the CRM, cannot be further reduced to other concepts by logical terms.

extension

The extension of a **class** is the set of all real life **instances** belonging to the class that fulfil

the criteria of its **intension**. This set is "open" in the sense that it is generally beyond our capabilities to know all instances of a class in the world and indeed that the future may bring new instances about at any time (**Open World**). An information system may at any point in time refer to some instances of a class, which form a subset of its extension.

scope note

A scope note is a textual description of the **intension** of a **class** or **property.**
Scope notes are not formal modelling constructs, but are provided to help explain the intended meaning and application of the CRM's classes and properties. Basically, they refer to a conceptualisation common to domain experts and disambiguate between different possible interpretations. Illustrative example **instances** of classes and properties are also regularly provided in the scope notes for explanatory purposes.

instance

An instance of a **class** is a real world item that fulfils the criteria of the **intension** of the class. Note, that the number of **instances** declared for a class in an information system is typically less than the total in the real world. For example, you are an instance of Person, but you are not mentioned in all information systems describing Persons.
For example:
The painting known as the "The Mona Lisa" is an instance of the class Man Made Object.

An instance of a **property** is a factual relation between an instance of the **domain** and an instance of the **range** of the property that matches the criteria of the **intension** of the property.

For example:
"The Louvre *is current owner of* The Mona Lisa" is an instance of the property "*is current owner of*".

property

A property serves to define a relationship of a specific kind between two **classes.** The property is characterized by an **intension**, which is conveyed by a **scope note.** A property plays a role analogous to a grammatical verb, in that it must be defined with reference to both its **domain** and **range**, which are analogous to the subject and object in grammar (unlike classes, which can be defined independently). It is arbitrary, which class is selected as the domain, just as the choice between active and passive voice in grammar is arbitrary. In other words, a property can be interpreted in both directions, with two distinct, but related interpretations. Properties may themselves have properties that relate to other classes (This feature is used in this model only in order to describe dynamic subtyping of properties). Properties can also be specialized in the same manner as classes, resulting in IsA relationships between **subproperties** and their **superproperties**.
In some contexts, the terms attribute, reference, link, role or slot are used synonymously with property.

For example:
"Physical Man-Made Thing *depicts* CRM Entity" is equivalent to "CRM Entity *is depicted by* Physical Man-Made Thing".

inverse of

The inverse of a property is the reinterpretation of a **property** from **range** to **domain** without more general or more specific meaning, similar to the choice between active and passive voice in some languages. In contrast to some knowledge representation languages, such as RDF and OWL, we regard that the inverse of a property is not a property in its own right that needs an explicit declaration of being inverse of another, but an interpretation implicitly existing for any property. The inverse of the inverse of a property is identical to the property itself, i.e. its primary sense of direction.

For example:
"CRM Entity *is depicted by* Physical Man-Made Thing" is the inverse of "Physical Man-Made Thing *depicts* CRM Entity"

subproperty

A subproperty is a **property** that is a specialization of another property (its **superproperty**). Specialization or IsA relationship means that:

1. all **instances** of the subproperty are also instances of its superproperty,
2. the **intension** of the subproperty extends the intension of the superproperty, i.e. its traits are more restrictive than that of its superproperty,
3. the **domain** of the subproperty is the same as the domain of its superproperty or a **subclass** of that domain,
4. the **range** of the subproperty is the same as the range of its superproperty or a

subclass of that range,
5. the subproperty inherits the definition of all of the properties declared for its superproperty without exceptions (**strict inheritance**), in addition to having none, one or more properties of its own.

A subproperty can have more than one immediate superproperty and consequently inherits the properties of all of its superproperties (**multiple inheritance**). The IsA relationship or specialization between two or more properties gives rise to the structure we call a property hierarchy. The IsA relationship is transitive and may not be cyclic.
Some object-oriented programming languages, such as C++, do not contain constructs that allow for the expression of the specialization of properties as sub-properties.

Alternatively, a property may be subproperty of the **inverse of** another property, i.e. reading the property from range to domain. In that case,
1. all instances of the subproperty are also instances of the inverse of the other property,
2. the intension of the subproperty extends the intension of the inverse of the other property, i.e. its traits are more restrictive than that of the inverse of the other property,
3. the domain of the subproperty is the same as the range of the other property or a subclass of that range,
4. the range of the subproperty is the same as the domain of the other property or a subclass of that domain,
5. the subproperty inherits the definition of all of the properties declared for the other property without exceptions (strict inheritance), in addition to having none, one or more properties of its own. The definitions of inherited properties have to be interpreted in the inverse sense of direction of the subproperty, i.e., from range to domain.

superproperty

A superproperty is a **property** that is a generalization of one or more other properties (its **subproperties**), which means that it subsumes all **instances** of its subproperties, and that it can also have additional instances that do not belong to any of its subproperties. The **intension** of the superproperty is less restrictive than any of its subproperties. The subsumption relationship or generalization is the inverse of the IsA relationship or specialization. A superproperty may be a generalization of the **inverse of** another property

domain

The domain is the **class** for which a **property** is formally defined. This means that **instances** of the property are applicable to instances of its domain class. A property must have exactly one domain, although the domain class may always contain instances for which the property is not instantiated. The domain class is analogous to the grammatical subject of the phrase for which the property is analogous to the verb. It is arbitrary, which class is selected as the domain and which as the **range**, just as the choice between active and passive voice in grammar is arbitrary. Property names in the CRM are designed to be semantically meaningful and grammatically correct when read from domain to range**.** In addition, the inverse property name, normally given in parentheses, is also designed to be semantically meaningful and grammatically correct when read from range to domain.

range

The range is the **class** that comprises all potential values of a **property.** That means that **instances** of the property can link only to instances of its range class. A property must have exactly one range, although the range class may always contain instances that are not the value of the property. The range class is analogous to the grammatical object of a phrase for which the property is analogous to the verb. It is arbitrary, which class is selected as **domain** and which as range, just as the choice between active and passive voice in grammar is arbitrary. Property names in the CRM are designed to be semantically meaningful and grammatically correct when read from domain to range**.** In addition the inverse property name, normally given in parentheses, is also designed to be semantically meaningful and grammatically correct when read from range to domain.

inheritance

Inheritance of **properties** from **superclasses** to **subclasses** means that if an item x is an **instance** of a **class** A, then
1. all properties that must hold for the instances of any of the superclasses of A must also hold for item x, and

all optional properties that may hold for the instances of any of the superclasses of A may also hold for item x.

strict inheritance

Strict **inheritance** means that there are no exceptions to the inheritance of **properties** from **superclasses** to **subclasses**. For instance, some systems may declare that elephants are grey, and regard a white elephant as an exception. Under strict inheritance it would hold that: if all elephants were grey, then a white elephant could not be an elephant. Obviously not all elephants are grey. To be grey is not part of the **intension** of the concept elephant but an optional property. The CRM applies strict inheritance as a normalization principle.

multiple inheritance

Multiple **inheritance** means that a **class** A may have more than one immediate **superclass**. The **extension** of a class with multiple immediate superclasses is a subset of the intersection of all extensions of its superclasses. The **intension** of a class with multiple immediate superclasses extends the intensions of all its superclasses, i.e. its traits are more restrictive than any of its superclasses. If multiple inheritance is used, the resulting "class hierarchy" is a directed graph and not a tree structure. If it is represented as an indented list, there are necessarily repetitions of the same class at different positions in the list.
For example, Person is both, an Actor and a Biological Object.

Multiple Instantiation

Multiple **Instantiation** is the term that describes the case that an instance of class A is also regarded as an instance of one or more other classes B1...n at the same time. When multiple instantiation is used, it has the effect that the properties of all these classes become available to describe this instance. For instance, some particular cases of destruction may also be activities (e.g.,Herostratos' deed), but not all destructions are activities (e.g., destruction of Herculaneum). In comparison, multiple inheritance describes the case that all instances of a class A are implicitly instances of all superclasses of A, by virtue of the definition of the class A, whereas the combination of classes used for multiple instantiation is a characteristic of particular instances only. It is important to note that multiple instantiation is not allowed using combinations of disjoint classes.

endurant, perdurant

"The difference between enduring and perduring entities (which we shall also call *endurants* and *perdurants*) is related to their behaviour in time. Endurants are wholly present (i.e., all their proper parts are present) at any time they are present. Perdurants, on the other hand, just extend in time by accumulating different temporal parts, so that, at any time they are present, they are only partially present, in the sense that some of their proper temporal parts (e.g., their previous or future phases) may be not present. E.g., the piece of paper you are reading now is wholly present, while some temporal parts of your reading are not present any more. Philosophers say that endurants are entities that are in time, while lacking however temporal parts (so to speak, all their parts flow with them in time). Perdurants, on the other hand, are entities that happen in time, and can have temporal parts (all their parts are fixed in time)." (Gangemi et al. 2002, pp. 166-181).

shortcut

A shortcut is a formally defined single **property** that represents a deduction or join of a data path in the CRM. The **scope notes** of all properties characterized as shortcuts describe in words the equivalent deduction. Shortcuts are introduced for the cases where common documentation practice refers only to the deduction rather than to the fully developed path. For example, museums often only record the dimension of an object without documenting the Measurement that observed it. The CRM declares shortcuts explicitly as single properties in order to allow the user to describe cases in which he has less detailed knowledge than the full data path would need to be described. For each shortcut, the CRM contains in its schema the properties of the full data path explaining the shortcut.

monotonic reasoning

Monotonic reasoning is a term from knowledge representation. A reasoning form is monotonic if an addition to the set of propositions making up the knowledge base never determines a decrement in the set of conclusions that may be derived from the knowledge base via inference rules. In practical terms, if experts enter subsequently correct statements to an information system, the system should not regard any results from those statements as invalid, when a new one is entered. The CRM is designed for monotonic reasoning and so enables conflict-free merging of huge stores of knowledge.

disjoint

Classes are disjoint if the intersection of their **extensions** is an empty set. In other words, they have no common **instances** in any possible world.

primitive

The term primitive as used in knowledge representation characterizes a concept that is declared and its meaning is agreed upon, but that is not defined by a logical deduction from other concepts. For example, mother may be described as a female human with child. Then mother is not a primitive concept. Event however is a primitive concept.
Most of the CRM is made up of primitive concepts.

Open World

The “Open World Assumption” is a term from knowledge base systems. It characterizes knowledge base systems that assume the information stored is incomplete relative to the universe of discourse they intend to describe. This incompleteness may be due to the inability of the maintainer to provide sufficient information or due to more fundamental problems of cognition in the system’s domain. Such problems are characteristic of cultural information systems. Our records about the past are necessarily incomplete. In addition, there may be items that cannot be clearly assigned to a given **class**.
In particular, absence of a certain **property** for an item described in the system does not mean that this item does not have this property. For example, if one item is described as Biological Object and another as Physical Object, this does not imply that the latter may not be a Biological Object as well. Therefore **complements** of a class with respect to a **superclass** cannot be concluded in general from an information system using the Open World Assumption. For example, one cannot list “all Physical Objects known to the system that are not Biological Objects in the real world”, but one may of course list “all items known to the system as Physical Objects but that are not known to the system as Biological Objects”.

complement

The complement of a class A with respect to one of its **superclasses** B is the set of all **instances** of B that are not instances of A. Formally, it is the set-theoretic difference of the **extension** of B minus the extension of A. Compatible extensions of the CRM should not declare any **class** with the **intension** of them being the complement of one or more other classes. To do so will normally violate the desire to describe an **Open World**. For example, for all possible cases of human gender, male should not be declared as the complement of female or vice versa. What if someone is both or even of another kind?

query containment

Query containment is a problem from database theory: A query X contains another query Y, if for each possible population of a database the answer set to query X contains also the answer set to query Y. If query X and Y were classes, then X would be **superclass** of Y.

interoperability

Interoperability means the capability of different information systems to communicate some of their contents. In particular, it may mean that

1. two systems can exchange information, and/or
2. multiple systems can be accessed with a single method.

Generally, syntactic interoperability is distinguished from **semantic interoperability**. Syntactic interoperability means that the information encoding of the involved systems and the access protocols are compatible, so that information can be processed as described above without error. However, this does not mean that each system processes the data in a manner consistent with the intended meaning. For example, one system may use a table called “Actor” and another one called “Agent”. With syntactic interoperability, data from both tables may only be retrieved as distinct, even though they may have exactly the same meaning. To overcome this situation, semantic interoperability has to be added. The CRM relies on existing syntactic interoperability and is concerned only with adding *semantic interoperability*.

semantic interoperability

Semantic **interoperability** means the capability of different information systems to communicate information consistent with the intended meaning. In more detail, the intended meaning encompasses

1. the data structure elements involved,
2. the terminology appearing as data and
3. the identifiers used in the data for factual items such as places, people, objects etc.

Obviously communication about data structure must be resolved first. In this case consistent communication means that data can be transferred between data structure elements with the same intended meaning or that data from elements with the same intended meaning can be merged. In practice, the different levels of generalization in different systems do not allow the achievement of this ideal. Therefore semantic interoperability is regarded as achieved if elements can be found that provide a reasonably close generalization for the transfer or merge. This problem is being studied theoretically as the **query containment** problem. The CRM is only concerned with semantic interoperability on the level of data structure elements.

property

We use the term "property quantifiers" for the declaration of the allowed number of

quantifiers	**instances** of a certain **property** that can refer to a particular instance of the **range** class or the **domain** class of that property. These declarations are ontological, i.e. they refer to the nature of the real world described and not to our current knowledge. For example, each person has exactly one father, but collected knowledge may refer to none, one or many.
universal	The fundamental ontological distinction between universals and particulars can be informally understood by considering their relationship with instantiation: particulars are entities that have no **instances** in any possible world; universals are entities that do have instances. **Classes** and **properties** (corresponding to predicates in a logical language) are usually considered to be universals. (after Gangemi et al. 2002, pp. 166-181).
Knowledge Creation Process	All knowledge contained in an information system must have been introduced into that system by some human agent, either directly or indirectly. Despite this fact, many, if not most, statements within such a system will lack specific attribution of authority. That being said, in the domain of cultural heritage, it is common practice that, for the processes of collection documentation and management, there are clearly and explicitly elaborated systems of responsibility outlining by whom and how knowledge can be added and or modified in the system. Ideally these systems are specified in institutional policy and protocol documents. Thus, it is reasonable to hold that all such statements that lack explicit authority attribution within the information system can, in fact, be read as the official view of the administrating institution of that system. Such a position does not mean to imply that an information system represents at any particular moment a completed phase of knowledge that the institution promotes. Rather, it means to underline that, in a CH context, a managed set of data, at any state of elaboration, will in fact embody an adherence to some explicit code of standards which guarantees the validity of that data within the scope of said standards and all practical limitations. So long as the information is under active management it remains continuously open to revision and improvement as further research reveals further understanding surrounding the objects of concern. A distinct exception to this rule is represented by information in the data set that carries with it an explicit statement of responsibility. In CRM such statements of responsibility are expressed though knowledge creation events such as E13 Attribute Assignment and its relevant subclasses. Any information in a CRM model that is based on an explicit creation event for that piece of information, where the creator's identity has been given, is attributed to the authority and assigned to the responsibility of the actor identified as causal in that event. For any information in the system connected to knowledge creation events that do not explicitly reference their creator, as well as any information not connected to creation events, the responsibility falls back to the institution responsible for the database/knowledge graph. That means that for information only expressed through shortcuts such as 'P2 has type', where no knowledge creation event has been explicitly specified, the originating creation event cannot be deduced and the responsibility for the information can never be any other body than the institution responsible for the whole information system. In the case of an institution taking over stewardship of a database transferred into their custody, two relations of responsibility for the knowledge therein can be envisioned. If the institution accepts the dataset and undertakes to maintain and update it, then they take on responsibility for that information and become the default authority behind its statements as described above. If, on the other hand, the institution accepts the data set and stores it without change as a closed resource, then it can be considered that the default authority remains the original steward.
Transitivity	Transitivity is defined in the standard way found in mathematics or logic: A property P is transitive if the domain and range is the same class and for all instances x, y, z of this class the following is the case: If x is related by P to y and y is related byP to z, then x is related by P to z. The intention of a property as described in the scope note will decide whether a property is transitive. For example overlap in time or in space are not transitive, while occurs before is transitive. Transitivity is especially useful when CRM is implemented in a system with deduction.

Comment [GB1]: Put property number in

Comment [GB2]: Put property number in

Comment [GB3]: CEO comment: check term list of CRM in the intro, sometimes properties are mentioned by identifier and sometimes not. Standardize to introduce the identifier consistently across term list.

Property Quantifiers

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

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

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

The CRM defines some dependencies between properties and the classes that are their domains or ranges. These can be one or both of the following:

A) the property is necessary for the domain

B) the property is necessary for the range, or, in other words, the range is dependent on the property.

The possible kinds of dependencies are defined in the table above. Note that if a dependent property is not specified for an instance of the respective domain or range, it means that the property exists, but the value on one side of the property is unknown. In the case of optional properties, the methodology proposed by the CRM does not distinguish between a value being unknown or the property not being applicable at all. For example, one may know that an object has an owner, but the owner is unknown. In a CRM instance this case cannot be distinguished from the fact that the object has no owner at all. Of course, such details can always be specified by a textual note.

Naming Conventions

The following naming conventions have been applied throughout the CRM:

- Classes are identified by numbers preceded by the letter "E" (historically classes were sometimes referred to as "Entities"), and are named using noun phrases (nominal groups) using title case (initial capitals). For example, E63 Beginning of Existence.
- Properties are identified by numbers preceded by the letter "P," and are named in both directions using verbal phrases in lower case. Properties with the character of states are named in the present tense, such as "has type", whereas properties related to events are named in past tense, such as "carried out." For example, *P126 employed (was employed in)*.
- Property names should be read in their non-parenthetical form for the domain-to-range direction, and in parenthetical form for the range-to-domain direction. Reading a property in range-to-domain direction is equivalent to the inverse of that property. Following a current notational practice in OWL knowledge representation language, we represent inverse properties in this text by adding a letter "i" following the identification number and the parenthetical form of the full property name, such as *P59i is located on or within*, which is the inverse of *P59 has section (is located on or within).*
- Properties with a range that is a subclass of E59 Primitive Value (such as *E1 CRM Entity. P3 has note: E62 String*, for example) have no parenthetical name form, because reading the property name in the range-to-domain direction is not regarded as meaningful.
- Properties that have identical domain and range are either symmetric or transitive. Instantiating a symmetric property implies that the same relation holds for both the domain-to-range and the range-to-domain directions. An example of this is *E53 Place. P122 borders with: E53 Place*. The names of symmetric properties have no parenthetical form, because reading in the range-to-domain direction is the same as the domain-to-range reading. Transitive asymmetric properties, such as *E4 Period. P9 consist of (forms part of): E4 Period*, have a parenthetical form that relates to the meaning of the inverse direction.
- The choice of the domain of properties, and hence the order of their names, are established in accordance with the following priority list:
  - Temporal Entity and its subclasses
  - Thing and its subclasses
  - Actor and its subclasses
  - Other

About the logical expressions of the CRM

The present CRM specifications are annotated with logical axioms, providing an alternative formal expressions of the CRM ontology. This section briefly introduces the assumptions that are at the basis of the logical expression of the CRM (for a fully detailed account of the logical expression of semantic data modelling, see [1][4]).

The CRM is expressed in terms of the primitives of semantic data modelling. As such, it consists of:

- *classes*, which represent general notions in the domain of discourse, such as the CRM class *E21 Person* which represents the notion of person;
- *properties*, which represent the binary relations that link the individuals in the domain of discourse, such as the CRM property *P152 has parent* linking a person to one of the person's parent.

Classes and properties are used to express ontological knowledge by means of various kinds of constraints, such as sub-class/sub-property links, e.g., *E21 Person* is a sub-class of *E20 Biological Object*, or domain/range constraints, e.g., the domain of *P152 has parent* is class *E21 Person.*

In contrast, first-order logic-based knowledge representation relies on a language for formally encoding an ontology. This language can be directly put in correspondence with semantic data modeling in a straightforward way:

- classes are named by *unary predicate symbols*; conventionally, we use `E21` as the unary predicate symbol corresponding to class *E21 Person*;
- properties are named by *binary predicate symbols*; conventionally, we use `P152` as the binary predicate symbol corresponding to property *P152 has parent.*

Ontology is expressed in logic by means of *logical axioms*, which correspond to the constraints of semantic modelling. These axioms use the well-known non-logical symbols (and for conjunction, or for disjunction, implies for implication, not for negation, forall for universal quantification and exists for existential quantification) and the predicate symbols representing the involved classes and properties. For instance, the above sub-class link between *E21 Person* and *E20 Biological Object* can be formulated

[4] [1] R. Reiter (1984). Towards a logical reconstruction of relational database theory. In Brodie, M. L., Mylopoulos, J., and Schmidt, J. W., editors, On Conceptual Modelling, pages 191–233. Springer Verlag, New York, NY

in logic as the axiom:

(forall x) [E21(x) implies E20(x)]

(reading: for all individuals x, if x is a E21 then x is an E20). In the specifications, universal quantifiers are omitted for simplicity, so the above axiom is simply written:

E21(x) implies E20(x)

Likewise, the above domain constraint on property *P152 has parent* can be formulated in logic as the axiom:

P152(x,y) implies E21(x)

(reading: for all individuals x and y, if x is a P152 of y, then x is an E21).
These basic considerations should be used by the reader to understand the logical axioms that are inserted into the present specifications. If the reader wishes to know the complete first-order language that has been used for the logical expression of the CRM, he is referred to [2][5].

Modelling principles

The following modelling principles have guided and informed the development of the CIDOC CRM.

Monotonicity

Because the CRM's primary role is the meaningful integration of information in an Open World, it aims to be monotonic in the sense of Domain Theory. That is, the existing CRM constructs and the deductions made from them must always remain valid and well-formed, even as new constructs are added by extensions to the CRM.

For example:
One may add a subclass of E7 Activity to describe the practice of an instance of group to use a certain name for a place over a certain time-span. By this extension, no existing IsA Relationships or property inheritances are compromised.

In addition, the CRM aims to enable the formal preservation of monotonicity when augmenting a particular CRM compatible system. That is, existing CRM instances, their properties and deductions made from them, should always remain valid and well-formed, even as new instances, regarded as consistent by the domain expert, are added to the system.

For example:
If someone describes correctly that an item is an instance of E19 Physical Object, and later it is correctly characterized as an instance of E20 Biological Object, the system should not stop treating it as an instance of E19 Physical Object.

In order to formally preserve monotonicity for the frequent cases of alternative opinions, all formally defined properties should be implemented as unconstrained (**many: many**) so that conflicting instances of properties are merely accumulated. Thus knowledge integrated following the CRM serves as a research base, accumulating relevant alternative opinions around well-defined entities, whereas conclusions about the truth are the task of open-ended scientific or scholarly hypothesis building.

For example:
El Greco and even King Arthur should always remain an instance of E21 Person and be dealt with as existing within the sense of our discourse, once they are entered into our knowledge base. Alternative opinions about properties, such as their birthplaces and their living places, should be accumulated without validity decisions being made during data compilation.

Properties, such as having a part, an owner or a location, may change many times for a single item during its existence. Stating instances of such properties for an item in terms of the CRM only means that these properties existed during some particular time-span. Therefore, one item may have multiple instances of the same property reflecting an aggregation of these instances over the time-span of its existence. If more temporal details are required, the CRM recommends explicitly describing the events of acquiring or losing such property instances, such as by E9 Move etc. By virtue of this principle, the CRM achieves monotonicity with respect to an increase of knowledge about the states of an item at different times, regardless of their temporal order.

However, for some of these properties many collection databases describe the "current" state, such as "current location" or

[5] [2] C. Meghini and M. Doerr (2016). A first-order logic expression of the CIDOC Conceptual Reference Model. Submitted for publication.

"current owner". Using such a "current" state means, that the database manager is able to verify the respective reality at the latest date of validity of the database. Obviously, this information is non-monotonic, i.e., it requires deletion when the state changes. In order to preserve a reduced monotonicity, these properties have time-neutral superproperties by which respective instances can be reclassified if the validity becomes unknown or no longer holds. Therefore the use of such properties in the CRM is only recommended if they can be maintained consistently. Otherwise, they should be reclassified by their time-neutral superproperties. This holds in particular if data is exported to another repository.

Minimality

Although the scope of the CRM is very broad, the model itself is constructed as economically as possible.

- A class is not declared unless it is required as the domain or range of a property not appropriate to its superclass, or it is a key concept in the practical scope.
- CRM classes and properties that share a superclass are non-exclusive by default. For example, an object may be both an instance of E20 Biological Object and E22 Man-made Object.
- CRM classes and properties are either primitive, or they are key concepts in the practical scope.
- Complements of CRM classes are not declared.

Shortcuts

Some properties are declared as shortcuts of longer, more comprehensively articulated paths that connect the same domain and range classes as the shortcut property via one or more intermediate classes. For example, the property *E18 Physical Thing. P52 has current owner (is current owner of): E39 Actor*, is a shortcut for a fully articulated path from E18 Physical Thing through E8 Acquisition to E39 Actor. An instance of the fully-articulated path always implies an instance of the shortcut property. However, the inverse may not be true; an instance of the fully-articulated path cannot always be inferred from an instance of the shortcut property.

The class E13 Attribute Assignment allows for the documentation of how the assignment of any property came about, and whose opinion it was, even in cases of properties not explicitly characterized as "shortcuts".

Disjointness

Classes are disjoint if they share no common instances in any possible world. That implies that it is not possible to instantiate an item using a combination of classes that are mutually disjoint or with subclasses of them (see "multiple instantiation" in section "Terminology"). There are many examples of disjoint classes in the CRM.

A comprehensive declaration of all possible disjoint class combinations afforded by the CRM has not been provided here; it would be of questionable practical utility, and may easily become inconsistent with the goal of providing a concise definition. However, there are two key examples of disjoint class pairs that are fundamental to effective comprehension of the CRM:

- **E2 Temporal Entity is disjoint from E77 Persistent Item.** Instances of the class E2 Temporal Entity are perdurants, whereas instances of the class E77 Persistent Item are endurants. Even though instances of E77 Persistent Item have a limited existence in time, they are fundamentally different in nature from instances of E2 Temporal Entity, because they preserve their identity between events. Declaring endurants and perdurants as disjoint classes is consistent with the distinctions made in data structures that fall within the CRM's practical scope.
- **E18 Physical Thing is disjoint from E28 Conceptual Object.** The distinction is between material and immaterial items, the latter being exclusively man-made. Instances of E18 Physical Thing and E28 Conceptual Object differ in many fundamental ways; for example, the production of instances of E18 Physical Thing implies the incorporation of physical material, whereas the production of instances of E28 Conceptual Object does not. Similarly, instances of E18 Physical Thing cease to exist when destroyed, whereas an instance of E28 Conceptual Object perishes when it is forgotten or its last physical carrier is destroyed.

Extensions

Since the intended scope of the CRM is a subset of the "real" world and is therefore potentially infinite, the model has been designed to be extensible through the linkage of compatible external type hierarchies.

Compatibility of extensions with the CRM means that data structured according to an extension must also remain valid as a CRM instance. In practical terms, this implies *query containment:* any queries based on CRM concepts should retrieve a result set that is correct according to the CRM's semantics, regardless of whether the knowledge base is structured according to the CRM's semantics alone, or according to the CRM plus compatible extensions. For example, a query such as "list all events" should recall 100% of the instances deemed to be events by the CRM, regardless of how they are classified by the extension.

A sufficient condition for the compatibility of an extension with the CRM is that CRM classes subsume all classes of the extension, and all properties of the extension are either subsumed by CRM properties, or are part of a path for which a CRM

property is a shortcut. Obviously, such a condition can only be tested intellectually.

Coverage

Of necessity, some concepts covered by the CRM are less thoroughly elaborated than others: E39 Actor and E30 Right, for example. This is a natural consequence of staying within the CRM's clearly articulated practical scope in an intrinsically unlimited domain of discourse. These 'underdeveloped' concepts can be considered as hooks for compatible extensions.

The CRM provides a number of mechanisms to ensure that coverage of the intended scope is complete:

1. Existing high level classes can be extended, either structurally as subclasses or dynamically using the type hierarchy.
2. Existing high level properties can be extended, either structurally as subproperties, or in some cases, dynamically, using properties of properties which allow subtyping.
3. Additional information that falls outside the semantics formally defined by the CRM can be recorded as unstructured data using *E1 CRM Entity. P3 has note: E62 String*.

In mechanisms 1 and 2 the CRM concepts subsume and thereby cover the extensions.

In mechanism 3, the information is accessible at the appropriate point in the respective knowledge base. This approach is preferable when detailed, targeted queries are not expected; in general, only those concepts used for formal querying need to be explicitly modelled.

Transitivity

CRM is formulated as a class system with inheritance. A property P with domain A and range B will also be a property between possible subclasses of A and B. In many cases there will be a common subclass C of A and B. In these cases when the property restricted to C, that is, with C as domain and range, the restricted property could be transitive. For instance, an information object can be incorporated in a symbolic object and thus an information object can be incorporated in another information object.
In the definition of CRM the transitive properties are explicitly marked as such in the scope notes. All unmarked properties should be considered as not transitive.

Comment [GB4]: Introduce class numbers

Comment [GB5]: Introduce class numbers

Comment [GB6]: For all properties that have same domain and range, and are not transitive, this shuold be explicitly stated.

Specific Modelling Constructs

About Types

Virtually all structured descriptions of museum objects begin with a unique object identifier and information about the "type" of the object, often in a set of fields with names like "Classification", "Category", "Object Type", "Object Name", etc. All these fields are used for terms that declare that the object belongs to a particular category of items. In the CRM the class E55 Type comprises such terms from thesauri and controlled vocabularies used to characterize and classify instances of CRM classes. Instances of E55 Type represent concepts (universals) in contrast to instances of E41 Appellation which are used to name instances of CRM classes.

E55 Type is the CRM's interface to domain specific ontologies and thesauri. These can be represented in the CRM as subclasses of E55 Type, forming hierarchies of terms, i.e. instances of E55 Type linked via P127 *has broader term (has narrower term)*. Such hierarchies may be extended with additional properties.

For this purpose the CRM provides two basic properties that describe classification with terminology, corresponding to what is the current practice in the majority of information systems. The class E1 CRM Entity is the domain of the property P2 has type (is type of), which has the range E55 Type. Consequently, every class in the CRM, with the exception of E59 Primitive Value, inherits the property P2 has type (is type of). This provides a general mechanism for simulating a specialization of the classification of CRM instances to any level of detail, by linking to external vocabulary sources, thesauri, classification schema or ontologies.

Analogous to the function of the P2 has type (is type of) property, some properties in the CRM are associated with an additional property. These are numbered in the CRM documentation with a '.1' extension. The range of these properties of properties always falls under E55 Type. Their purpose is to simulate a specialization of their parent property through the use of property subtypes declared as instances of E55 Type. They do not appear in the property hierarchy list but are included as part of the property declarations and referred to in the class declarations. For example, P62.1 mode of depiction: E55 Type is associated with E24 Physical Man-made Thing. P62 depicts (is depicted by): E1 CRM Entity.

The class E55 Type also serves as the range of properties that relate to categorical knowledge commonly found in cultural documentation. For example, the property *P125 used object of type (was type of object used in)* enables the CRM to express statements such as "this casting was produced using a mould", meaning that there has been an unknown or unmentioned object, a mould, that was actually used. This enables the specific instance of the casting to be associated with the entire type of

manufacturing devices known as moulds. Further, the objects of type "mould" would be related via *P2 has type (is type of)* to this term. This indirect relationship may actually help in detecting the unknown object in an integrated environment. On the other side, some casting may refer directly to a known mould via *P16 used specific object (was used for)*. So a statistical question to how many objects in a certain collection are made with moulds could be answered correctly (following both paths through *P16 used specific object (was used for) - P2 has type (is type of)* and *P125 used object of type (was type of object used in*). This consistent treatment of categorical knowledge enhances the CRM's ability to integrate cultural knowledge.

In addition to being an interface to external thesauri and classification systems E55 Type is an ordinary class in the CRM and a subclass of E28 Conceptual Object. E55 Type and its subclasses inherit all properties from this superclass. Thus together with the CRM class E83 Type Creation the rigorous scholarly or scientific process that ensures a type is exhaustively described and appropriately named can be modelled inside the CRM. In some cases, particularly in archaeology and the life sciences, E83 Type Creation requires the identification of an exemplary specimen and the publication of the type definition in an appropriate scholarly forum. This is very central to research in the life sciences, where a type would be referred to as a "taxon," the type description as a "protologue," and the exemplary specimens as "original element" or "holotype".

Finally, types, that is, instances of E55 Type and its subclasses, are used to characterize the instances of a CRM class and hence refine the meaning of the class. A type 'artist' can be used to characterize persons through *P2 has type (is type of)*. On the other hand, in an art history application of the CRM it can be adequate to extend the CRM class E21 Person with a subclass *E21.xx* Artist. What is the difference of the type 'artist' and the class Artist? From an everyday conceptual point of view there is no difference. Both denote the concept 'artist' and identify the same set of persons. Thus in this setting a type could be seen as a class and the class of types may be seen as a metaclass. Since current systems do not provide an adequate control of user defined metaclasses, the CRM prefers to model instances of E55 Type as if they were particulars, with the relationships described in the previous paragraphs.

Users may decide to implement a concept either as a subclass extending the CRM class system or as an instance of E55 Type. A new subclass should only be created in case the concept is sufficiently stable and associated with additional explicitly modelled properties specific to it. Otherwise, an instance of E55 Type provides more flexibility of use. Users that may want to describe a discourse not only using a concept extending the CRM but also describing the history of this concept itself, may choose to model the same concept both as subclass and as an instance of E55 Type with the same name. Similarly it should be regarded as good practice to foresee for each term hierarchy refining a CRM class a term equivalent of this class as top term. For instance, a term hierarchy for instances of E21 Person may begin with "Person".

Temporal Relation Primitives based on fuzzy boundaries

It is characteristic for sciences dealing with the past, such as history, archaeology or geology, to derive temporal topological relations from stratigraphic and other observations and from considerations of causality between events. For this reason the CIDOC CRM introduced in version 3.3 the whole set of temporal relationships of Allen's temporal logic (properties P114 to P120). It was regarded at that time as a well-justified, exhaustive and sufficient theory to deal with temporal topological relationships of spatiotemporal phenomena relevant to cultural historical discourse. Allen's temporal logic is based on the assumption of known, exact endpoints of time intervals (time-spans), described by an exhaustive set of mutually exclusive relationships.
Since many temporal relations can be inferred from facts causal to them, e.g., a birth necessarily occurring before any intentional interaction of a person with other individuals, or from observations of material evidence without knowing the absolute time, the temporal relationships pertain in the CIDOC CRM to E2 Temporal Entities, and not their Time-Spans, which require knowledge of absolute time. If absolute times are known, deduction of Allen's relation is a simple question of automated calculus and not the kind of primary scientific insight the CRM, as a core model, is interested in. However, their application turned out to be problematic in practice for two reasons:
Firstly, facts causal to temporal relationships result in expressions that often require a disjunction (logical OR condition) of Allen's relationships. For instance, a child may be stillborn. Ignoring states at pregnancy as it is usual in older historical sources, birth may be *equal to* death, *meet* with death or be *before* death. The knowledge representation formalism chosen for the CRM however does **not allow** for specifying **disjunctions**, except within queries. Consequently, simple properties of the CRM that imply a temporal order, such as *P134 continued*, cannot be declared as subproperties of the temporal relationship they do imply, which would be, in this case: "before, meets, overlaps, starts, started-by, contains, finishes, finished-by, equals, during or overlapped by" (see *P174 starts before the end of*).

Secondly, nature does not allow us to observe equality of points in time. There are three possible interpretations of this impossibility to observe these equality of points.Common to all three interpretations is that they can be described in terms of fuzzy boundaries. The model proposed here is consistent with **all** three of these interpretations.

1. Any observable phenomenon that can be dated has a **natural temporal extent** with **fuzzy boundaries** of **gradual transition** from not existing to definitely existing and then to no longer existing.
2. These fuzzy boundaries can also be interpreted as the time intervals about which experts, even with a complete knowledge of the described phenomenon, may not agree as to whether this phenomenon is already ongoing or not, or still ongoing or not.

3. Under a third interpretation, the fact that an instance of E2 Temporal Entity is ongoing is **not observable** within the fuzzy boundaries.

Consider, for instance, a birth. Extending over a limited and non-negligible duration in the scale of hours it begins and ends gradually (1), but can be given alternative scientific definitions of start and end points (2), and neither of these can be determined with a precision much smaller than on a scale of minutes (3). The fuzzy boundaries **do not** describe the relation of incomplete or imprecise knowledge to reality. Assuming a lowest granularity in time is an approach which does not help, because the relevant extent of fuzziness varies at a huge scale even in cultural reasoning, depending on the type of phenomena considered. The only exact match is between arbitrarily declared time intervals, such as the end of a year being equal to the beginning of the next year, or that "Early Minoan" ends exactly when "Middle Minoan" starts, whenever that might have been.
Consequently, we introduce here a new set of "temporal relation primitives" with the following characteristics:

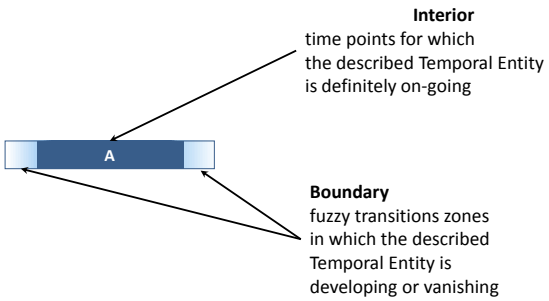
- It is a minimal set of properties that allows for specifying all possible relations between two time intervals given by their start and end points, either directly, or by conjunction (logical AND condition) of the latter.
- Start and end points are interpreted as "thick" fuzzy boundaries as described above.
- Conditions of equality of end points are relaxed to the condition that the fuzzy boundaries **overlap**. Therefore knowledge of the shape of the fuzzy function is **not** needed.
- All of Allen's relationships can be expressed either directly or by conjunctions of these properties.
- In case of time intervals without or with negligibly short fuzzy boundaries, all of Allen's relationships can exactly be described by adequate conjunctions of these properties.
- No relationship is equal to the inverse of another. Inverses are specified by exchanging the roles of domain and range.

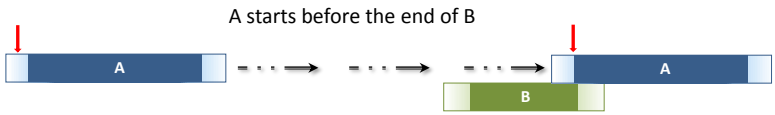
Notation

We use the following notation:
Comparing two instances of E2 Temporal Entity, we denote one with capital letter A, its (fuzzy) starting time with A^{start} and its (fuzzy) ending time with A^{end}, such that A = [A^{start},A^{end}]; we denote the other with capital letter B, its (fuzzy) starting time with B^{start} and its (fuzzy) ending time with B^{end}, such that B = [B^{start},B^{end}].
We identify a temporal relation with a predicate name (label) and define it by one or more (in)equality expressions between its end points, such as:

A *starts before the end of* B if and only if (≡) $\mathbf{A^{start} < B^{end}}$

We visualize a temporal relation symbolizing the temporal extents of two instances A and B of E2 Temporal Entity as horizontal bars, considered to be on an horizontal time-line proceeding from left to right. The fuzzy boundary areas are symbolized by an increasing/decreasing color gradient. The different choices of relative arrangement the relationship allows for are symbolized by two extreme allowed positions of instance A with respect to instance B connected by arrows. The reader may imagine it as the relative positions of a train A approaching a station B. If the relative length of A compared to B matters, two diagrams are provided.





Overview of Temporal Relation Primitives

The final set of temporal relation primitives can be separated into two groups:

1) Those based on improper inequalities, such as $A^{start} \leq B^{end}$ (odd number items in the list below- table 1)

2) Those based on proper inequalities, such as $A^{start} < B^{end}$ (even number items in the list below- table 1).

Improper inequalities with fuzzy boundaries are understood as extending into situations in which the fuzzy boundaries of the respective endpoints may overlap. In other words, they include situations in which it cannot be decided when one interval has ended and when the other started, but there is no knowledge of a definite gap between these endpoints. In a proper inequality with fuzzy boundaries, the fuzzy boundaries of the respective endpoints must not overlap, i.e., there is knowledge of a definite gap between these endpoints, for instance, a discontinuity between settlement phases based on the observation of archaeological layers.

1. P173 starts before or with the end of (ends with or after the start of)
2. P174 starts before the end of (ends after the start of)
3. P175 starts before or with the start of (starts with or after the start of)
4. P176 starts before the start of (starts after the start of)
5. P182 ends before or with the start of (starts with or after the end of)
6. P183 ends before the start of (starts after the end of)
7. P184 ends before or with the end of (ends with or after the end of)
8. P185 ends before the end of (ends after the end of)

Table 1, temporal relation primitives

Enumerate the topological relations i.e. spatial and temporal

New Issue: write the above topological relations introduction for spatial and spatiotemporal relations MD GH asigned

Examples

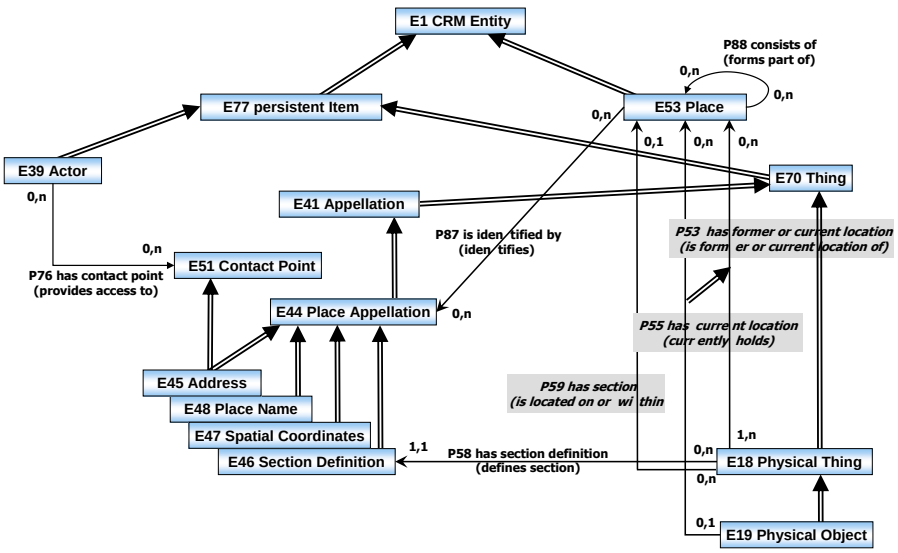


fig. 2 reasoning about spatial information

The diagram above shows a partial view of the CRM, representing reasoning about spatial information. Five of the main hierarchy branches are included in this view: E39 Actor, E51 Contact Point, E41 Appellation, E53 Place and E70 Thing. All classes are shown as blue-white rectangles. Properties are shown as single arrows. In some cases the order of priority for property names has been reversed in order to facilitate reading the diagram from left to right. Double arrows indicate IsA relations between classes and their subclasses or between properties and their subproperties. 'Shortcuts' are indicated with light grey rectangles and their names are written in italics, such as the P59 has section (is located on or within) between E53 Place and E18 Physical Thing, which is a shortcut of the path through E46 Section Definition. .

As can be seen, an instance of E53 Place *is identified by* an instance of E44 Place Appellation, which may be an instance of E45 Address, E47 Spatial Coordinates, E48 Place Name, or E46 Section Definition such as 'basement', 'prow', or 'lower left-hand corner.' An instance of E53 Place may *consist of* or *form part of* another instance of E53 Place, thereby allowing a hierarchy of geometric 'containers' to be constructed.

An instance of E45 Address can be considered both as an E44 Place Appellation–a way of referring to an E53 Place–and as an E51 Contact Point for an E39 Actor. An E39 Actor may have any number of instances of E51 Contact Point. E18 Physical Thing is found on locations as a consequence of being created there or being moved there. Therefore the properties *P53 has former or current location (is former or current location of) (*and *P55 has current location (currently holds)* are regarded as shortcuts of the fully articulated paths through the respective events. *P55 has current location (currently holds)* is a subproperty of *P53 has former or current location (is former or current location of)*. The latter is a container for location information in the absence of knowledge about time of validity and related events.

An interesting aspect of the model is the *P58 has section definition (defines section)* property between E46 Section Definition and E18 Physical Thing (and the corresponding shortcut from E53 Place to E19 Physical Object). This allows an instance of E53 Place to be defined as a section of an instance of E19 Physical Object. For example, we may know that Nelson fell at a particular spot on the deck of H.M.S. Victory, without knowing the exact position of the vessel in geospatial terms at the time of the fatal shooting of Nelson. Similarly, a signature or inscription can be located "in the lower right corner of" a painting, regardless of where the painting is hanging.

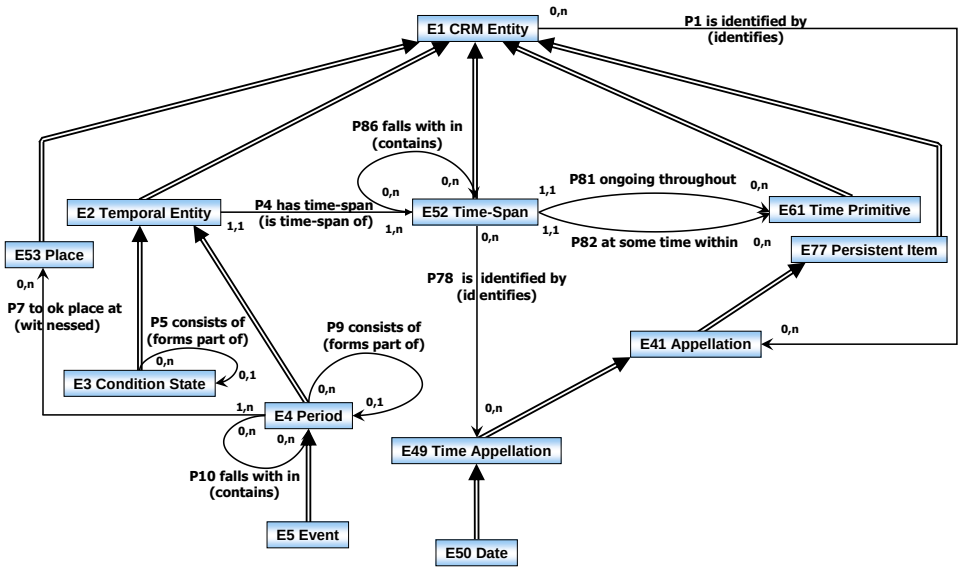


fig. 3 reasoning about temporal information

This second example shows how the CRM handles reasoning about temporal information. Four of the main hierarchy branches are included in this view: E2 Temporal Entity, E52 Time-Span, E77 Persistent Item and E53 Place.

The E2 Temporal Entity class is an abstract class (i.e. it has no direct instances) that serves to group together all classes with a temporal component, such as instances of E4 Period, E5 Event and E3 Condition State.

An instance of E52 Time-Span is simply a temporal interval that does not make any reference to cultural or geographical contexts (unlike instances of E4 Period, which *took place at* a particular instance of E53 Place). Instances of E52 Time-Span are sometimes identified by instances of E49 Time Appellation, often in the form of E50 Date.

Both E52 Time-Span and E4 Period have transitive properties. E52 Time-Span has the transitive property *P86 falls within (contains),* denoting a purely incidental inclusion; whereas E4 Period has the transitive property *P9 consists of (forms part of)* that supports the decomposition of instances of E4 Period into their constituent parts. For example, the E52 Time-Span during which a building is constructed might *falls within* the E52 Time-Span of a particular government, although there is no causal or contextual

connection between the two instances of E52 Time-Span; conversely, the E4 Period of the Chinese Song Dynasty *consists of* the Northern Song Period and the Southern Song Period.

Instances of E52 Time-Span are related to their outer bounds (i.e. their indeterminacy interval) by the property *P82 at some time within*, and to their inner bounds via the property *P81 ongoing throughout.* The range of these properties is the E61 Time Primitive class, instances of which are treated by the CRM as application or system specific date intervals that are not further analysed.

Class & Property Hierarchies

Although they do not provide comprehensive definitions, compact monohierarchical presentations of the class and property IsA hierarchies have been found to significantly aid comprehension and navigation of the CRM, 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 "E" (originally denoting "entity," although now replaced by convention with the term "class").
- 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 subhierarchies.
- Classes that appear in more than one position in the class hierarchy as a result of multiple inheritance are shown in an italic typeface.

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 "P" (for "property").
- 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, followed by its inverse name in parentheses for reading in the range to domain direction.
- The domain class for which the property is declared.
- The range class that the property references.
- The index is ordered by hierarchical level, in a "depth first" manner, from the smaller to the larger subhierarchies, and by property number between equal siblings.
- Properties that appear in more than one position in the property hierarchy as a result of multiple inheritance are shown in an italic typeface.

CIDOC CRM Class Hierarchy

E1 CRM Entity
E2 - Temporal Entity
E3 - - Condition State
E4 - - Period
E5 - - - Event
E7 - - - - Activity
E8 - - - - - Acquisition Event
E9 - - - - - Move
E10 - - - - - Transfer of Custody
E11 - - - - - Modification
E12 - - - - - - Production
E79 - - - - - - Part Addition
E80 - - - - - - Part Removal
E13 - - - - - Attribute Assignment
E14 - - - - - - Condition Assessment
E15 - - - - - - Identifier Assignment
E16 - - - - - - Measurement
E17 - - - - - - Type Assignment
E65 - - - - - Creation
E83 - - - - - - Type Creation
E66 - - - - - Formation
E85 - - - - - Joining
E86 - - - - - Leaving
E87 - - - - - Curation Activity
E63 - - - - Beginning of Existence
E67 - - - - - Birth
E81 - - - - - Transformation
E12 - - - - - *Production*
E65 - - - - - *Creation*
E83 - - - - - - *Type Creation*
E66 - - - - - *Formation*
E64 - - - - End of Existence
E6 - - - - - Destruction
E68 - - - - - Dissolution
E69 - - - - - Death
E81 - - - - - *Transformation*
E77 - Persistent Item
E70 - - Thing
E72 - - - Legal Object
E18 - - - - Physical Thing
E19 - - - - - Physical Object
E20 - - - - - - Biological Object
E21 - - - - - - - Person
E22 - - - - - - Man-Made Object
E84 - - - - - - - Information Carrier
E24 - - - - - Physical Man-Made Thing
E22 - - - - - - *Man-Made Object*
E84 - - - - - - - *Information Carrier*
E25 - - - - - - Man-Made Feature
E78 - - - - - - Collection
E26 - - - - - Physical Feature
E27 - - - - - - Site
E25 - - - - - - *Man-Made Feature*
E90 - - - - Symbolic Object
E73 - - - - - Information Object
E29 - - - - - Design or Procedure
E31 - - - - - Document
E32 - - - - - - Authority Document
E33 - - - - - - Linguistic Object
E34 - - - - - - - Inscription
E35 - - - - - - - Title

E36 - - - - - - - - Visual Item
E37 - - - - - - - - - Mark
E34 - - - - - - - - - - *Inscription*
E38 - - - - - - - - - Image
E41 - - - - - - Appellation
E42 - - - - - - - Identifier
E44 - - - - - - - Place Appellation
E45 - - - - - - - - Address
E46 - - - - - - - - Section Definition
E47 - - - - - - - - Spatial Coordinates
E48 - - - - - - - - Place Name
E49 - - - - - - - Time Appellation
E50 - - - - - - - - Date
E75 - - - - - - - Conceptual Object Appellation
E82 - - - - - - - Actor Appellation
E51 - - - - - - - Contact Point
E45 - - - - - - - - Address
E35 - - - - - - - *Title*
E71 - - - Man-Made Thing
E24 - - - - *Physical Man-Made Thing*
E22 - - - - - *Man-Made Object*
E84 - - - - - - *Information Carrier*
E25 - - - - - *Man-Made Feature*
E78 - - - - - *Collection*
E28 - - - - Conceptual Object
E90 - - - - - *Symbolic Object*
E73 - - - - - - *Information Object*
E29 - - - - - - - *Design or Procedure*
E31 - - - - - - - *Document*
E32 - - - - - - - - *Authority Document*
E33 - - - - - - - *Linguistic Object*
E34 - - - - - - - - - *Inscription*
E35 - - - - - - - - *Title*
E36 - - - - - - - - *Visual Item*
E37 - - - - - - - - - *Mark*
E34 - - - - - - - - - - *Inscription*
E38 - - - - - - - - - *Image*
E41 - - - - - - *Appellation*
E42 - - - - - - - *Identifier*
E44 - - - - - - - *Place Appellation*
E45 - - - - - - - - *Address*
E46 - - - - - - - - *Section Definition*
E47 - - - - - - - - *Spatial Coordinates*
E48 - - - - - - - - *Place Name*
E49 - - - - - - *Time Appellation*
E50 - - - - - - - - *Date*
E75 - - - - - - - *Conceptual Object Appellation*
E82 - - - - - - - *Actor Appellation*
E51 - - - - - - - *Contact Point*
E45 - - - - - - - - *Address*
E35 - - - - - - - *Title*
E89 - - - - - Propositional Object
E73 - - - - - - *Information Object*
E29 - - - - - - - *Design or Procedure*
E31 - - - - - - - *Document*
E32 - - - - - - - - *Authority Document*
E33 - - - - - - - *Linguistic Object*
E34 - - - - - - - - *Inscription*
E35 - - - - - - - - *Title*
E36 - - - - - - - *Visual Item*
E37 - - - - - - - - *Mark*
E34 - - - - - - - - - *Inscription*
E38 - - - - - - - - *Image*
E30 - - - - - - Right

E55 - - - - - - Type
E56 - - - - - - - Language
E57 - - - - - - - Material
E58 - - - - - - - Measurement Unit
E39 - - Actor
E74 - - - Group
E40 - - - - Legal Body
E21 - - - *Person*
E52 - Time-Span
E53 - Place
E54 - Dimension
E92 - Spacetime Volume
E4 - - *Period*
E5 - - - *Event*
E7 - - - - *Activity*
E8 - - - - - *Acquisition Event*
E9 - - - - - *Move*
E10 - - - - - *Transfer of Custody*
E11 - - - - - *Modification*
E12 - - - - - - *Production*
E79 - - - - - - *Part Addition*
E80 - - - - - - *Part Removal*
E13 - - - - - *Attribute Assignment*
E14 - - - - - - *Condition Assessment*
E15 - - - - - - *Identifier Assignment*
E16 - - - - - - *Measurement*
E17 - - - - - - *Type Assignment*
E65 - - - - - *Creation*
E83 - - - - - - *Type Creation*
E66 - - - - - *Formation*
E85 - - - - - *Joining*
E86 - - - - - *Leaving*
E87 - - - - - *Curation Activity*
E63 - - - - *Beginning of Existence*
E67 - - - - - *Birth*
E81 - - - - - *Transformation*
E12 - - - - - *Production*
E65 - - - - - *Creation*
E83 - - - - - - *Type Creation*
E66 - - - - - *Formation*
E64 - - - - *End of Existence*
E6 - - - - - *Destruction*
E68 - - - - - *Dissolution*
E69 - - - - - *Death*
E81 - - - - - *Transformation*
E18 - - *Physical Thing*
E19 - - - *Physical Object*
E20 - - - - *Biological Object*
E21 - - - - - *Person*
E22 - - - - *Man-Made Object*
E84 - - - - - *Information Carrier*
E24 - - *Physical Man-Made Thing*
E22 - - - - *Man-Made Object*
E84 - - - - - *Information Carrier*
E25 - - - - *Man-Made Feature*
E78 - - - - *Collection*
E26 - - - *Physical Feature*
E27 - - - - *Site*
E25 - - - - *Man-Made Feature*
E93 - - Presence
E59 Primitive Value
E60 - Number
E61 - Time Primitive
E62 - String

E94 - Space Primitive

CIDOC CRM Property Hierarchy:

Property id	Property Name	Entity – Domain	Entity - Range
P1	is identified by (identifies)	E1 CRM Entity	E41 Appellation
P48	- has preferred identifier (is preferred identifier of)	E1 CRM Entity	E42 Identifier
P78	- is identified by (identifies)	E52 Time-Span	E49 Time Appellation
P87	- is identified by (identifies)	E53 Place	E44 Place Appellation
P102	- has title (is title of)	E71 Man-Made Thing	E35 Title
P131	- is identified by (identifies)	E39 Actor	E82 Actor Appellation
P149	- is identified by (identifies)	E28 Conceptual Object	E75 Conceptual Object Appellation
P2	has type (is type of)	E1 CRM Entity	E55 Type
P137	- exemplifies (is exemplified by)	E1 CRM Entity	E55 Type
P3	has note	E1 CRM Entity	E62 String
P79	- beginning is qualified by	E52 Time-Span	E62 String
P80	- end is qualified by	E52 Time-Span	E62 String
P4	has time-span (is time-span of)	E2 Temporal Entity	E52 Time-Span
P5	consists of (forms part of)	E3 Condition State	E3 Condition State
P7	took place at (witnessed)	E4 Period	E53 Place
P8	took place on or within (witnessed)	E4 Period	E18 Physical Thing
P10	falls within (contains)	E92 Spacetime Volume	E92 Spacetime Volume
P10i	falls within (contains)	E92 Spacetime Volume	E92 Spacetime Volume
P9	…-…consists of (forms part of)	E4 Period	E4 Period
P12	occurred in the presence of (was present at)	E5 Event	E77 Persistent Item
P111	- added (was added by)	E79 Part Addition	E18 Physical Thing
P113	- removed (was removed by)	E80 Part Removal	E18 Physical Thing
P11	- had participant (participated in)	E5 Event	E39 Actor
P14	- - carried out by (performed)	E7 Activity	E39 Actor
P22	- - - transferred title to (acquired title through)	E8 Acquisition	E39 Actor
P23	- - - transferred title from (surrendered title through)	E8 Acquisition	E39 Actor
P28	- - - custody surrendered by (surrendered custody through)	E10 Transfer of Custody	E39 Actor
P29	- - - custody received by (received custody through)	E10 Transfer of Custody	E39 Actor
P96	- - by mother (gave birth)	E67 Birth	E21 Person
P99	- - dissolved (was dissolved by)	E68 Dissolution	E74 Group
P143	- - joined (was joined by)	E85 Joining	E39 Actor
P144	- - joined with (gained member by)	E85 Joining	E74 Group
P145	- - separated (left by)	E86 Leaving	E39 Actor
P146	- - separated from (lost member by)	E86 Leaving	E74 Group
P151	- - was formed from (participated in)	E66 Formation	E74 Group
P16	- used specific object (was used for)	E7 Activity	E70 Thing
P33	- - used specific technique (was used by)	E7 Activity	E29 Design or Procedure
P111	- - added (was added by)	E79 Part Addition	E18 Physical Thing
P142	- - used constituent (was used in)	E15 Identifier Assignment	E90 Symbolic Object
P25	- moved (moved by)	E9 Move	E19 Physical Object
P31	- has modified (was modified by)	E11 Modification	E24 Physical Man-Made Thing
P108	- - has produced (was produced by)	E12 Production	E24 Physical Man-Made Thing
P110	- - augmented (was augmented by)	E79 Part Addition	E24 Physical Man-Made Thing
P112	- - diminished (was diminished by)	E80 Part Removal	E24 Physical Man-Made Thing
P92	- brought into existence (was brought into existence by)	E63 Beginning of Existence	E77 Persistent Item
P94	- - has created (was created by)	E65 Creation	E28 Conceptual Object
P135	- - - created type (was created by)	E83 Type Creation	E55 Type
P95	- - has formed (was formed by)	E66 Formation	E74 Group
P98	- - brought into life (was born)	E67 Birth	E21 Person
P108	- - *has produced (was produced by)*	*E12 Production*	*E24 Physical Man-Made Thing*
P123	- - resulted in (resulted from)	E81 Transformation	E77 Persistent Item
P93	- took out of existence (was taken out of existence by)	E64 End of Existence	E77 Persistent Item
P13	- - destroyed (was destroyed by)	E6 Destruction	E18 Physical Thing
P99	- - *dissolved (was dissolved by)*	*E68 Dissolution*	*E74 Group*
P100	- - was death of (died in)	E69 Death	E21 Person
P124	- - transformed (was transformed by)	E81 Transformation	E77 Persistent Item
P142	- - *used constituent (was used in)*	*E15 Identifier Assignment*	*E90 Symbolic Object*
P15	was influenced by (influenced)	*E7 Activity*	E1 CRM Entity
P16	- *used specific object (was used for)*	*E7 Activity*	*E70 Thing*
P33	- - *used specific technique (was used by)*	*E11 Modification*	*E29 Design or Procedure*
P111	- - *added (was added by)*	*E79 Part Addition*	*E18 Physical Thing*
P142	- - *used constituent (was used in)*	*E15 Identifier Assignment*	*E90 Symbolic Object*
P17	- was motivated by (motivated)	E7 Activity	E1 CRM Entity
P134	- continued (was continued by)	E7 Activity	E7 Activity
P136	- was based on (supported type creation)	E83 Type Creation	E1 CRM Entity
P19	was intended use of (was made for)	E7 Activity	E71 Man-Made Thing
P20	had specific purpose (was purpose of)	E7 Activity	E5 Event
P21	had general purpose (was purpose of)	E7 Activity	E55 Type
P24	transferred title of (changed ownership through)	E8 Acquisition	E18 Physical Thing
P26	- moved to (was destination of)	E9 Move	E53 Place
P27	- moved from (was origin of)	E9 Move	E53 Place
P30	transferred custody of (custody transferred through)	E10 Transfer of Custody	E18 Physical Thing
P43	has dimension (is dimension of)	E70 Thing	E54 Dimension
P44	has condition (is condition of)	E18 Physical Thing	E3 Condition State

Property id	Property Name	Entity – Domain	Entity - Range
P45	consists of (is incorporated in)	E18 Physical Thing	E57 Material
P56	- bears feature (is found on)	E19 Physical Object	E26 Physical Feature
P49	has former or current keeper (is former or current keeper of)	E18 Physical Thing	E39 Actor
P50	- has current keeper (is current keeper of)	E18 Physical Thing	E39 Actor
P109	- has current or former curator (is current or former curator of)	E78 Collection	E39 Actor
P51	has former or current owner (is former or current owner of)	E18 Physical Thing	E39 Actor
P52	- has current owner (is current owner of)	E18 Physical Thing	E39 Actor
P53	has former or current location (is former or current location of)	E18 Physical Thing	E53 Place
P55	- has current location (currently holds)	E19 Physical Object	E53 Place
P54	has current permanent location (is current permanent location of)	E19 Physical Object	E53 Place
P57	has number of parts	E19 Physical Object	E60 Number
P58	has section definition (defines section)	E18 Physical Thing	E46 Section Definition
P59	has section (is located on or within)	E18 Physical Thing	E53 Place
P62	depicts (is depicted by)	E24 Physical Man-Made Thing	E1 CRM Entity
P67	refers to (is referred to by)	E89 Propositional Object	E1 CRM Entity
P68	- foresees use of (use foreseen by)	E29 Design or Procedure	E57 Material
P70	- documents (is documented in)	E31 Document	E1 CRM Entity
P71	- lists (is listed in)	E32 Authority Document	E1 CRM Entity
P129	- is about (is subject of)	E89 Propositional Object	E1 CRM Entity
P138	- represents (has representation)	E36 Visual Item	E1 CRM Entity
P69	has association with (is associated with)	E29 Design or Procedure	E29 Design or Procedure
P72	has language (is language of)	E33 Linguistic Object	E56 Language
P74	has current or former residence (is current or former residence of)	E39 Actor	E53 Place
P75	possesses (is possessed by)	E39 Actor	E30 Right
P76	has contact point (provides access to)	E39 Actor	E51 Contact Point
P81	ongoing throughout	E52 Time-Span	E61 Time Primitive
P82	at some time within	E52 Time-Span	E61 Time Primitive
P83	had at least duration (was minimum duration of)	E52 Time-Span	E54 Dimension
P84	had at most duration (was maximum duration of)	E52 Time-Span	E54 Dimension
P86	falls within (contains)	E52 Time-Span	E52 Time-Span
P89	falls within (contains)	E53 Place	E53 Place
P90	has value	E54 Dimension	E60 Number
P91	has unit (is unit of)	E54 Dimension	E58 Measurement Unit
P97	from father (was father for)	E67 Birth	E21 Person
P101	had as general use (was use of)	E70 Thing	E55 Type
P103	was intended for (was intention of)	E71 Man-Made Thing	E55 Type
P104	is subject to (applies to)	E72 Legal Object	E30 Right
P105	right held by (has right on)	E72 Legal Object	E39 Actor
P52	- has current owner (is current owner of)	E18 Physical Thing	E39 Actor
P106	is composed of (forms part of)	E90 Symbolic Object	E90 Symbolic Object
P165	- incorporates (is incorporated in)	E73 Information Object	E90 Symbolic Object
P107	has current or former member (is current or former member of)	E74 Group	E39 Actor
P114	is equal in time to	E2 Temporal Entity	E2 Temporal Entity
P115	finishes (is finished by)	E2 Temporal Entity	E2 Temporal Entity
P116	starts (is started by)	E2 Temporal Entity	E2 Temporal Entity
P117	occurs during (includes)	E2 Temporal Entity	E2 Temporal Entity
P118	overlaps in time with (is overlapped in time by)	E2 Temporal Entity	E2 Temporal Entity
P119	meets in time with (is met in time by)	E2 Temporal Entity	E2 Temporal Entity
P120	occurs before (occurs after)	E2 Temporal Entity	E2 Temporal Entity
P121	overlaps with	E53 Place	E53 Place
P122	borders with	E53 Place	E53 Place
P125	used object of type (was type of object used in)	E7 Activity	E55 Type
P32	- used general technique (was technique of)	E7 Activity	E55 Type
P126	employed (was employed in)	E11 Modification	E57 Material
P127	has broader term (has narrower term)	E55 Type	E55 Type
P65	- shows visual item (is shown by)	E24 Physical Man-Made Thing	E36 Visual Item
P130	shows features of (features are also found on)	E70 Thing	E70 Thing
P73i	- is translation of	E33 Linguistic Object	E33 Linguistic Object
P128	- carries (is carried by)	E18 Physical Thing	E90 Symbolic Object
P65	- - shows visual item (is shown by)	E24 Physical Man-Made Thing	E36 Visual Item
P132	overlaps with	E92 Spacetime Volume	E92 Spacetime Volume
P46	- is composed of (forms part of)	E18 Physical Thing	E18 Physical Thing
P133	is separated from	E92 Spacetime Volume	E92 Spacetime Volume
P139	has alternative form	E41 Appellation	E41 Appellation
P140	assigned attribute to (was attributed by)	E13 Attribute Assignment	E1 CRM Entity
P34	- concerned (was assessed by)	E14 Condition Assessment	E18 Physical Thing
P39	- measured (was measured by)	E16 Measurement	E1 CRM Entity
P41	- classified (was classified by)	E17 Type Assignement	E1 CRM Entity
P141	assigned (was assigned by)	E13 Attribute Assignement	E1 CRM Entity
P35	- has identified (identified by)	E14 Condition Assessment	E3 Condition State
P37	- assigned (was assigned by)	E15 Identifier Assignement	E42 Identifier
P38	- deassigned (was deassigned by)	E15 Identifier Assignement	E42 Identifier
P40	- observed dimension (was observed in)	E16 Measurement	E54 Dimension
P42	- assigned (was assigned by)	E17 Type Assignment	E55 Type
P147	curated (was curated by)	E87 Curation Activity	E78 Collection
P148	has component (is component of)	E89 Propositional Object	E89 Propositional Object
P150	defines typical parts of(defines typical wholes for)	E55 Type	E55 Type
P152	has parent(is parent of)	E21 Person	E21 Person

Property id	Property Name	Entity – Domain	Entity - Range
P157	is at rest relative to (provides reference space for)	E53 Place	E18 Physical Thing
P59i	- is located on or within	E53 Place	E18 Physical Thing
P160	has temporal projection	E92 Spacetime Volume	E52 Time-Span
P164	- during (was time-span of)	E93 Presence	E52 Time Span
P161	has spatial projection	E92 Spacetime Volume	E53 Place
P156	- occupies	E18 Physical Thing	E53 Place
P166	was a presence of (had presence)	E93 Presence	E92 Spacetime Volume
P167	was at(was place of)	E93 Presence	E53 Place
P168	Place is defined by (defines place)	E53 Place	E94 Space primitive

CIDOC CRM Class Declarations

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

- Class names are presented as headings in bold face, preceded by the class' 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. If the example is also instance of a subclass of this class, the unique identifier of the subclass is added in parenthesis. If the example instantiates two classes, the unique identifiers of both classes is added in parenthesis. Non-fictitious examples may be followed by an explanation in brackets.
- The line "Properties:" declares the list of the class' properties;
- Each property is represented by its unique identifier, its forward and reverse names, and the range class that it links to, separated by colons;
- Inherited properties are not represented;
- Properties of properties are provided indented and in parentheses beneath their respective domain property.

E1 CRM Entity

Superclass of: E2 Temporal Entity
E52 Time-Span
E53 Place
E54 Dimension
E77 Persistent Item
E92 Spacetime Volume

Scope note: This class comprises all things in the universe of discourse of the CIDOC Conceptual Reference Model.

It is an abstract concept providing for three general properties:
1. Identification by name or appellation, and in particular by a preferred identifier
2. Classification by type, allowing further refinement of the specific subclass an instance belongs to
3. Attachment of free text for the expression of anything not captured by formal properties

With the exception of E59 Primitive Value, all other classes within the CRM are directly or indirectly specialisations of E1 CRM Entity.

Examples:

- the earthquake in Lisbon 1755 (E5)

In First Order Logic:
E1(x)

Properties:
P1 is identified by (identifies): E41 Appellation
P2 has type (is type of): E55 Type
P3 has note: E62 String
(P3.1 has type: E55 Type)
P48 has preferred identifier (is preferred identifier of): E42 Identifier
P137 exemplifies (is exemplified by): E55 Type
(P137.1 in the taxonomic role: E55 Type)

E2 Temporal Entity

Subclass of: E1 CRM Entity
Superclass of: E3 Condition State
E4 Period

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. This extent in time must be contiguous, i.e., without gaps. In case the defining kinds of phenomena for an instance of E2 Temporal Entity cease to happen, and occur later again at another time, we regard that the former E2 Temporal Entity has ended and a new instance has come into existence. In more intuitive terms, the same event cannot happen twice.

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:

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

In First Order Logic:
E2(x) ⊃ E1(x)

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
P173 starts before or at the end of (ends with or after the start of): E2 Temporal Entity
P174 starts before (starts after the start of): E2 Temporal Entity
P175 starts before or with the start of (starts with or after the start of) : E2 Temporal Entity
P176 starts before the start of (starts after the start of): E2 Temporal Entity
P182 ends before or at the start of (starts with or after the end of) : E2 Temporal Entity
P183 ends before the start of (starts after the end of) : E2 Temporal Entity
P184 ends before or with the end of (ends with or after the end of) : E2 Temporal Entity
P185 ends before the end of (ends after the end of): E2 Temporal Entityy

E3 Condition State

Subclass of: E2 Temporal Entity

Scope note: This class comprises the states of objects characterised by a certain condition over a time-span.

An instance of this class describes the prevailing physical condition of any material object or feature during a specific E52 Time Span. In general, the time-span for which a certain condition can be asserted may be shorter than the real time-span, for which this condition held.
The nature of that condition can be described using *P2 has type*. For example, the E3 Condition State "condition of the SS Great Britain between 22 September 1846 and 27 August 1847" can be characterized as E55 Type "wrecked".

Examples:

- the "reconstructed" state of the "Amber Room" in Tsarskoje Selo from summer 2003 until now
- the "ruined" state of Peterhof Palace near Saint Petersburg from 1944 to 1946
- the state of my turkey in the oven at 14:30 on 25 December, 2002 (*P2 has type: E55 Type* "still not cooked")
- the topography of the leaves of Sinai Printed Book 3234.2361 on the 10th of July 2007 (described as: of type "cockled")

In First Order Logic:

E3(x) ⊃ E2(x)

Properties**:**

P5 consists of (forms part of): E3 Condition State

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.

Another specific case of an E4 Period is the set of activities and phenomena associated with a settlement, such as the populated period of Nineveh.

Examples:

- Jurassic
- 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

E5 Event

Subclass of: E4 Period
Superclass of: E7 Activity
E63 Beginning of Existence
E64 End of Existence

Scope note: This class comprises changes of states in cultural, social or physical systems, regardless of scale, brought about by a series or group of coherent physical, cultural, technological or legal phenomena. Such changes of state will affect instances of E77 Persistent Item or its subclasses.

The distinction between an E5 Event and an E4 Period is partly a question of the scale of observation. Viewed at a coarse level of detail, an E5 Event is an 'instantaneous' change of state. At a fine level, the E5 Event can be analysed into its component phenomena within a space and time frame, and as such can be seen as an E4 Period. The reverse is not necessarily the case: not all instances of E4 Period give rise to a noteworthy change of state.

Examples:

- the birth of Cleopatra (E67)
- the destruction of Herculaneum by volcanic eruption in 79 AD (E6)
- World War II (E7)
- the Battle of Stalingrad (E7)
- the Yalta Conference (E7)
- my birthday celebration 28-6-1995 (E7)
- the falling of a tile from my roof last Sunday
- the CIDOC Conference 2003 (E7)

In First Order Logic:

$E5(x) \supset E4(x)$

Properties:

P11 had participant (participated in): E39 Actor
P12 occurred in the presence of (was present at): E77 Persistent Item

E6 Destruction

Subclass of: E64 End of Existence

Scope note: This class comprises events that destroy one or more instances of E18 Physical Thing such that they lose their identity as the subjects of documentation.

Some destruction events are intentional, while others are independent of human activity. Intentional destruction may be documented by classifying the event as both an E6 Destruction and E7 Activity.

The decision to document an object as destroyed, transformed or modified is context sensitive:

1. If the matter remaining from the destruction is not documented, the event is modelled solely as E6 Destruction.
2. An event should also be documented using E81 Transformation if it results in the destruction of one or more objects and the simultaneous production of others using parts or material from the original. In this case, the new items have separate identities. Matter is preserved, but identity is not.
3. When the initial identity of the changed instance of E18 Physical Thing is preserved, the event should be documented as E11 Modification.

Examples:

- the destruction of Herculaneum by volcanic eruption in 79 AD
- the destruction of Nineveh (E6, E7)
- the breaking of a champagne glass yesterday by my dog

In First Order Logic:

E6(x) ⊃ E64(x)

Properties:

P13 destroyed (was destroyed by): E18 Physical Thing

E7 Activity

Subclass of: E5 Event

Superclass of: E8 Acquisition
E9 Move
E10 Transfer of Custody
E11 Modification
E13 Attribute Assignment
E65 Creation
E66 Formation
E85 Joining
E86 Leaving
E87 Curation Activity

Scope note: This class comprises actions intentionally carried out by instances of E39 Actor that result in changes of state in the cultural, social, or physical systems documented.

This notion includes complex, composite and long-lasting actions such as the building of a settlement or a war, as well as simple, short-lived actions such as the opening of a door.

Examples:

- the Battle of Stalingrad
- the Yalta Conference
- my birthday celebration 28-6-1995
- the writing of "Faust" by Goethe (E65)
- the formation of the Bauhaus 1919 (E66)
- calling the place identified by TGN '7017998' 'Quyunjig' by the people of Iraq
- Kira Weber working in glass art from 1984 to 1993
- Kira Weber working in oil and pastel painting from 1993

In First Order Logic:

E7(x) ⊃ E5(x)

Properties:

P14 carried out by (performed): E39 Actor
(P14.1 in the role of: E55 Type)
P15 was influenced by (influenced): E1 CRM Entity
P16 used specific object (was used for): E70 Thing
(P16.1 mode of use: E55 Type)
P17 was motivated by (motivated): E1 CRM Entity
P19 was intended use of (was made for): E71 Man-Made Thing
(P19.1 mode of use: E55 Type)
P20 had specific purpose (was purpose of): E5 Event
P21 had general purpose (was purpose of): E55 Type
P32 used general technique (was technique of): E55 Type
P33 used specific technique (was used by): E29 Design or Procedure
P125 used object of type (was type of object used in): E55 Type
P134 continued (was continued by): E7 Activity

E8 Acquisition

Subclass of: E7 Activity

Scope note: This class comprises transfers of legal ownership from one or more instances of E39 Actor to one or more other instances of E39 Actor.

The class also applies to the establishment or loss of ownership of instances of E18 Physical Thing. It

does not, however, imply changes of any other kinds of right. The recording of the donor and/or recipient is optional. It is possible that in an instance of E8 Acquisition there is either no donor or no recipient. Depending on the circumstances, it may describe:

1. the beginning of ownership
2. the end of ownership
3. the transfer of ownership
4. the acquisition from an unknown source
5. the loss of title due to destruction of the item

It may also describe events where a collector appropriates legal title, for example by annexation or field collection. The interpretation of the museum notion of "accession" differs between institutions. The CRM therefore models legal ownership (E8 Acquisition) and physical custody (E10 Transfer of Custody) separately. Institutions will then model their specific notions of accession and deaccession as combinations of these.

Examples

- the collection of a hammer-head shark of the genus *Sphyrna* (Carchariniformes) XXXtbc by John Steinbeck and Edward Ricketts at Puerto Escondido in the Gulf of Mexico on March 25th, 1940
- the acquisition of El Greco's painting entitled 'The Apostles Peter and Paul' by the State Hermitage in Saint Petersburg
- the loss of my stuffed chaffinch *'Fringilla coelebs* Linnaeus, 1758' due to insect damage last year

In First Order Logic:

E8(x) ⊃ E7(x)

Properties:

P22 transferred title to (acquired title through): E39 Actor
P23 transferred title from (surrendered title through): E39 Actor
P24 transferred title of (changed ownership through): E18 Physical Thing

E9 Move

Subclass of: E7 Activity

Scope note: This class comprises changes of the physical location of the instances of E19 Physical Object.

Note, that the class E9 Move inherits the property *P7 took place at (witnessed): E53 Place*. This property should be used to describe the trajectory or a larger area within which a move takes place, whereas the properties *P26 moved to (was destination of)*, *P27 moved from (was origin of)* describe the start and end points only. Moves may also be documented to consist of other moves (via *P9 consists of (forms part of)*), in order to describe intermediate stages on a trajectory. In that case, start and end points of the partial moves should match appropriately between each other and with the overall event.

Examples

- the relocation of London Bridge from the UK to the USA
- the movement of the exhibition "Treasures of Tut-Ankh-Amun" 1976-1979

In First Order Logic:

E9(x) ⊃ E7(x)

Properties:

P25 moved (moved by): E19 Physical Object
P26 moved to (was destination of): E53 Place
P27 moved from (was origin of): E53 Place

E10 Transfer of Custody

Subclass of: E7 Activity

Scope note: This class comprises transfers of physical custody of objects between instances of E39 Actor.

The recording of the donor and/or recipient is optional. It is possible that in an instance of E10 Transfer of Custody there is either no donor or no recipient. Depending on the circumstances it may describe:

1. the beginning of custody
2. the end of custody
3. the transfer of custody
4. the receipt of custody from an unknown source
5. the declared loss of an object

The distinction between the legal responsibility for custody and the actual physical possession of the object should be expressed using the property *P2 has type (is type of)*. A specific case of transfer of custody is theft. The sense of physical possession requires that the object of custody is in the hands of the keeper at least with a part representative for the whole. The way, in which a representative part is defined, should ensure that it is unambiguous who keeps a part and who the whole and should be consistent with the identity criteria of the kept instance of E18 Physical Thing. For instance, in the case of a set of cutlery we may require the majority of pieces having been in the hands of the actor regardless which individual pieces are kept over time.

The interpretation of the museum notion of "accession" differs between institutions. The CRM therefore models legal ownership and physical custody separately. Institutions will then model their specific notions of accession and deaccession as combinations of these.

Examples:

- the delivery of the paintings by Secure Deliveries Inc. to the National Gallery
- the return of Picasso's "Guernica" to Madrid's Prado in 1981

In First Order Logic:

E10(x) ⊃ E7(x)

Properties:

P28 custody surrendered by (surrendered custody through): E39 Actor
P29 custody received by (received custody through): E39 Actor
P30 transferred custody of (custody transferred through): E18 Physical Thing

E11 Modification

Subclass of: E7 Activity
Superclass of: E12 Production
E79 Part Addition
E80 Part Removal

Scope note: This class comprises all instances of E7 Activity that create, alter or change E24 Physical Man-Made Thing.

This class includes the production of an item from raw materials, and other so far undocumented objects, and the preventive treatment or restoration of an object for conservation.

Since the distinction between modification and production is not always clear, modification is regarded as the more generally applicable concept. This implies that some items may be consumed or destroyed in a Modification, and that others may be produced as a result of it. An event should also be documented using E81 Transformation if it results in the destruction of one or more objects and the simultaneous production of others using parts or material from the originals. In this case, the new items have separate identities.

If the instance of the E29 Design or Procedure utilized for the modification prescribes the use of specific materials, they should be documented using property *P68 foresees use of (use foreseen by):* E57 Material of E29 Design or Procedure, rather than via *P126 employed (was employed in*): E57 Material.

Examples:

- the construction of the SS Great Britain (E12)
- the impregnation of the Vasa warship in Stockholm for preservation after 1956
- the transformation of the Enola Gay into a museum exhibit by the National Air and Space Museum in Washington DC between 1993 and 1995 (E12, E81)
- the last renewal of the gold coating of the Toshogu shrine in Nikko, Japan

In First Order Logic:
E11(x) ⊃ E7(x)

Properties:
P31 has modified (was modified by): E24 Physical Man-Made Thing
P126 employed (was employed in): E57 Material

E12 Production

Subclass of: E11 Modification
E63 Beginning of Existence

Scope note: This class comprises activities that are designed to, and succeed in, creating one or more new items.

It specializes the notion of modification into production. The decision as to whether or not an object is regarded as new is context sensitive. Normally, items are considered "new" if there is no obvious overall similarity between them and the consumed items and material used in their production. In other cases, an item is considered "new" because it becomes relevant to documentation by a modification. For example, the scribbling of a name on a potsherd may make it a voting token. The original potsherd may not be worth documenting, in contrast to the inscribed one.

This entity can be collective: the printing of a thousand books, for example, would normally be considered a single event.

An event should also be documented using E81 Transformation if it results in the destruction of one or more objects and the simultaneous production of others using parts or material from the originals. In this case, the new items have separate identities and matter is preserved, but identity is not.

Examples:
- the construction of the SS Great Britain
- the first casting of the Little Mermaid from the harbour of Copenhagen
- Rembrandt's creating of the seventh state of his etching "Woman sitting half dressed beside a stove", 1658, identified by Bartsch Number 197 (E12,E65,E81)

In First Order Logic:
E12(x) ⊃ E11(x)
E12(x) ⊃ E63(x)

Properties:
P108 has produced (was produced by): E24 Physical Man-Made Thing
P186 produced thing of product type (is produced by): E99 Product Type

E13 Attribute Assignment

Subclass of: E7 Activity
Superclass of: E14 Condition Assessment
E15 Identifier Assignment
E16 Measurement
E17 Type Assignment

Scope note: This class comprises the actions of making assertions about properties of an object or any relation between two items or concepts.

This class allows the documentation of how the respective assignment came about, and whose opinion it was. All the attributes or properties assigned in such an action can also be seen as directly attached to the respective item or concept, possibly as a collection of contradictory values. All cases of properties in this model that are also described indirectly through an action are characterised as "short cuts" of this action. This redundant modelling of two alternative views is preferred because many implementations may have good reasons to model either the action or the short cut, and the relation between both alternatives can be captured by simple rules.

In particular, the class describes the actions of people making propositions and statements during certain museum procedures, e.g. the person and date when a condition statement was made, an identifier was assigned, the museum object was measured, etc. Which kinds of such assignments and statements need to be documented explicitly in structures of a schema rather than free text, depends on if this information should be accessible by structured queries.

Examples:

- the assessment of the current ownership of Martin Doerr's silver cup in February 1997

In First Order Logic:

E13(x) ⊃ E7(x)

Properties:

P140 assigned attribute to (was attributed by): E1 CRM Entity
P141 assigned (was assigned by): E1 CRM Entity

E14 Condition Assessment

Subclass of: E13 Attribute Assignment

Scope note: This class describes the act of assessing the state of preservation of an object during a particular period.

The condition assessment may be carried out by inspection, measurement or through historical research. This class is used to document circumstances of the respective assessment that may be relevant to interpret its quality at a later stage, or to continue research on related documents.

Examples:

- last year's inspection of humidity damage to the frescos in the St. George chapel in our village

In First Order Logic:

E14(x) ⊃ E13(x)

Properties:

P34 concerned (was assessed by): E18 Physical Thing
P35 has identified (identified by): E3 Condition State

E15 Identifier Assignment

Subclass of: E13 Attribute Assignment

Scope note: This class comprises activities that result in the allocation of an identifier to an instance of E1 CRM Entity. An E15 Identifier Assignment may include the creation of the identifier from multiple constituents, which themselves may be instances of E41 Appellation. The syntax and kinds of constituents to be used may be declared in a rule constituting an instance of E29 Design or Procedure.

Examples of such identifiers include Find Numbers, Inventory Numbers, uniform titles in the sense of librarianship and Digital Object Identifiers (DOI). Documenting the act of identifier assignment and deassignment is especially useful when objects change custody or the identification system of an organization is changed. In order to keep track of the identity of things in such cases, it is important to document by whom, when and for what purpose an identifier is assigned to an item.

The fact that an identifier is a preferred one for an organisation can be expressed by using the property *E1 CRM Entity. P48 has preferred identifier (is preferred identifier of): E42 Identifier*. It can better be expressed in a context independent form by assigning a suitable E55 Type, such as "preferred identifier assignment", to the respective instance of E15 Identifier Assignment via the *P2 has type* property.

Examples:

- Replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens
- Assigning the author-uniform title heading "Goethe, Johann Wolfgang von, 1749-1832. Faust. 1. Theil." for a work (E28)
- On June 1, 2001 assigning the personal name heading "Guillaume, de Machaut, ca. 1300-1377" (E42,E82) to Guillaume de Machaut (E21)

In First Order Logic:
E15(x) ⊃ E13(x)

Properties:
P37 assigned (was assigned by): E42 Identifier
P38 deassigned (was deassigned by): E42 Identifier
P142 used constituent (was used in): E90 Symbolic Object

E16 Measurement

Subclass of: E13 Attribute Assignment

Scope note: This class comprises actions measuring quantitative physical properties and other values that can be determined by a systematic, objective procedure of direct observation of particular states of physical reality. Properties of instances of E90 Symbolic Object may be measured by observing some of their representative carriers which may or may not be named explicitly. In the former case, the property P16 used specific object should be used to specify the information carriers used as empirical basis for the measurement activity.

Examples include measuring the nominal monetary value of a collection of coins or the running time of a movie on a specific video cassette.

The E16 Measurement may use simple counting or tools, such as yardsticks or radiation detection devices. The interest is in the method and care applied, so that the reliability of the result may be judged at a later stage, or research continued on the associated documents. The date of the event is important for dimensions, which may change value over time, such as the length of an object subject to shrinkage. Methods and devices employed should be associated with instances of E16 Measurement by properties such as P33 used specific technique, P125 used object of type, P16 used specific object, whereas basic techniques such as "carbon 14 dating" should be encoded using P2 has type (is type of:) E55 Type. Details of methods and devices reused or reusable in other instances of E16 Measurement should be documented for these entities rather than the measurements themselves, whereas details of particular execution may be documented by free text or by instantiating adequate subactivities, if the detail may be of interest for an overarching query.

Regardless whether a measurement is made by an instrument or by human senses, it represents the initial transition from physical reality to information without any other documented information object in between within the reasoning chain that would represent the result of the interaction of the observer or device with reality. Therefore, inferring properties of depicted items using image material, such as satellite images, is not regarded as an instance of E16 Measurement, but as a subsequent instance of E13 Attribute Assignment. Rather, only the production of the images, understood as arrays of radiation intensities, is regarded as an instance of E16 Measurement. The same reasoning holds for other sensor data.

Examples:
- measurement of height of silver cup 232 on the 31st August 1997
- the carbon 14 dating of the “Schoeninger Speer II” in 1996 [an about 400.000 years old Palaeolithic complete wooden spear found in Schoeningen, Niedersachsen, Germany in 1995]

In First Order Logic:
E16(x) ⊃ E13(x)

Properties:
P39 measured (was measured by): E1 CRM Entity
P40 observed dimension (was observed in): E54 Dimension

E17 Type Assignment

Subclass of: E13 Attribute Assignment

Scope note: This class comprises the actions of classifying items of whatever kind. Such items include objects, specimens, people, actions and concepts.

This class allows for the documentation of the context of classification acts in cases where the value of the classification depends on the personal opinion of the classifier, and the date that the classification was made. This class also encompasses the notion of "determination," i.e. the systematic and molecular identification of a specimen in biology.

Examples:

- the first classification of object GE34604 as Lament Cloth, October 2nd
- the determination of a cactus in Martin Doerr's garden as '*Cereus hildmannianus* K.Schumann', July 2003

In First Order Logic:

E17(x) ⊃ E13(x)

Properties:

P41 classified (was classified by): E1 CRM Entity
P42 assigned (was assigned by): E55 Type

E18 Physical Thing

Subclass of: E72 Legal Object
E92 Spacetime Volume
Superclass of: E19 Physical Object
E24 Physical Man-Made Thing
E26 Physical Feature

Scope Note: This class comprises all persistent physical items with a relatively stable form, man-made or natural.

Depending on the existence of natural boundaries of such things, the CRM distinguishes the instances of E19 Physical Object from instances of E26 Physical Feature, such as holes, rivers, pieces of land etc. Most instances of E19 Physical Object can be moved (if not too heavy), whereas features are integral to the surrounding matter.

An instance of E18 Physical Thing occupies not only a particular geometric space, but in the course of its existence it also forms a trajectory through spacetime, which occupies a real, that is phenomenal, volume in spacetime. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces, such as the interior of a box. Physical things consisting of aggregations of physically unconnected objects, such as a set of chessmen, occupy a number of individually contiguous spacetime volumes equal to the number of unconnected objects that constitute the set.

We model E18 Physical Thing to be a subclass of E72 Legal Object 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 E18 Physical Thing 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 E18 Physical Thing is matter while a spacetime volume is an aggregation of points in spacetime. However, the real spatiotemporal extent of an instance of E18 Physical Thing 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 E18 Physical Thing. Therefore this multiple inheritance is unambiguous and effective and furthermore corresponds to the intuitions of natural language.

The CIDOC CRM is generally not concerned with amounts of matter in fluid or gaseous states.

Examples:

- the Cullinan Diamond (E19)
- the cave "Ideon Andron" in Crete (E26)
- the Mona Lisa (E22)

In First Order Logic:

E18(x) ⊃ E72(x)
E18(x) ⊃ E92(x)

Properties:

P44 has condition (is condition of): E3 Condition State
P45 consists of (is incorporated in): E57 Material
P46 is composed of (forms part of): E18 Physical Thing
P49 has former or current keeper (is former or current keeper of): E39 Actor
P50 has current keeper (is current keeper of): E39 Actor
P51 has former or current owner (is former or current owner of): E39 Actor
P52 has current owner (is current owner of): E39 Actor
P53 has former or current location (is former or current location of): E53 Place
P58 has section definition (defines section): E46 Section Definition
P59 has section (is located on or within): E53 Place
P128 carries (is carried by): E90 Symbolic Object
P156 occupies (is occupied by): E53 Place

E19 Physical Object

Subclass of: E18 Physical Thing
Superclass of: E20 Biological Object
E22 Man-Made Object

Scope note: This class comprises items of a material nature that are units for documentation and have physical boundaries that separate them completely in an objective way from other objects.

The class also includes all aggregates of objects made for functional purposes of whatever kind, independent of physical coherence, such as a set of chessmen. Typically, instances of E19 Physical Object can be moved (if not too heavy).

In some contexts, such objects, except for aggregates, are also called "bona fide objects" (Smith & Varzi, 2000, pp.401-420), i.e. naturally defined objects.

The decision as to what is documented as a complete item, rather than by its parts or components, may be a purely administrative decision or may be a result of the order in which the item was acquired.

Examples:

- John Smith
- Aphrodite of Milos
- the Palace of Knossos
- the Cullinan Diamond
- Apollo 13 at the time of launch

In First Order Logic:

E19(x) ⊃ E18(x)

Properties:

P54 has current permanent location (is current permanent location of): E53 Place
P55 has current location (currently holds): E53 Place
P56 bears feature (is found on): E26 Physical Feature
P57 has number of parts: E60 Number

E20 Biological Object

Subclass of: E19 Physical Object
Superclass of: E21 Person

Scope note: This class comprises individual items of a material nature, which live, have lived or are natural products of or from living organisms.

Artificial objects that incorporate biological elements, such as Victorian butterfly frames, can be documented as both instances of E20 Biological Object and E22 Man-Made Object.

Examples:

- me
- Tut-Ankh-Amun
- Boukephalas [Horse of Alexander the Great]

- petrified dinosaur excrement PA1906-344

In First Order Logic:
E20(x) ⊃ E19(x)

E21 Person

Subclass of: E20 Biological Object
E39 Actor

Scope note: This class comprises real persons who live or are assumed to have lived.

Legendary figures that may have existed, such as Ulysses and King Arthur, fall into this class if the documentation refers to them as historical figures. In cases where doubt exists as to whether several persons are in fact identical, multiple instances can be created and linked to indicate their relationship. The CRM does not propose a specific form to support reasoning about possible identity.

Examples:
- Tut-Ankh-Amun
- Nelson Mandela

In First Order Logic:
E21(x) ⊃ E20(x)
E21(x) ⊃ E39(x)

Properties:
P152 has parent (is parent of): E21 Person

E22 Man-Made Object

Subclass of: E19 Physical Object
E24 Physical Man-Made Thing
Superclass of: E84 Information Carrier

Scope note: This class comprises physical objects purposely created by human activity.

No assumptions are made as to the extent of modification required to justify regarding an object as man-made. For example, an inscribed piece of rock or a preserved butterfly are both regarded as instances of E22 Man-Made Object.

Examples:
- Mallard (the World's fastest steam engine)
- the Portland Vase
- the Coliseum

In First Order Logic:
E22(x) ⊃ E19(x)
E22(x) ⊃ 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.

Examples:

- the Forth Railway Bridge (E22)
- the Channel Tunnel (E25)
- the Historical Collection of the Museum Benaki in Athens (E78)

In First Order Logic:

E24(x) ⊃ E18(x)
E24(x) ⊃ 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

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.

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

In First Order Logic:

E25(x) ⊃ E26(x)
E25(x) ⊃ E24(x)

E26 Physical Feature

Subclass of: E18 Physical Thing
Superclass of: E25 Man-Made Feature
E27 Site

Scope Note: This class comprises identifiable features that are physically attached in an integral way to particular physical objects.

Instances of E26 Physical Feature share many of the attributes of instances of E19 Physical Object. They may have a one-, two- or three-dimensional geometric extent, but there are no natural borders that separate them completely in an objective way from the carrier objects. For example, a doorway is a feature but the door itself, being attached by hinges, is not.

Instances of E26 Physical Feature can be features in a narrower sense, such as scratches, holes, reliefs, surface colours, reflection zones in an opal crystal or a density change in a piece of wood. In the wider sense, they are portions of particular objects with partially imaginary borders, such as the core of the Earth, an area of property on the surface of the Earth, a landscape or the head of a contiguous marble statue. They can be measured and dated, and it is sometimes possible to state who or what is or was responsible for them. They cannot be separated from the carrier object, but a segment of the carrier object may be identified (or sometimes removed) carrying the complete feature.

This definition coincides with the definition of "fiat objects" (Smith & Varzi, 2000, pp.401-420), with the exception of aggregates of “bona fide objects”.

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 damage to the nose of the Great Sphinx in Giza
- Michael Jackson's nose prior to plastic surgery

In First Order Logic:

E26(x) ⊃ E18(x)

E27 Site

Subclass of: E26 Physical Feature

Scope Note: This class comprises pieces of land or sea floor.

In contrast to the purely geometric notion of E53 Place, this class describes constellations of matter on the surface of the Earth or other celestial body, which can be represented by photographs, paintings and maps.

Instances of E27 Site are composed of relatively immobile material items and features in a particular configuration at a particular location.

Examples:

- the Amazon river basin
- Knossos
- the Apollo 11 landing site
- Heathrow Airport
- the submerged harbour of the Minoan settlement of Gournia, Crete

In First Order Logic:

E27(x)⊃ E26(x)

E28 Conceptual Object

Subclass of: E71 Man-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.

Examples:

- Beethoven's "Ode an die Freude" (Ode to Joy) (E73)
- the definition of "ontology" in the Oxford English Dictionary
- the knowledge about the victory at Marathon carried by the famous runner
- 'Maxwell equations' [preferred subject access point from LCSH, http://lccn.loc.gov/sh85082387, as of 19 November 2012]
- 'Equations, Maxwell' [variant subject access point, from the same source]

In First Order Logic:

E28(x) ⊃ E71(x)

Properties: P149 is identified by (identifies): E75 Conceptual Object Appellation

E29 Design or Procedure

Subclass of: E73 Information Object

Scope note: This class comprises documented plans for the execution of actions in order to achieve a result of a specific quality, form or contents. In particular it comprises plans for deliberate human activities that may result in the modification or production of instances of E24 Physical Thing.

Instances of E29 Design or Procedure can be structured in parts and sequences or depend on others. This is modelled using *P69* has association with (is associated with)..

Designs or procedures can be seen as one of the following:

1. A schema for the activities it describes
2. A schema of the products that result from their application.
3. An independent intellectual product that may have never been applied, such as Leonardo da Vinci's famous plans for flying machines.

Because designs or procedures may never be applied or only partially executed, the CRM models a loose relationship between the plan and the respective product.

Examples:

- the ISO standardisation procedure
- the musical notation for Beethoven's "Ode to Joy"
- the architectural drawings for the Kölner Dom in Cologne, Germany
- The drawing on the folio 860 of the Codex Atlanticus from Leonardo da Vinci, 1486-1490, kept in the Biblioteca Ambrosiana in Milan

In First Order Logic:

E29(x) ⊃ E73(x)

Properties:

P68 foresees use of (use foreseen by): E57 Material
P69 has association with (is associated with): E29 Design or Procedure
(P69.1 has type: E55 Type)

E30 Right

Subclass of: E89 Propositional Object

Scope Note: This class comprises legal privileges concerning material and immaterial things or their derivatives.

These include reproduction and property rights.

Examples:

- copyright held by ISO on ISO/CD 21127
- ownership of the "Mona Lisa" by the Louvre

In First Order Logic:

E30(x) ⊃ E89(x)

E31 Document

Subclass of: E73 Information Object
Superclass of: E32 Authority Document

Scope note: This class comprises identifiable immaterial items that make propositions about reality.

These propositions may be expressed in text, graphics, images, audiograms, videograms or by other similar means. Documentation databases are regarded as a special case of E31 Document. This class should not be confused with the term “document” in Information Technology, which is compatible with E73 Information Object.

Examples:

- the Encyclopaedia Britannica (E32)
- The image content of the photo of the Allied Leaders at Yalta published by UPI, 1945 (E38)
- the Doomsday Book

In First Order Logic:

E31(x) ⊃ E73(x)

Properties:

P70 documents (is documented in): E1 CRM Entity

E32 Authority Document

Subclass of: E31 Document

Scope note: This class comprises encyclopaedia, thesauri, authority lists and other documents that define terminology or conceptual systems for consistent use.

Examples:

- Webster's Dictionary
- Getty Art and Architecture Thesaurus
- the CIDOC Conceptual Reference Model

In First Order Logic:

E32(x) ⊃ E31(x)

Properties:

P71 lists (is listed in): E1 CRM Entity

E33 Linguistic Object

Subclass of: E73 Information Object
Superclass of: E34 Inscription
E35 Title

Scope note: This class comprises identifiable expressions in natural language or languages.

Instances of E33 Linguistic Object can be expressed in many ways: e.g. as written texts, recorded speech or sign language. However, the CRM treats instances of E33 Linguistic Object independently from the medium or method by which they are expressed. Expressions in formal languages, such as computer code or mathematical formulae, are not treated as instances of E33 Linguistic Object by the CRM. These should be modelled as instances of E73 Information Object.
The text of an instance of E33 Linguistic Object can be documented in a note by P3 has note: E62 String

Examples:

- the text of the Ellesmere Chaucer manuscript
- the lyrics of the song "Blue Suede Shoes"
- the text of the Jabberwocky by Lewis Carroll
- the text of "Doktoro Jekyll kaj Sinjoro Hyde" (an Esperanto translation of Dr Jekyll and Mr Hyde)

In First Order Logic:

E33(x) ⊃ E73(x)

Properties:

P72 has language (is language of): E56 Language
P73 has translation (is translation of): E33 Linguistic Object

E34 Inscription

Subclass of: E33 Linguistic Object
E37 Mark

Scope note: This class comprises recognisable, short texts attached to instances of E24 Physical Man-Made Thing.

The transcription of the text can be documented in a note by *P3 has note: E62 String*. The alphabet used can be documented by *P2 has type: E55 Type*. This class does not intend to describe the idiosyncratic characteristics of an individual physical embodiment of an inscription, but the underlying prototype. The physical embodiment is modelled in the CRM as E24 Physical Man-Made Thing.

The relationship of a physical copy of a book to the text it contains is modelled using *E84 Information Carrier. P128 carries (is carried by): E33 Linguistic Object.*

Examples:

- "keep off the grass" on a sign stuck in the lawn of the quad of Balliol College
- The text published in Corpus Inscriptionum Latinarum V 895
- Kilroy was here

In First Order Logic:

E34(x) ⊃ E33(x)
E34(x) ⊃ E37(x)

E35 Title

Subclass of: E33 Linguistic Object
E41 Appellation

Scope note: This class comprises the names assigned to works, such as texts, artworks or pieces 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.

Examples:

- "The Merchant of Venice"
- "Mona Lisa"
- "La Pie or The Magpie"
- "Lucy in the Sky with Diamonds"

In First Order Logic:

E35(x) ⊃ E33(x)
E35(x) ⊃ E41(x)

E36 Visual Item

Subclass of: E73 Information Object
Superclass of: E37 Mark
E38 Image

Scope Note: This class comprises the intellectual or conceptual aspects of recognisable marks and images.

This class does not intend to describe the idiosyncratic characteristics of an individual physical embodiment of a visual item, but the underlying prototype. For example, a mark such as the ICOM logo is generally considered to be the same logo when used on any number of publications. The size, orientation and colour may change, but the logo remains uniquely identifiable. The same is true of

images that are reproduced many times. This means that visual items are independent of their physical support.

The class E36 Visual Item provides a means of identifying and linking together instances of E24 Physical Man-Made Thing that carry the same visual symbols, marks or images etc. The property *P62 depicts (is depicted by)* between E24 Physical Man-Made Thing and depicted subjects (E1 CRM Entity) can be regarded as a short-cut of the more fully developed path from E24 Physical Man-Made Thing through *P65 shows visual item (is shown by)*, E36 Visual Item, *P138 represents (has representation)* to E1CRM Entity, which in addition captures the optical features of the depiction.

Examples:

- the visual appearance of Monet's "La Pie" (E38)
- the Coca-Cola logo (E34)
- the Chi-Rho (E37)
- the communist red star (E37)

In First Order Logic:

E36(x) ⊃ E73(x)

Properties:

P138 represents (has representation): E1 CRM Entity
(P138.1 mode of representation: E55 Type)

E37 Mark

Subclass of: E36 Visual Item
Superclass of: E34 Inscription

Scope note: This class comprises symbols, signs, signatures or short texts applied to instances of E24 Physical Man-Made Thing by arbitrary techniques in order to indicate the creator, owner, dedications, purpose, etc.

This class specifically excludes features that have no semantic significance, such as scratches or tool marks. These should be documented as instances of E25 Man-Made Feature.

Examples:

- Minoan double axe mark
- ©
- ☺

In First Order Logic:

E37(x) ⊃ E36(x)

E38 Image

Subclass of: E36 Visual Item

Scope note: This class comprises distributions of form, tone and colour that may be found on surfaces such as photos, paintings, prints and sculptures or directly on electronic media.

The degree to which variations in the distribution of form and colour affect the identity of an instance of E38 Image depends on a given purpose. The original painting of the Mona Lisa in the Louvre may be said to bear the same instance of E38 Image as reproductions in the form of transparencies, postcards, posters or T-shirts, even though they may differ in size and carrier and may vary in tone and colour. The images in a "spot the difference" competition are not the same with respect to their context, however similar they may at first appear.

Examples:

- the front side of all 20 Swiss Frs notes
- the image depicted on all reproductions of the Mona Lisa

In First Order Logic:
E38(x) ⊃ E36(x)

E39 Actor

Subclass of: E77 Persistent Item
Superclass of: E21 Person
E74 Group

Scope note: This class comprises people, either individually or in groups, who have the potential to perform intentional actions of kinds for which someone may be held responsible.

The CRM does not attempt to model the inadvertent actions of such actors. Individual people should be documented as instances of E21 Person, whereas groups should be documented as instances of either E74 Group or its subclass E40 Legal Body.

Examples:

- London and Continental Railways (E40)
- the Governor of the Bank of England in 1975 (E21)
- Sir Ian McKellan (E21)

In First Order Logic:
E39(x) ⊃ E77(x)

Properties:

P74 has current or former residence (is current or former residence of): E53 Place
P75 possesses (is possessed by): E30 Right
P76 has contact point (provides access to): E51 Contact Point
P131 is identified by (identifies): E82 Actor Appellation

E40 Legal Body

Subcass of: E74 Group

Scope Note: This class comprises institutions or groups of people that have obtained a legal recognition as a group and can act collectively as agents.

This means that they can perform actions, own property, create or destroy things and can be held collectively responsible for their actions like individual people. The term 'personne morale' is often used for this in French.

Examples

- Greenpeace
- Paveprime Ltd
- the National Museum of Denmark

In First Order Logic:
E40(x) ⊃ E74(x)

E41 Appellation

Subclass of: E90 Symbolic Object
Superclass of: E35 Title
E42 Identifier
E49 Time Appellation
E51 Contact Point

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.

Specific subclasses of E41 Appellation should be used when instances of E41 Appellation of a characteristic form are used for particular objects. Instances of E49 Time Appellation, for example, which take the form of instances of E50 Date, can be easily recognised.

Thus, the use of subclasses of E41 is not determined by the characteristics of the object the appellation refers to, e.g., a person or a place, but rather the form of the appellation itself shows it as a special type of appellation, such as an identifier.

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

Examples:

- "Martin"
- "the Forth Bridge"
- "the Merchant of Venice" (E35)
- "*Spigelia marilandica* (L.) L." [not the species, just the *name*]
- "information science" [not the science itself, but the name through which we refer to it in an English-speaking context]
- “安” [Chinese “an”, meaning “peace”]

In First Order Logic:

E41(x) ⊃ E90(x)

Properties:

P139 has alternative form: E41 Appellation
(P139.1 has type: E55 Type)

E42 Identifier

Subclass of: E41 Appellation

Scope note: This class comprises strings or codes assigned to instances of E1 CRM Entity in order to identify them uniquely and permanently within the context of one or more organisations. Such codes are often known as inventory numbers, registration codes, etc. and are typically composed of alphanumeric sequences. The class E42 Identifier is not normally used for machine-generated identifiers used for automated processing unless these are also used by human agents.

Examples:

- “MM.GE.195”
- “13.45.1976”
- “OXCMS: 1997.4.1”
- ISSN “0041-5278”
- ISRC “FIFIN8900116”
- Shelf mark “Res 8 P 10”
- “Guillaume de Machaut (1300?-1377)” [a controlled personal name heading that follows the French rules]

In First Order Logic:

E42(x) ⊃ E41(x)

E44 Place Appellation

Deprecated, use E41 Appellation instead

E45 Address

Subclass of: E44 Place Appellation
E51 Contact Point

Scope Note: This class comprises identifiers expressed in coding systems for places, such as postal addresses used for mailing.

An E45 Address can be considered both as the name of an E53 Place and as an E51 Contact Point for an E39 Actor. This dual aspect is reflected in the multiple inheritance. However, some forms of mailing addresses, such as a postal box, are only instances of E51 Contact Point, since they do not identify any particular Place. These should not be documented as instances of E45 Address.

Examples:

- "1-29-3 Otsuka, Bunkyo-ku, Tokyo, 121, Japan"
- "Rue David Dufour 5, CH-1211, Genève"

In First Order Logic:

E45(x) ⊃ E44(x)
E45(x) ⊃ E51(x)

E46 Section Definition

Deprecated, use E41 Appellation instead

E47 Spatial Coordinates

Subclass of: E44 Place Appellation

Scope Note: This class comprises the textual or numeric information required to locate specific instances of E53 Place within schemes of spatial identification.

Coordinates are a specific form of E44 Place Appellation, that is, a means of referring to a particular E53 Place. Coordinates are not restricted to longitude, latitude and altitude. Any regular system of reference that maps onto an E19 Physical Object can be used to generate coordinates.

Examples:

- "6°5'29"N 45°12'13"W"
- "Black queen's bishop 4" [chess coordinate]

In First Order Logic:

E47(x) ⊃ E44(x)

E48 Place Name

Subclass of: E44 Place Appellation

Scope Note: This class comprises particular and common forms of E44 Place Appellation.

Place Names may change their application over time: the name of an E53 Place may change, and a name may be reused for a different E53 Place. Instances of E48 Place Name are typically subject to place name gazetteers.

Examples:

- "Greece"
- "Athens"
- "Geneva"
- "Lac Léman"

In First Order Logic:

E48(x) ⊃ E44(x)

E49 Time Appellation

Subclass of: E41 Appellation
Superclass of E50 Date

Scope Note: This class comprises all forms of names or codes, such as historical periods, and dates, which are characteristically used to refer to a specific E52 Time-Span.

The instances of E49 Time Appellation may vary in their degree of precision, and they may be relative to other time frames, "Before Christ" for example. Instances of E52 Time-Span are often defined by reference to a cultural period or an event e.g. 'the duration of the Ming Dynasty'.

Examples:

- "Meiji" [Japanese term for a specific time-span]
- "1st half of the XX century"
- "Quaternary"
- "1215 Hegira" [a date in the Islamic calendar]
- "Last century"

In First Order Logic:

E49(x) ⊃ E41(x)

E50 Date

Subclass of: E49 Time Appellation

Scope Note: This class comprises specific forms of E49 Time Appellation.

Dates may vary in their degree of precision.

Examples:

- "1900"
- "4-4-1959"
- "19-MAR-1922"
- "19640604"

In First Order Logic:

E50(x) ⊃ E49(x)

E51 Contact Point

Subcass of: E41 Appellation
Superclass of: E45 Address

Scope Note: This class comprises identifiers employed, or understood, by communication services to direct communications to an instance of E39 Actor. These include E-mail addresses, telephone numbers, post office boxes, Fax numbers, URLs etc. Most postal addresses can be considered both as instances of E44 Place Appellation and E51 Contact Point. In such cases the subclass E45 Address should be used.
URLs are addresses used by machines to access another machine through an http request. Since the accessed machine acts on behalf of the E39 Actor providing the machine, URLs are considered as instances of E51 Contact Point to that E39 Actor.

Examples:

- "+41 22 418 5571"
- weasel@paveprime.com

In First Order Logic:

E51(x) ⊃ E41(x)

E52 Time-Span

Subclass of: E1 CRM Entity

Scope note: This class comprises abstract temporal extents, in the sense of Galilean physics, having a beginning, an end and a duration.

Time Span has no other semantic connotations. Time-Spans are used to define the temporal extent of instances of E4 Period, E5 Event and any other phenomena valid for a certain time. An E52 Time-Span may be identified by one or more instances of E49 Time Appellation.

Since our knowledge of history is imperfect, instances of E52 Time-Span can best be considered as approximations of the actual Time-Spans of temporal entities. The properties of E52 Time-Span are intended to allow these approximations to be expressed precisely. An extreme case of approximation, might, for example, define an E52 Time-Span having unknown beginning, end and duration. Used as a common E52 Time-Span for two events, it would nevertheless define them as being simultaneous, even if nothing else was known.

Automatic processing and querying of instances of E52 Time-Span is facilitated if data can be parsed into an E61 Time Primitive.

Examples:

- 1961
- From 12-17-1993 to 12-8-1996
- 14h30 – 16h22 4th July 1945
- 9.30 am 1.1.1999 to 2.00 pm 1.1.1999
- duration of the Ming Dynasty

In First Order Logic:

E52(x) ⊃ E1(x)

Properties:

P78 is identified by (identifies): E49 Time Appellation
P79 beginning is qualified by: E62 String
P80 end is qualified by: E62 String
P81 ongoing throughout: E61 Time Primitive
P82 at some time within: E61 Time Primitive
P83 had at least duration (was minimum duration of): E54 Dimension
P84 had at most duration (was maximum duration of): E54 Dimension
P86 falls within (contains): E52 Time-Span

E53 Place

Subclass of: E1 CRM Entity

Scope note: This class comprises extents in space, in particular on the surface of the earth, in the pure sense of physics: independent from temporal phenomena and matter.

The instances of E53 Place are usually determined by reference to the position of "immobile" objects such as buildings, cities, mountains, rivers, or dedicated geodetic marks. A Place can be determined by combining a frame of reference and a location with respect to this frame. It may be identified by one or more instances of E44 Place Appellation.

It is sometimes argued that instances of E53 Place are best identified by global coordinates or absolute reference systems. However, relative references are often more relevant in the context of cultural documentation and tend to be more precise. In particular, we are often interested in position in relation to large, mobile objects, such as ships. For example, the Place at which Nelson died is known with reference to a large mobile object – H.M.S Victory. A resolution of this Place in terms of absolute coordinates would require knowledge of the movements of the vessel and the precise time of death, either of which may be revised, and the result would lack historical and cultural relevance.

Any object can serve as a frame of reference for E53 Place determination. The model foresees the notion of a "section" of an E19 Physical Object as a valid E53 Place determination.

Examples:

- the extent of the UK in the year 2003

- the position of the hallmark on the inside of my wedding ring
- the place referred to in the phrase: “Fish collected at three miles north of the confluence of the Arve and the Rhone”
- here -> <-

In First Order Logic:

E53(x) ⊃ E1(x)

Properties:

P87 is identified by (identifies): E44 Place Appellation
P89 falls within (contains): E53 Place
P121 overlaps with: E53 Place
P122 borders with: E53 Place
P157 is at rest relative to (provides reference space for): E18 Physical Thing
P168 place is defined by (defines place) : E94 Space Primitive
P171 at some place within : E53 Place
P172 contains : E53 Place

E54 Dimension

Subclass of: E1 CRM Entity

Scope note: This class comprises quantifiable properties that can be measured by some calibrated means and can be approximated by values, i.e. points or regions in a mathematical or conceptual space, such as natural or real numbers, RGB values etc.

An instance of E54 Dimension represents the true quantity, independent from its numerical approximation, e.g. in inches or in cm. The properties of the class E54 Dimension allow for expressing the numerical approximation of the values of an instance of E54 Dimension. If the true values belong to a non-discrete space, such as spatial distances, it is recommended to record them as approximations by intervals or regions of indeterminacy enclosing the assumed true values. For instance, a length of 5 cm may be recorded as 4.5-5.5 cm, according to the precision of the respective observation. Note, that interoperability of values described in different units depends critically on the representation as value regions.

Numerical approximations in archaic instances of E58 Measurement Unit used in historical records should be preserved. Equivalents corresponding to current knowledge should be recorded as additional instances of E54 Dimension as appropriate.

Examples:

- The 250 metric ton weight of the Luxor Obelisk
-
- The 5.17 m height of the statue of David by Michaelangelo
-
- The 530.2 carats of the Great Star of Africa diamond
-
- The AD1262-1312, 1303-1384 calibrated C14 date for the Shroud of Turin
-
- The 33 m diameter of the Stonehenge Sarcen Circle
-
- The 755.9 foot length of the sides of the Great Pyramid at Giza
- Christies’ hammer price for “Vase with Fifteen Sunflowers” (E97) has currency British Pounds (E98)

In First Order Logic:

E54(x) ⊃ E1(x)

Properties:

P90 has value: E60 Number

P91 has unit (is unit of): E58 Measurement Unit

E55 Type

Subclass of: E28 Conceptual Object
Superclass of: E56 Language
E57 Material
E58 Measurement Unit

Scope note: This class comprises concepts denoted by terms from thesauri and controlled vocabularies used to characterize and classify instances of CRM classes. Instances of E55 Type represent concepts in contrast to instances of E41 Appellation which are used to name instances of CRM classes.

E55 Type is the CRM's interface to domain specific ontologies and thesauri. These can be represented in the CRM as subclasses of E55 Type, forming hierarchies of terms, i.e. instances of E55 Type linked via P127 has broader term (has narrower term). Such hierarchies may be extended with additional properties.

Examples:

- weight, length, depth [types of E54]
- portrait, sketch, animation [types of E38]
- French, English, German [E56]
- excellent, good, poor [types of E3]
- Ford Model T, chop stick [types of E22]
- cave, doline, scratch [types of E26]
- poem, short story [types of E33]
- wedding, earthquake, skirmish [types of E5]

In First Order Logic:
E55(x) ⊃ E28(x)

Properties:
P127 has broader term (has narrower term): E55 Type
P150 defines typical parts of(define typical wholes for): E55 Type

E56 Language

Subclass of: E55 Type

Scope note: This class is a specialization of E55 Type and comprises the natural languages in the sense of concepts.

This type is used categorically in the model without reference to instances of it, i.e. the Model does not foresee the description of instances of instances of E56 Language, e.g.: "instances of Mandarin Chinese".

It is recommended that internationally or nationally agreed codes and terminology are used to denote instances of E56 Language, such as those defined in ISO 639:1988.

Examples:

- el [Greek]
- en [English]
- eo [Esperanto]
- es [Spanish]
- fr [French]

In First Order Logic:
E56(x) ⊃ E55(x)

E57 Material

Subclass of: E55 Type

Scope note: This class is a specialization of E55 Type and comprises the concepts of materials.

Instances of E57 Material may denote properties of matter before its use, during its use, and as incorporated in an object, such as ultramarine powder, tempera paste, reinforced concrete. Discrete pieces of raw-materials kept in museums, such as bricks, sheets of fabric, pieces of metal, should be modelled individually in the same way as other objects. Discrete used or processed pieces, such as the stones from Nefer Titi's temple, should be modelled as parts (cf. *P46 is composed of*).

This type is used categorically in the model without reference to instances of it, i.e. the Model does not foresee the description of instances of instances of E57 Material, e.g.: "instances of gold".

It is recommended that internationally or nationally agreed codes and terminology are used.

Examples:

- brick
- gold
- aluminium
- polycarbonate
- resin

In First Order Logic:

E57(x) ⊃ E55(x)

E58 Measurement Unit

Subclass of: E55 Type

Scope Note: This class is a specialization of E55 Type and comprises the types of measurement units: feet, inches, centimetres, litres, lumens, etc.

This type is used categorically in the model without reference to instances of it, i.e. the Model does not foresee the description of instances of instances of E58 Measurement Unit, e.g.: "instances of cm".

Système International (SI) units or internationally recognized non-SI terms should be used whenever possible. (ISO 1000:1992). Archaic Measurement Units used in historical records should be preserved.

Examples:

- cm [centimetre]
- km [kilometre]
- m [meter]
- m/s [meters per second]
- A [Ampere]
- GRD [Greek Drachme]
- °C [degrees centigrade]

In First Order Logic:

E58(x) ⊃ E55(x)

E59 Primitive Value

Superclass of: E60 Number
E61 Time Primitive
E62 String

Scope Note: This class comprises values of primitive data types of programming languages or database management systems and data types composed of such values used as documentation elements, as well as their mathematical abstractions.
They are not considered as elements of the universe of discourse this model aims at defining and analysing. Rather, they play the role of a symbolic interface between the scope of this model and the world of mathematical and computational manipulations and the symbolic objects they define and handle.
In particular they comprise lexical forms encoded as "strings" or series of characters and symbols based on encoding schemes (characterised by being a limited subset of the respective mathematical

abstractions) such as UNICODE and values of datatypes that can be encoded in a lexical form, including quantitative specifications of time-spans and geometry. They have in common that instances of E59 Primitive Value define themselves by virtue of their encoded value, regardless the nature of their mathematical abstractions.
Therefore they must not be represented in an implementation by a universal identifier associated with a content model of different identity. In a concrete application, it is recommended that the primitive value system from a chosen implementation platform and/or data definition language be used to substitute for this class and its subclasses.

Examples:

- ABCDEFG (E62)
- 3.14 (E60)
- 0
- 1921-01-01 (E61)

In First Order Logic:

E59(x)

E60 Number

Subclass of: E59 Primitive Value

Scope Note: This class comprises any encoding of computable (algebraic) values such as integers, real numbers, complex numbers, vectors, tensors etc., including intervals of these values to express limited precision.

Numbers are fundamentally distinct from identifiers in continua, such as instances of E50 Date and E47 Spatial Coordinate, even though their encoding may be similar. Instances of E60 Number can be combined with each other in algebraic operations to yield other instances of E60 Number, e.g., 1+1=2. Identifiers in continua may be combined with numbers expressing distances to yield new identifiers, e.g., 1924-01-31 + 2 days = 1924-02-02. Cf. E54 Dimension

Examples:

- 5
- 3+2i
- 1.5e-04
- (0.5, - 0.7,88)

In First Order Logic:

E60(x) ⊃ E59(x)

E61 Time Primitive

Subclass of: E59 Primitive Value

Scope Note: This class comprises instances of E59 Primitive Value for time that should be implemented with appropriate validation, precision and references to temporal coordinate systems to express time in some context relevant to cultural and scientific documentation.
Instantiating different instances of E61 Time Primitive relative to the same instance of E52 Time Span allows for the expression of multiple opinions/approximations of the same phenomenon. When representing different opinions/approximations of the E52 Time Span of some E2 Temporal Event, multiple instances of E61 Time Primitive should be instantiated relative to one E52 Time Span. Only one E52 Time Span should be instantiated since there is only one real phenomenal time extent of any given event.

The instances of E61 Time Primitive are not considered as elements of the universe of discourse that the CRM aims at defining and analysing. Rather, they play the role of a symbolic interface between the scope of this model and the world of mathematical and computational manipulations and the symbolic objects they define and handle.

Therefore they must not be represented in an implementation by a universal identifier associated with a content model of different identity. In a concrete application, it is recommended that the primitive

value system from a chosen implementation platform and/or data definition language be used to substitute for this class and its subclasses.

Examples:

- 1994 – 1997
- 13 May 1768
- 2000/01/01 00:00:59.7
- 85th century BC

In First Order Logic:

E61(x) ⊃ E59(x)

E62 String

Subclass of: E59 Primitive Value

Scope Note: This class comprises the instances of E59 Primitive Values used for documentation such as free text strings, bitmaps, vector graphics, etc.

E62 String is not further elaborated upon within the model

Examples:

- the Quick Brown Fox Jumps Over the Lazy Dog
- 6F 6E 54 79 70 31 0D 9E

In First Order Logic:

E62(x) ⊃ E59(x)

E63 Beginning of Existence

Subclass of: E5 Event
Superclass of: E12 Production
E65 Creation
E66 Formation
E67 Birth
E81 Transformation

Scope note: This class comprises events that bring into existence any E77 Persistent Item.

It may be used for temporal reasoning about things (intellectual products, physical items, groups of people, living beings) beginning to exist; it serves as a hook for determination of a terminus post quem and ante quem.

Examples:

- the birth of my child
- the birth of Snoopy, my dog
- the calving of the iceberg that sank the Titanic
- the construction of the Eiffel Tower

In First Order Logic:

E63(x) ⊃ E5(x)

Properties:

P92 brought into existence (was brought into existence by): E77 Persistent Item

E64 End of Existence

Subclass of: E5 Event
Superclass of: E6 Destruction
E68 Dissolution
E69 Death
E81 Transformation

Scope note: This class comprises events that end the existence of any E77 Persistent Item.

It may be used for temporal reasoning about things (physical items, groups of people, living beings) ceasing to exist; it serves as a hook for determination of a terminus postquem and antequem. In cases where substance from a Persistent Item continues to exist in a new form, the process would be documented by E81 Transformation.

Examples:

- the death of Snoopy, my dog
- the melting of the snowman
- the burning of the Temple of Artemis in Ephesos by Herostratos in 356BC

In First Order Logic:

E64(x) ⊃ E5(x)

Properties:

P93 took out of existence (was taken out of existence by): E77 Persistent Item

E65 Creation

Subclass of: E7 Activity
E63 Beginning of Existence
Superclass of: E83 Type Creation

Scope note: This class comprises events that result in the creation of conceptual items or immaterial products, such as legends, poems, texts, music, images, movies, laws, types etc.

Examples:

- the framing of the U.S. Constitution
- the drafting of U.N. resolution 1441

In First Order Logic:

E65(x) ⊃ E7(x)
E65(x) ⊃ E63(x)

Properties:

P94 has created (was created by): E28 Conceptual Object

E66 Formation

Subclass of: E7 Activity
E63 Beginning of Existence

Scope note: This class comprises events that result in the formation of a formal or informal E74 Group of people, such as a club, society, association, corporation or nation.

E66 Formation does not include the arbitrary aggregation of people who do not act as a collective.
The formation of an instance of E74 Group does not require that the group is populated with members at the time of formation. In order to express the joining of members at the time of formation, the respective activity should be simultaneously an instance of both E66 Formation and E85 Joining.

Examples:

- the formation of the CIDOC CRM Special Interest Group
- the formation of the Soviet Union
- the conspiring of the murderers of Caesar

In First Order Logic:

E66(x) ⊃ E7(x)
E66(x) ⊃ E63(x)

Properties:

P95 has formed (was formed by): E74 Group

P151 was formed from: E74 Group

E67 Birth

Subclass of: E63 Beginning of Existence

Scope note: This class comprises the births of human beings. E67 Birth is a biological event focussing on the context of people coming into life. (E63 Beginning of Existence comprises the coming into life of any living beings).

Twins, triplets etc. are brought into life by the same E67 Birth event. The introduction of the E67 Birth event as a documentation element allows the description of a range of family relationships in a simple model. Suitable extensions may describe more details and the complexity of motherhood with the intervention of modern medicine. In this model, the biological father is not seen as a necessary participant in the E67 Birth event.

Examples:

- the birth of Alexander the Great

In First Order Logic:

E67(x) ⊃ E63(x)

Properties:

P96 by mother (gave birth): E21 Person
P97 from father (was father for): E21 Person
P98 brought into life (was born): E21 Person

E68 Dissolution

Subclass of: E64 End of Existence

Scope note: This class comprises the events that result in the formal or informal termination of an E74 Group of people.

If the dissolution was deliberate, the Dissolution event should also be instantiated as an E7 Activity.

Examples:

- the fall of the Roman Empire
- the liquidation of Enron Corporation

In First Order Logic:

E68(x) ⊃ E64(x)

Properties:

P99 dissolved (was dissolved by): E74 Group

E69 Death

Subclass of: E64 End of Existence

Scope note: This class comprises the deaths of human beings.
If a person is *killed*, their death should be instantiated as E69 Death and as E7 Activity. The death or perishing of other living beings should be documented using E64 End of Existence.

Examples:

- the murder of Julius Caesar (E69,E7)
- the death of Senator Paul Wellstone

In First Order Logic:

E69(x) ⊃ E64(x)

Properties:

P100 was death of (died in): E21 Person

E70 Thing

Subclass of: E77 Persistent Item
Superclass of: E71 Man-Made Thing
E72 Legal Object

Scope note: This general class comprises discrete, identifiable, instances of E77 Persistent Item that are documented as single units, that either consist of matter or depend on being carried by matter and are characterized by relative stability.

They may be intellectual products or physical things. They may for instance have a solid physical form, an electronic encoding, or they may be a logical concept or structure.

Examples:

- my photograph collection (E78)
- the bottle of milk in my refrigerator (E22)
- the plan of the Strassburger Muenster (E29)
- the thing on the top of Otto Hahn's desk (E19)
- the form of the no-smoking sign (E36)
- the cave of Dirou, Mani, Greece (E27)

In First Order Logic:

E70(x) ⊃ E77(x)

Properties

P43 has dimension (is dimension of): E54 Dimension
P101 had as general use (was use of): E55 Type
P130 shows features of (features are also found on): E70 Thing
(P130.1 kind of similarity: E55 Type)

E71 Man-Made Thing

Subclass of: E70 Thing
Superclass of: E24 Physical Man-Made Thing
E28 Conceptual Object

Scope note: This class comprises discrete, identifiable man-made items that are documented as single units.

These items are either intellectual products or man-made physical things, and are characterized by relative stability. They may for instance have a solid physical form, an electronic encoding, or they may be logical concepts or structures.

Examples:

- Beethoven's 5th Symphony (E73)
- Michelangelo's David
- Einstein's Theory of General Relativity (E73)
- the taxon *'Fringilla coelebs* Linnaeus,1758' (E55)

In First Order Logic:

E71(x) ⊃ E70(x)

Properties

P102 has title (is title of): E35 Title
(P102.1 has type: E55 Type)
P103 was intended for (was intention of): E55 Type

E72 Legal Object

Subclass of: E70 Thing
Superclass of: E18 Physical Thing
E90 Symbolic Object

Scope note: This class comprises those material or immaterial items to which instances of E30 Right, such as the right of ownership or use, can be applied.

This is true for all E18 Physical Thing. In the case of instances of E28 Conceptual Object, however, the identity of the E28 Conceptual Object or the method of its use may be too ambiguous to reliably establish instances of E30 Right, as in the case of taxa and inspirations. Ownership of corporations is currently regarded as out of scope of the CRM.

Examples:

- the Cullinan diamond (E19)
- definition of the CIDOC Conceptual Reference Model Version 2.1 (E73)

In First Order Logic:

E72(x) ⊃ E70(x)

Properties:

P104 is subject to (applies to): E30 Right
P105 right held by (has right on): E39 Actor

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

Scope note: This class comprises identifiable immaterial items, such as a 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. The encoding structure known as a "named graph" also falls under this class, so that each "named graph" is an instance of an E73 Information Object.
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
- The Getty AAT as published as Linked Open Data, accessed 1/10/2014

In First Order Logic:

E73(x) ⊃ E89(x)
E73(x) ⊃ E90(x)

Properties:

E74 Group

Subclass of: E39 Actor
Superclass of: E40 Legal Body

Scope note: This class comprises any gatherings or organizations of E39 Actors that act collectively or in a similar way due to any form of unifying relationship. In the wider sense this class also comprises official positions which used to be regarded in certain contexts as one actor, independent of the current holder of the office, such as the president of a country. In such cases, it may happen that the Group never had more than one member. A joint pseudonym (i.e., a name that seems indicative of an individual but that is actually used as a persona by two or more people) is a particular case of E74 Group..

A gathering of people becomes an E74 Group when it exhibits organizational characteristics usually typified by a set of ideas or beliefs held in common, or actions performed together. These might be communication, creating some common artifact, a common purpose such as study, worship, business, sports, etc. Nationality can be modelled as membership in an E74 Group (cf. HumanML markup). Married couples and other concepts of family are regarded as particular examples of E74 Group.

Examples:

- the impressionists
- the Navajo
- the Greeks
- the peace protestors in New York City on February 15 2003
- Exxon-Mobil
- King Solomon and his wives
- The President of the Swiss Confederation
- Nicolas Bourbaki
- Betty Crocker
- Ellery Queen

In First Order Logic:

E74(x) ⊃ E39(x)

Properties:

P107 has current or former member (is current or former member of): E39 Actor
(P107.1 *kind of member*: E55 Type)

E75 Conceptual Object Appellation

Deprecated use E41 Appellation instead

E77 Persistent Item

Subclass of: E1 CRM Entity
Superclass of: E39 Actor
E70 Thing

Scope note: This class comprises items that have a persistent identity, sometimes known as "endurants" in philosophy.

They can be repeatedly recognized within the duration of their existence by identity criteria rather than by continuity or observation. Persistent Items can be either physical entities, such as people, animals or things, or conceptual entities such as ideas, concepts, products of the imagination or common names.

The criteria that determine the identity of an item are often difficult to establish -; the decision depends largely on the judgement of the observer. For example, a building is regarded as no longer existing if it is dismantled and the materials reused in a different configuration. On the other hand, human beings go through radical and profound changes during their life-span, affecting both material composition and form, yet preserve their identity by other criteria. Similarly, inanimate objects may be subject to exchange of parts and matter. The class E77 Persistent Item does not take any position about the nature of the applicable identity criteria and if actual knowledge about identity of an instance of this class exists. There may be cases, where the identity of an E77 Persistent Item is not decidable by a certain state of knowledge.
The main classes of objects that fall outside the scope the E77 Persistent Item class are temporal objects such as periods, events and acts, and descriptive properties.

Examples:

- Leonard da Vinci
- Stonehenge
- the hole in the ozone layer
- the First Law of Thermodynamics
- the Bermuda Triangle

In First Order Logic:

E77(x) ⊃ E1(x)

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

In First Order Logic:

E78(x) ⊃ E24(x)

Properties:

P109 has current or former curator (is current or former curator of): E39 Actor

E79 Part Addition

Subclass of: E11 Modification

Scope note: This class comprises activities that result in an instance of E24 Physical Man-Made Thing being increased, enlarged or augmented by the addition of a part.

Typical scenarios include the attachment of an accessory, the integration of a component, the addition of an element to an aggregate object, or the accessioning of an object into a curated E78 Collection. Objects to which parts are added are, by definition, man-made, since the addition of a part implies a human activity. Following the addition of parts, the resulting man-made assemblages are treated objectively as single identifiable wholes, made up of constituent or component parts bound together either physically (for example the engine becoming a part of the car), or by sharing a common purpose (such as the 32 chess pieces that make up a chess set). This class of activities forms a basis for reasoning about the history and continuity of identity of objects that are integrated into other objects over time, such as precious gemstones being repeatedly incorporated into different items of jewellery, or cultural artifacts being added to different museum instances of E78 Collection over their lifespan.

Examples:

- the setting of the koh-i-noor diamond into the crown of Queen Elizabeth the Queen Mother
- the addition of the painting "Room in Brooklyn" by Edward Hopper to the collection of the Museum of Fine Arts, Boston

In First Order Logic:

E79(x) ⊃ E11(x)

Properties:

P110 augmented (was augmented by): E24 Physical Man-Made Thing
P111 added (was added by): E18 Physical Thing

E80 Part Removal

Subclass of: E11 Modification

Scope note: This class comprises the activities that result in an instance of E18 Physical Thing being decreased by the removal of a part.

Typical scenarios include the detachment of an accessory, the removal of a component or part of a composite object, or the deaccessioning of an object from a curated E78 Collection. If the E80 Part Removal results in the total decomposition of the original object into pieces, such that the whole ceases to exist, the activity should instead be modelled as an E81 Transformation, i.e. a simultaneous destruction and production. In cases where the part removed has no discernible identity prior to its removal but does have an identity subsequent to its removal, the activity should be regarded as both E80 Part Removal and E12 Production. This class of activities forms a basis for reasoning about the history, and continuity of identity over time, of objects that are removed from other objects, such as precious gemstones being extracted from different items of jewelry, or cultural artifacts being deaccessioned from different museum collections over their lifespan.

Examples:

- the removal of the engine from my car
- the disposal of object number 1976:234 from the collection

In First Order Logic:

E80(x) ⊃ E11(x)

Properties:

P112 diminished (was diminished by): E24 Physical Man-Made Thing
P113 removed (was removed by): E18 Physical Thing

E81 Transformation

Subclass of: E63 Beginning of Existence
E64 End of Existence

Scope note: This class comprises the events that result in the simultaneous destruction of one or more than one E77 Persistent Item and the creation of one or more than one E77 Persistent Item that preserves recognizable substance from the first one(s) but has fundamentally different nature ~~and~~ or identity.

Although the old and the new instances of E77 Persistent Item are treated as discrete entities having separate, unique identities, they are causally connected through the E81 Transformation; the destruction of the old E77 Persistent Item(s) directly causes the creation of the new one(s) using or preserving some relevant substance. Instances of E81 Transformation are therefore distinct from re-classifications (documented using E17 Type Assignment) or modifications (documented using E11 Modification) of objects that do not fundamentally change their nature or identity. Characteristic cases are reconstructions and repurposing of historical buildings or ruins, fires leaving buildings in ruins, taxidermy of specimen in natural history and the reorganization of a corporate body into a new one.

Examples:

- the death and mummification of Tut-Ankh-Amun (transformation of Tut-Ankh-Amun from a living person to a mummy) (E69,E81,E7)

In First Order Logic:

E81(x) ⊃ E63(x)
E81(x) ⊃ E64(x)

Properties:

P123 resulted in (resulted from): E77 Persistent Item
P124 transformed (was transformed by): E77 Persistent Item

E82 Actor Appellation

Deprecated use E41 Appellation instead

E83 Type Creation

Subclass of: E65 Creation

Scope note: This class comprises activities formally defining new types of items.

It is typically a rigorous scholarly or scientific process that ensures a type is exhaustively described and appropriately named. In some cases, particularly in archaeology and the life sciences, E83 Type Creation requires the identification of an exemplary specimen and the publication of the type definition in an appropriate scholarly forum. The activity of E83 Type Creation is central to research in the life sciences, where a type would be referred to as a "taxon," the type description as a "protologue," and the exemplary specimens as "orgininal element" or "holotype".

Examples:

- creation of the taxon '*Penicillium brefeldianum* B. O. Dodge' (1933)
- addition of class E84 Information Carrier to the CIDOC CRM

In First Order Logic:

E83(x) ⊃ E65(x)

Properties:

P135 created type (was created by): E55 Type
P136 was based on (supported type creation): E1 CRM Entity
(P136.1 in the taxonomic role: E55 Type)

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) ⊃ E22(x)

E85 Joining

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in an instance of E39 Actor becoming a member of an instance of E74 Group. This class does not imply initiative by either party. It may be the initiative of a third party.

Typical scenarios include becoming a member of a social organisation, becoming employee of a company, marriage, the adoption of a child by a family and the inauguration of somebody into an official position.

Examples:

- The election of Sir Isaac Newton as Member of Parliament for the University of Cambridge to the

Convention Parliament of 1689
- The inauguration of Mikhail Sergeyevich Gorbachev as leader of the Union of Soviet Socialist Republics (USSR) in 1985
- The implementation of the membership treaty between EU and Denmark January 1. 1993

In First Order Logic:
E85(x) ⊃ E7(x)

Properties:
P143 joined (was joined by): E39 Actor
P144 joined with (gained member by) E74 Group
(P144.1 *kind of member*: E55 Type)

E86 Leaving

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in an instance of E39 Actor to be disassociated from an instance of E74 Group. This class does not imply initiative by either party. It may be the initiative of a third party.

Typical scenarios include the termination of membership in a social organisation, ending the employment at a company, divorce, and the end of tenure of somebody in an official position.

Examples:
- The end of Sir Isaac Newton's duty as Member of Parliament for the University of Cambridge to the Convention Parliament in 1702
- George Washington's leaving office in 1797
- The implementation of the treaty regulating the termination of Greenland's membership in EU between EU, Denmark and Greenland February 1. 1985

In First Order Logic:
E86(x) ⊃ E7(x)

Properties:
P145 separated (left by) E39 Actor
P146 separated from (lost member by) E74 Group

E87 Curation Activity

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in the continuity of management and the preservation and evolution of instances of E78 Collection, following an implicit or explicit curation plan.

It specializes the notion of activity into the curation of a collection and allows the history of curation to be recorded.

Items are accumulated and organized following criteria like subject, chronological period, material type, style of art etc. and can be added or removed from an E78 Collection for a specific purpose and/or audience. The initial aggregation of items of a collection is regarded as an instance of E12 Production Event while the activity of evolving, preserving and promoting a collection is regarded as an instance of E*87 Curation Activity*.

Examples:
- The curation of Mikael Heggelund Foslie's coralline red algae Herbarium 1876 – 1909 (when Foslie died), now at Museum of Natural History and Archaeology, Norway

In First Order Logic:
E87(x) ⊃ E7(x)

Properties:
P147 curated (was curated by): E78 Collection

E89 Propositional Object

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.

Examples:

- Maxwell's Equations
- The ideational contents of Aristotle's book entitled 'Metaphysics' as rendered in the Greek texts translated in … Oxford edition…
- The underlying prototype of any "no-smoking" sign (E36)
- The common ideas of the plots of the movie "The Seven Samurai" by Akira Kurosawa and the movie "The Magnificent Seven" by John Sturges
- The image content of the photo of the Allied Leaders at Yalta published by UPI, 1945 (E38)
- The character "Little Red Riding Hood" variants of which appear amongst others in Grimm brothers' 'Rotkäppchen', other oral fairy tales and the film 'Hoodwinked'
- The place "Havnor" as invented by Ursula K. Le Guin for her 'Earthsea' book series, the related maps and appearing in derivative works based on these novels

In First Order Logic:

E89(x) ⊃ E28(x)

Properties:

P148 has component (is component of): E89 Propositional Object
P67 refers to (is referred to by): E1 CRM Entity
(P67.1 has type: E55 Type)
P129 is about (is subject of): E1 CRM Entity

E90 Symbolic Object

Subclass of: E28 Conceptual Object
E72 Legal Object
Superclass of: E73 Information Object
E41 Appellation

Scope note:

This class comprises identifiable symbols and any aggregation of symbols, such as characters, identifiers, traffic signs, emblems, texts, data sets, images, musical scores, multimedia objects, computer program code or mathematical formulae that have an objectively recognizable structure and that are documented as single units.

It includes sets of signs of any nature, which may serve to designate something, or to communicate some propositional content.

An instance of E90 Symbolic Object does not depend on a specific physical carrier, which can include human memory, and it can exist on one or more carriers simultaneously. An instance of E90 Symbolic Object may or may not have a specific meaning, for example an arbitrary character string.

In some cases, the content of an instance of E90 Symbolic Object may completely be represented by a serialized digital content model, such as a sequence of ASCII-encoded characters, an XML or HTML document, or a TIFF image. The property *P3 has note* allows for the description of this content model. In order to disambiguate which symbolic level is the carrier of the meaning, the property *P3.1 has type* can be used to specify the encoding (e.g. "bit", "Latin character", RGB pixel).

Examples:

- 'ecognizabl'
- The "no-smoking" sign (E36)
- "BM000038850.JPG" (E75)
- image BM000038850.JPG from the Clayton Herbarium in London (E38)
- The distribution of form, tone and colour found on Leonardo da Vinci's painting named "Mona Lisa" in daylight (E38)
- The Italian text of Dante's "Divina Commedia" 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) (E33)

In First Order Logic:

E90(x) ⊃ E28(x)
E90(x) ⊃ E72(x)

Properties:

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

E92 Spacetime Volume

Subclass of: E1 CRM Entity
Superclass of: E4 Period
E18 Physical Thing
E93 Presence

Scope note: This class comprises 4 dimensional point sets (volumes) in physical spacetime regardless its true geometric form. They may derive their identity from being the extent of a material phenomenon or from being the interpretation of an expression defining an extent in spacetime. Intersections of instances of E92 Spacetime Volume, Place and Timespan are also regarded as instances of E92 Spacetime Volume. An instance of E92 Spacetime Volume is either contiguous or composed of a finite number of contiguous subsets. Its boundaries may be fuzzy due to the properties of the phenomena it derives from or due to the limited precision up to which defining expression can be identified with a real extent in spacetime. The duration of existence of an instance of a spacetime volume is trivially its projection on time.

Examples:

- the spacetime Volume of the Event of Caesar's murder
- the spacetime Volume where and when the carbon 14 dating of the "Schoeninger Speer II" in 1996 took place
- the spatio-temporal trajectory of the H.M.S. Victory from its building to its actual location
- the spacetime volume defined by a polygon approximating the Danube river flood in Austria between 6th and 9th of August 2002

In First Order Logic:

E92(x) ⊃ E1(x)

Properties:

P10 falls within (contains): E92 Spacetime Volume
P132 spatiotemporally overlaps with: E92 Spacetime Volume
P133 spatiotemporally separated from: E92 Spacetime Volume
P160 has temporal projection: E52 Time-Span
P161 has spatial projection: E53 Place

E93 Presence

Subclass of: E92 Spacetime Volume

Scope note: This class comprises instances of E92 Spacetime Volume, whose arbitrary temporal extent has been chosen in order to determine the spatial extent of a phenomenon over the chosen time-span. Respective phenomena may, for instance, be historical events or periods, but can also be physical things seen in their diachronic existence and extent. In other words, instances of this class fix a slice of a Spacetime Volume in time.

The temporal extent typically is predetermined by the researcher so as to focus the investigation particularly on finding the spatial extent of the phenomenon by testing for its characteristic features. There are at least two basic directions such investigations might take. The investigation may wish to determine where something was during some time or it may wish to reconstruct the total passage of a phenomenon's Spacetime Volume through an examination of discrete presences. Observation and measurement of features indicating the presence or absence of a phenomenon in some space allows for the progressive approximation of spatial extents through argumentation typically based on inclusion, exclusion and various overlaps.

In First Order Logic:

E93(x) ⊃ E92(x)

Properties:

P164 during (was time-span of): E52 Time Span
P166 was a presence of (had presence): E92 Space Time Volume
P167 at (was place of): E53 Place

E94 Space Primitive

Subclass of: E59 Primitive Value

Scope Note: This class comprises instances of E59 Primitive Value for space that should be implemented with appropriate validation, precision and references to spatial coordinate systems to express geometries on or relative to earth, or any other stable constellations of matter, relevant to cultural and scientific documentation.
An E94 Space Primitive defines an E53 Place in the sense of a declarative place as elaborated in CRMgeo (Doerr and Hiebel 2013), which means that the identity of the place is derived from its geometric definition. This declarative place allows for the application of all place properties to relate phenomenal places to their approximations expressed with geometries.
Definitions of instances of E53 Place using different spatial reference systems always result in definitions of different instances of E53 place approximating each other.

Instances of E94 Space Primitive provide the ability to link CRM encoded data to the kinds of geometries used in maps or Geoinformation systems. They may be used for visualisation of the instances of E53 Place they define, in their geographic context and for computing topological relations between places based on these geometries.
Note that it is possible for a place to be defined by phenomena causal to it or other forms of identification rather than by an instance of E94 Space Primitive. In this case, this property must not be used for approximating the respective instance of E53 Place with an instance of E94 Space Primitive.
E94 Space Primitive is not further elaborated upon within this model. Compatibility with OGC standards are recommended.

Examples:

- Coordinate Information in GML like <gml:Point gml:id="p21" srsName="http://www.opengis.net/def/crs/EPSG/0/4326"> <gml:coordinates>45.67, 88.56</gml:coordinates> </gml:Point>
- Coordinate Information in lat, long 48,2 13,3
- Well Known Text like `POLYGON ((30 10, 40 40, 20 40, 10 20, 30 10))`

In First Order Logic:

E94(x) ⊃ E59(x)

Properties:

E95 Spacetime Primitive

Subclass of: E59 Primitive Value

Scope Note: This class comprises instances of E59 Primitive Value for spacetime volumes that should be implemented with appropriate validation, precision, interval logic and reference systems to express date ranges and geometries relevant to cultural documentation. A Spacetime Primitive may consist of one expression including temporal and spatial information like in GML or a different form of expressing spacetime in an integrated way like a formula containing all 4 dimensions.
An E95 Spacetime Primitive defines an E92 Spacetime Volume in the sense of a declarative spacetime volume as defined in CRMgeo (Doerr & Hiebel 2013), which means that the identity of the spacetime volume is derived from its geometric and temporal definition. This declarative spacetime volume allows for the application of all E92 Spacetime Volume properties to relate phenomenal spacetime volumes of periods and physical things to propositions about their spatial and temporal extents.
Definitions of spacetime volumes using different spacetime reference systems always result in definitions of different spacetime volumes approximating each other.

Note that it is possible for a spacetime volume to be defined by phenomena causal to it or other forms of identification rather than by an instance of E95 Spacetime Primitive. In this case, this property must not be used for approximating the respective instance of E92 Spacetime volume with an instance of E95 Spacetime Primitive.
E95 Spacetime Primitive is not further elaborated upon within this model. Compatibility with OGC standards are recommended.

Examples:

- Spatial and temporal information in KML for the maximum extent of the Byzantine Empire

```
<Placemark>
    <name> Byzantine Empire </name>
    <styleUrl>#style_1</styleUrl>
    <TimeSpan>
        <begin>330</begin>
        <end>1453</end>
    </TimeSpan>
<Polygon><altitudeMode>clampToGround</altitudeMode><outerBoundaryIs><LinearRing>
<coordinates>18.452787460,40.85553626,0 17.2223187,40.589098,.....0 17.2223,39.783
</coordinates>
</Polygon>
</Placemark>
```

Properties:

P169 defines spacetime volume (spacetime volume is defined by): E92 Spacetime Volume

E96 Purchase

Subclass of: E8 Acquisition

Superclass of:

Scope note: This class comprises transfers of legal ownership from one or more instances of E39 Actor to one or more different instances of E39 Actor, where the transferring party is completely compensated by

the payment of a monetary amount. In more detail, a purchase agreement establishes a fixed monetary obligation at its initialization on the receiving party, to the giving party. An instance of E96 Purchase begins with the contract or equivalent agreement and ends with the fulfilment of all contractual obligations. In the case that the activity is abandoned before both parties have fulfilled these obligations, the activity is not regarded as an instance of E96 Purchase.

This class is a very specific case of the much more complex social business practices of exchange of goods and the creation and satisfaction of related social obligations. Purchase activities which define individual sales prices per object can be modelled by instantiating E96 Purchase for each object individually and as part of an overall E96 Purchase transaction

Properties:

P179 had sales price (was sales price of)): E97 Monetary Amount

E97 Monetary Amount

Subclass of: E54 Dimension

Scope note: This class comprises quantities of monetary possessions or obligations in terms of their nominal value with respect to a particular currency. These quantities may be abstract accounting units, the nominal value of a heap of coins or bank notes at the time of validity of the respective currency, the nominal value of a bill of exchange or other documents expressing monetary claims or obligations.

Properties:

P180 has currency (was_currency_of): E98 Currency

P181 has amount : E60 Number

Example:

- Christies' hammer price for "Vase with Fifteen Sunflowers" (E97) has currency British Pounds (E98)

E98 Currency

Subclass of: E55 Type

Scope note: This class comprises the units in which a monetary system, supported by an administrative authority or other community, quantifies and arithmetically compares all monetary amounts declared in the unit. The unit of a monetary system must describe a nominal value which is kept constant by its administrative authority and an associated banking system if it exists, and not by market value. For instance, one may pay with grams of gold, but the respective monetary amount would have been agreed as the gold price in US dollars on the day of the payment. Under this definition, British Pounds, U.S. Dollars, and European Euros are examples of currency, but "grams of gold" is not. One monetary system has one and only one currency. Instances of this class must not be confused with coin denominations, such as "Dime" or "Sestertius". Non-monetary exchange of value in terms of quantities of a particular type of goods, such as cows, do not constitute a currency.

Examples: "As" (Roman mid republic)

"Euro",

"US Dollar"

E99 Product Type

Subclass of: E55 Type

Scope note: This class comprises types that characterize instances of E22 Man-Made Object that are the result of production activities that

a) use the same plans and
b) are intended to result in one or more series of functionally and aesthetically identical and interchangeable items.

A notable case is component parts which are typically replaceable pieces of a larger assembly. Instances of this class would, for example, capture the characteristic type of the series of objects that share a manufacturer's model number.

Frequently this uniform production is achieved by creating individual tools, such as moulds or printing plates, that are themselves carriers of the design of the product type. Modern tools may use the flexibility of electronically controlled devices to achieve such functionally and aesthetically identical products without themselves being specific to the created product. The product type itself, i.e., the potentially unlimited series of aesthetically equivalent items, may be the result of an artistic design process, in contrast to the design of an individual object.

In extreme cases, only one instance of a product type may have been produced, such as in a "print on demand" process. However, this case should not be confused with industrial prototypes, such as car prototypes, which are produced prior to the production line being set up, or to test the production line itself.

Examples: Volkswagen Type 11 (Beetle)

Dragendorff 54 samian vessel

1937 Edward VIII brass threepenny bit

Qin Crossbow trigger un-notched Part B (Bg2u)

Nokia Cityman 1320 (The first Nokia mobile phone)

Proposed properties: A unique plan, a required, unique tool.

CIDOC CRM Property Declarations

The properties of the CRM are comprehensively declared in this section using the following format:

- Property names are presented as headings in bold face, preceded by unique property identifiers;
- The line “Domain:” declares the class for which the property is defined;
- The line “Range:” declares the class to which the property points, or that provides the values for the property;
- The line “Superproperty of:” is a cross-reference to any subproperties the property may have;
- The line “Quantification:” declares the possible number of occurrences for domain and range class instances for the property. Possible values are: 1:many, many:many, many:1;
- The line “Scope note:” contains the textual definition of the concept the property represents;
- The line “Examples:” contains a bulleted list of examples of instances of this property. If the example is also instance of a subproperty of this property, the unique identifier of the subclass is added in parenthesis. If the example instantiates two properties, the unique identifiers of both properties is added in parenthesis.
  The line “Examples:” provides illustrative examples showing how the property should be used.

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
E52 Time-Span. P78 is identified by (identifies): E49 Time Appellation
E53 Place. P87 is identified by (identifies): E44 Place Appellation
E71 Man-Made Thing. P102 has title (is title of): E35 Title
E39 Actor. P131 is identified by (identifies): E82 Actor Appellation
E28 Conceptual Object.P149 is identified by (identifies): E75 Conceptual Object Appellation
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.

P1 is identified by (identifies), is a shortcut for the path from '*E1 CRM Entity*' through '*P140i was attributed by'*, 'E15 Identifier Assignment', '*P37 assigned*','E42 Identifier', 'P139 has alternative form' to 'E41 Appellation'.

Examples:

- the capital of Italy (E53) *is identified by* "Rome" (E48)
- text 25014–32 (E33) *is identified by* "The Decline and Fall of the Roman Empire" (E35)

In First Order Logic:

P1(x,y) ⊃ E1(x)
P1(x,y) ⊃ E41(y)

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

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

The 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 CRM may by specialised into any number of sub entities, which can be defined in the E55 Type hierarchy. E51 Contact Point, for example, may be specialised into "e-mail address", "telephone number", "post office box", "URL" etc. none of which figures explicitly in the CRM hierarchy. Sub typing obviously requires consistency between the meaning of the terms assigned and the more general intent of the CRM entity in question.

Examples:

"enquiries@cidoc-crm.org" (E51) *has type* e-mail address (E55)

In First Order Logic:

P2(x,y) ⊃ E1(x)
P2(x,y) ⊃ E55(y)

P3 has note

Domain: E1 CRM Entity

Range: E62 String
Superproperty of: E52 Time-Span. P79 beginning is qualified by: E62 String
E52 Time-Span. P80 end is qualified by: E62 String
Quantification: one to many (0,n:0,1)

Scope note: This property is a container for all informal descriptions about an object that have not been expressed in terms of CRM constructs.

In particular it captures the characterisation of the item itself, its internal structures, appearance etc.
Like property *P2 has type (is type of)*, this property is a consequence of the restricted focus of the CRM. The aim is not to capture, in a structured form, everything that can be said about an item; indeed, the CRM formalism is not regarded as sufficient to express everything that can be said. Good practice requires use of distinct note fields for different aspects of a characterisation. The *P3.1 has type* property of *P3 has note* allows differentiation of specific notes, e.g. "construction", "decoration" etc.
An item may have many notes, but a note is attached to a specific item.

Examples:

- coffee mug – OXCMS:1983.1.1 (E19) *has note* "chipped at edge of handle" (E62) *has type* Condition (E55)

In First Order Logic:

P3(x,y) ⊃ E1(x)
P3(x,y) ⊃ E62(y)
P3(x,y,z) ⊃ [P3(x,y) ∧ E55(z)]

Properties: P3.1 has type: E55 Type

P4 has time-span (is time-span of)

Domain: E2 Temporal Entity
Range: E52 Time-Span
Quantification: many to one, necessary, dependent (1,1:1,n)

Scope note: This property describes the temporal confinement of an instance of an E2 Temporal Entity.

The related E52 Time-Span is understood as the real Time-Span during which the phenomena were active, which make up the temporal entity instance. It does not convey any other meaning than a positioning on the "time-line" of chronology. The Time-Span in turn is approximated by a set of dates (E61 Time Primitive). A temporal entity can have in reality only one Time-Span, but there may exist alternative opinions about it, which we would express by assigning multiple Time-Spans. Related temporal entities may share a Time-Span. Time-Spans may have completely unknown dates but other descriptions by which we can infer knowledge.

Examples:

- the Yalta Conference (E7) *has time-span* Yalta Conference time-span (E52)

In First Order Logic:

P4(x,y) ⊃ E2(x)
P4(x,y) ⊃ E52(y)

P5 consists of (forms part of)

Domain: E3 Condition State
Range: E3 Condition State
Quantification: one to many (0,n:0,1)

Scope note: This property describes the decomposition of an E3 Condition State into discrete, subsidiary states.

It is assumed that the sub-states into which the condition state is analysed form a logical whole - although the entire story may not be completely known – and that the sub-states are in fact constitutive of the general condition state. For example, a general condition state of "in ruins" may be decomposed into the individual stages of decay.
This property is transitive.

Examples:

The Condition State of the ruined Parthenon (E3) *consists of* the bombarded state after the explosion of a Venetian shell in 1687 (E3)[6]

In First Order Logic:

P5(x,y) ⊃ E3(x)
P5(x,y) ⊃ E3(y)

P7 took place at (witnessed)

Domain: E4 Period
Range: E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property describes the spatial location of an instance of E4 Period.

The related E53 Place should be seen as a wider approximation of the geometric area within which the phenomena that characterise the period in question occurred, see below. *P7took place at (witnessed)* does not convey any meaning other than spatial positioning (frequently on the surface of the earth). For example, the period "Révolution française" can be said to have taken place in "France in 1789"; the "Victorian" period may be said to have taken place in "Britain" and its colonies, as well as other parts of Europe and North America. An instance of E4 Period can take place at multiple non-contiguous, non-overlapping locations.

It is a shortcut of the more fully developed path from E4 Period through *P161 has spatial projection*, E53 Place, *P89 falls within* to E53 Place. E4 Period is a subclass of E92 Spacetime Volume. By the definition of *P161 has spatial projection* an instance of E4 Period takes place on all its spatial projections, that is, instances of E53 Place. Something happening at a given place can also be considered to happen at a larger place containing the first. For example, the assault on the Bastille July 14th 1789 took place in the area covered by Paris in 1789 but also in the area covered by France in 1789.

Examples:

- the period "Révolution française" (E4) *took place at* the area covered by France in 1789 (E53)

In First Order Logic:

P7(x,y) ⊃ E4(x)
P7(x,y) ⊃ E53(y)

P8 took place on or within (witnessed)

Domain: E4 Period
Range: E18 Physical Thing
Quantification: many to many (0,n:0,n)

Scope note: This property describes the location of an instance of E4 Period with respect to an E19 Physical Object. P8 took place on or within (witnessed) is a shortcut of the more fully developed path from '*E4 Period*' through '*P7 took place at*,' '*E53 Place*', '*P156 occupies'*, to '*E18 Physical Thing*'.

It describes a period that can be located with respect to the space defined by an E19 Physical Object such as a ship or a building. The precise geographical location of the object during the period in question may be unknown or unimportant.
For example, the French and German armistice of 22 June 1940 was signed in the same railway carriage as the armistice of 11 November 1918.

Examples:

- the coronation of Queen Elizabeth II (E7) *took place on or within* Westminster Abbey (E19)

[6] The Venetians in Athens and the Destruction of the Parthenon in 1687, Theodor E. Mommsen, American Journal of Archaeology, Vol. 45, No. 4 (Oct. - Dec., 1941), pp. 544-5

In First Order Logic:
P8(x,y) ⊃ E4(x)
P8(x,y) ⊃ E18(y)

P9 consists of (forms part of)

Domain: E4 Period
Range: E4 Period
Subproperty of: E92 Spacetime Volume. P132 spatiotemporally overlaps with.:E92 Spacetime Volume

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

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.

Examples:

- Cretan Bronze Age (E4) *consists of* Middle Minoan (E4)

In First Order Logic:
P9(x,y) ⊃ E4(x)
P9(x,y) ⊃ E4(y)
P9(x,y) ⊃ P10(y,x)

P10 falls within (contains)

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Subproperty of: E92 Spacetime Volume. P132 spatiotemporally overlaps with.:E92 Spacetime Volume
Superproperty of: E93 Presence. P166 was a presence of (had presence): E92 Spacetime Volume
Quantification: many to many (0,n:0,n)

Scope note: This property associates an instance of E92 Spacetime Volume with another instance of E92 Spacetime Volume that falls within the latter. In other words, all points in the former are also points in the latter.
This property is transitive.

Examples:

- the Great Plague (E4) *falls within* The Gothic period (E4)

In First Order Logic:
P10(x,y) ⊃ E92(x)
P10(x,y) ⊃ E92(y)

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
P151 was formed from: 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 E5 Event.

It connects the life-line of the related E39 Actor with the E53 Place and E50 Date of the event. The property implies that the Actor was involved in the event but does not imply any causal relationship. The subject of a portrait can be said to have participated in the creation of the portrait.

Examples:

- Napoleon (E21) *participated in* The Battle of Waterloo (E7)
- Maria (E21) *participated in* Photographing of Maria (E7)

In First Order Logic:

P11(x,y) ⊃ E5(x)
P11(x,y) ⊃ E39(y)
P11(x,y) ⊃ P12(x,y)

P12 occurred in the presence of (was present at)

Domain: E5 Event
Range: E77 Persistent Item
Superproperty of: E5 Event. P11 had participant (participated in): E39 Actor
E7 Activity. P16 used specific object (was used for): E70 Thing
E9 Move. P25 moved (moved by): E19 Physical Object
E11 Modification. P31 has modified (was modified by): E24 Physical Man-Made Thing
E63 Beginning of Existence. P92 brought into existence (was brought into existence by): E77 Persistent Item
E64 End of Existence. P93 took out of existence (was taken out of existence by): E77 Persistent Item
E79 Part Addition.P111 added (was added by): E18 Physical Thing
E80 Part Removal.P113 removed (was removed by): E18 Physical Thing
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property describes the active or passive presence of an E77 Persistent Item in an E5 Event without implying any specific role.

It connects the history of a thing with the E53 Place and E50 Date of an event. For example, an object may be the desk, now in a museum on which a treaty was signed. The presence of an immaterial thing implies the presence of at least one of its carriers.

Examples:

- Deckchair 42 (E19) *was present at* The sinking of the Titanic (E5)

In First Order Logic:

P12(x,y) ⊃ E5(x)
P12(x,y) ⊃ E77(y)

P13 destroyed (was destroyed by)

Domain: E6 Destruction
Range: E18 Physical Thing
Subproperty of: E64 End of Existence. P93 took out of existence (was taken out of existence by): E77 Persistent Item
Quantification: one to many, necessary (1,n:0,1)

Scope note: This property allows specific instances of E18 Physical Thing that have been destroyed to be related to a destruction event.
Destruction implies the end of an item's life as a subject of cultural documentation – the physical matter of which the item was composed may in fact continue to exist. A destruction event may be contiguous with a Production that brings into existence a derived object composed partly of matter from the destroyed object.

Examples:

- the Tay Bridge Disaster (E6) *destroyed* The Tay Bridge (E22)

In First Order Logic:
P13 (x,y) ⊃ E6 (x)
P13 (x,y) ⊃ E18(y)
P13 (x,y) ⊃ P93(x,y)

P14 carried out by (performed)

Domain: E7 Activity
Range: E39 Actor
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Superproperty of: E8 Acquisition. P22 transferred title to (acquired title through): E39 Actor
E8 Acquisition. P23 transferred title from (surrendered title through): E39 Actor
E10 Transfer of Custody. P28 custody surrendered by (surrendered custody through): E39 Actor
E10 Transfer of Custody. P29 custody received by (received custody through): E39 Actor
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property describes the active participation of an E39 Actor in an E7 Activity.

It implies causal or legal responsibility. The *P14.1 in the role of* property of the property allows the nature of an Actor's participation to be specified.

Examples:

- the painting of the Sistine Chapel (E7) *carried out by* Michaelangelo Buonaroti (E21) *in the role of* master craftsman (E55)

In First Order Logic:
P14 (x,y) ⊃ E7(x)
P14 (x,y)⊃ E39(y)
P14 (x,y) ⊃ P11(x,y)
P14(x,y,z) ⊃ [P14(x,y) ∧ E55(z)]

Properties: P14.1 in the role of: E55 Type

P15 was influenced by (influenced)

Domain: E7 Activity
Range: E1 CRM Entity
Superproperty of: E7 Activity. P16 used specific object (was used for): E70 Thing
E7 Activity. P17 was motivated by (motivated): E1 CRM Entity
E7 Activity. P134 continued (was continued by): E7 Activity
E83 Type Creation. P136 was based on (supported type creation): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This is a high level property, which captures the relationship between an E7 Activity and anything that may have had some bearing upon it.

The property has more specific sub properties.

Examples:

- the designing of the Sydney Harbour Bridge (E7) *was influenced by* the Tyne bridge (E22)

In First Order Logic:
P15 (x,y) ⊃ E7(x)
P15 (x,y) ⊃ E1(y)

P16 used specific object (was used for)

Domain: E7 Activity
Range: E70 Thing
Subproperty of: E5 Event. P12 occurred in the presence of (was present at): E77 Persistent Item

E7 Activity. P15 was influenced by (influenced): E1 CRM Entity
Superproperty of: E7 Activity.P33 used specific technique (was used by):E29 Design or Procedure
E15 Identifier Assignment. P142 used constituent (was used in): E90 Symbolic Object
E79 Part Addition. P111 added (was added by):E18 Physical Thing
Quantification: many to many (0,n:0,n)

Scope note: This property describes the use of material or immaterial things in a way essential to the performance or the outcome of an E7 Activity.

This property typically applies to tools, instruments, moulds, raw materials and items embedded in a product. It implies that the presence of the object in question was a necessary condition for the action. For example, the activity of writing this text required the use of a computer. An immaterial thing can be used if at least one of its carriers is present. For example, the software tools on a computer.

Another example is the use of a particular name by a particular group of people over some span to identify a thing, such as a settlement. In this case, the physical carriers of this name are at least the people understanding its use.

Examples:

- the writing of this scope note (E7) *used specific object* Nicholas Crofts' computer (E22) *mode of use* Typing Tool; Storage Medium (E55)
- the people of Iraq calling the place identified by TGN '7017998' (E7) used specific object "Quyunjig" (E44) *mode of use Current*; Vernacular (E55)

In First Order Logic:

P16 (x,y) ⊃ E7(x)
P16 (x,y) ⊃ E70(y)
P16 (x,y) ⊃ P12(x,y)
P16 (x,y) ⊃ P15(x,y)
P16(x,y,z) ⊃ [P16(x,y) ∧ E55(z)]

Properties: P16.1 mode of use: E55 Type

P17 was motivated by (motivated)

Domain: E7 Activity
Range: E1 CRM Entity
Subproperty of: E7 Activity. P15 was influenced by (influenced): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property describes an item or items that are regarded as a reason for carrying out the E7 Activity.

For example, the discovery of a large hoard of treasure may call for a celebration, an order from head quarters can start a military manoeuvre.

Examples:

- the resignation of the chief executive (E7) *was motivated by* the collapse of SwissAir (E68).
- the coronation of Elizabeth II (E7) *was motivated by* the death of George VI (E69)

In First Order Logic:

P17(x,y) ⊃ E7(x)
P17(x,y) ⊃ E1(y)
P17 (x,y) ⊃ P15(x,y)

P19 was intended use of (was made for):

Domain: E7 Activity
Range: E71 Man-Made Thing
Quantification: many to many (0,n:0,n)

Scope note: This property relates an E7 Activity with objects created specifically for use in the activity.

This is distinct from the intended use of an item in some general type of activity such as the book of common prayer which was intended for use in Church of England services (see *P101 had as general use (was use of)*).

Examples:

- Lady Diana Spencer's wedding dress (E71) *was made for* Wedding of Prince Charles and Lady Diana Spencer (E7) *mode of use* To Be Worn (E55)

In First Order Logic:

P19(x,y) ⊃ E7(x)
P19(x,y) ⊃ E71(y)
P19(x,y,z) ⊃ [P19(x,y) ∧ E55(z)]

Properties: P19.1 mode of use: E55 Type

P20 had specific purpose (was purpose of)

Domain: E7 Activity
Range: E5 Event
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the relationship between a preparatory activity and the event it is intended to be preparation for.

This includes activities, orders and other organisational actions, taken in preparation for other activities or events.

P20 had specific purpose (was purpose of) implies that an activity succeeded in achieving its aim. If it does not succeed, such as the setting of a trap that did not catch anything, one may document the unrealized intention using *P21 had general purpose (was purpose of):E55 Type* and/or *P33 used specific technique (was used by): E29 Design or Procedure*.

Examples:

- Van Eyck's pigment grinding in 1432 (E7) *had specific purpose* the painting of the Ghent altar piece (E12)

In First Order Logic:

P21(x,y) ⊃ E7(x)
P21(x,y) ⊃ E55(y)

P21 had general purpose (was purpose of)

Domain: E7 Activity
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property describes an intentional relationship between an E7 Activity and some general goal or purpose.

This may involve activities intended as preparation for some type of activity or event. *P21had general purpose (was purpose of)* differs from *P20 had specific purpose (was purpose of)* in that no occurrence of an event is implied as the purpose.

Examples:

- Van Eyck's pigment grinding (E7) *had general purpose* painting (E55)
- The setting of trap 2742 on May 17th 1874 (E7) *had general purpose* Catching Moose (E55) (Activity type

In First Order Logic:

P21(x,y) ⊃ E7(x)
P21(x,y) ⊃ E55(y)

P22 transferred title to (acquired title through)

Domain: E8 Acquisition
Range: E39 Actor
Subproperty of: E7 Activity. P14 carried out by (performed): E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E39 Actor that acquires the legal ownership of an object as a result of an E8 Acquisition.

The property will typically describe an Actor purchasing or otherwise acquiring an object from another Actor. However, title may also be acquired, without any corresponding loss of title by another Actor, through legal fieldwork such as hunting, shooting or fishing.

In reality the title is either transferred to or from someone, or both.

Examples:

- acquisition of the Amoudrouz collection by the Geneva Ethnography Museum (E8) *transferred title to* Geneva Ethnography Museum (E74)

In First Order Logic:

P22(x,y) ⊃ E8(x)
P22(x,y) ⊃ E39(y)
P22 (x,y) ⊃ P14(x,y)

P23 transferred title from (surrendered title through)

Domain: E8 Acquisition
Range: E39 Actor
Subproperty of: E7 Activity. P14 carried out by (performed): E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E39 Actor or Actors who relinquish legal ownership as the result of an E8 Acquisition.

The property will typically be used to describe a person donating or selling an object to a museum. In reality title is either transferred to or from someone, or both.

Examples:

- acquisition of the Amoudrouz collection by the Geneva Ethnography Museum (E8) *transferred title from* Heirs of Amoudrouz (E74)

In First Order Logic:

P23(x,y) ⊃ E8(x)
P23(x,y) ⊃ E39(y)
P23 (x,y) ⊃ P14(x,y)

P24 transferred title of (changed ownership through)

Domain: E8 Acquisition
Range: E18 Physical Thing
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E18 Physical Thing or things involved in an E8 Acquisition.

In reality, an acquisition must refer to at least one transferred item.

Examples:

- acquisition of the Amoudrouz collection by the Geneva Ethnography Museum (E8) *transferred title of* Amoudrouz Collection (E78)

In First Order Logic:

P24(x,y) ⊃ E8(x)
P24(x,y) ⊃ E18(y)

P25 moved (moved by)

Domain: E9 Move
Range: E19 Physical Object
Subproperty of: E5 Event. P12 occurred in the presence of (was present at): E77 Persistent Item
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies an instance of E19 Physical Object that was moved by a move event. A move must concern at least one object.

The property implies the object's passive participation. For example, Monet's painting "Impression sunrise" was moved for the first Impressionist exhibition in 1874.

Examples:

- Monet´s "Impression sunrise" (E22) *moved by* preparations for the First Impressionist Exhibition (E9)

In First Order Logic:

P25(x,y) ⊃ E9(x)
P25(x,y) ⊃ E19(y)
P25(x,y) ⊃ P12(x,y)

P26 moved to (was destination of)

Domain: E9 Move
Range: E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies a destination of a E9 Move.

A move will be linked to a destination, such as the move of an artefact from storage to display. A move may be linked to many terminal instances of E53 Place by multiple instances of this property. In this case the move describes a distribution of a set of objects. The area of the move includes the origin(s), route and destination(s).
Therefore the described destination is an instance of E53 Place which *P89 falls within (contains)* the instance of E53 Place the move *P7 took place at.*

Examples:

- the movement of the Tut-Ankh-Amun Exhibition (E9) *moved to* The British Museum (E53)

In First Order Logic:

P26(x,y) ⊃ E9(x)
P26(x,y) ⊃ E53(y)
P26(x,y) ⊃ (∃z)[E53(z) ∧ P7(x,z) ∧ P89(y,z)]

P27 moved from (was origin of)

Domain: E9 Move
Range: E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies a starting E53 Place of an E9 Move.

A move will be linked to an origin, such as the move of an artefact from storage to display. A move may be linked to many starting instances of E53 Place by multiple instances of this property. In this

case the move describes the picking up of a set of objects. The area of the move includes the origin(s), route and destination(s).
Therefore the described origin is an instance of E53 Place which *P89 falls within (contains)* the instance of E53 Place the move *P7 took place at.*

Examples:

- the movement of the Tut-Ankh-Amun Exhibition (E9) *moved from* The Egyptian Museum in Cairo (E53)

In First Order Logic:

P27(x,y) ⊃ E9(x)
P27(x,y) ⊃ E53(y)
P27(x,y) ⊃ (∃z)[E53(z) ∧ P7(x,z) ∧ P89(y,z)]

P28 custody surrendered by (surrendered custody through)

Domain: E10 Transfer of Custody
Range: E39 Actor
Subproperty of: E7 Activity. P14 carried out by (performed): E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E39 Actor or Actors who surrender custody of an instance of E18 Physical Thing in an E10 Transfer of Custody activity.

The property will typically describe an Actor surrendering custody of an object when it is handed over to someone else's care. On occasion, physical custody may be surrendered involuntarily – through accident, loss or theft.
In reality, custody is either transferred to someone or from someone, or both.

Examples:

- the Secure Deliveries Inc. crew (E40) *surrendered custody through* The delivery of the paintings by Secure Deliveries Inc. to the National Gallery (E10).

In First Order Logic:

P28(x,y) ⊃ E10(x)
P28(x,y) ⊃ E39(y)
P28(x,y) ⊃ P14(x,y)

P29 custody received by (received custody through)

Domain: E10 Transfer of Custody
Range: E39 Actor
Subproperty of: E7 Activity. P14 carried out by (performed): E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E39 Actor or Actors who receive custody of an instance of E18 Physical Thing in an E10 Transfer of Custody activity.

The property will typically describe Actors receiving custody of an object when it is handed over from another Actor's care. On occasion, physical custody may be received involuntarily or illegally – through accident, unsolicited donation, or theft.
In reality, custody is either transferred to someone or from someone, or both.

Examples:

- representatives of The National Gallery (E40) *received custody through.* The delivery of the paintings by Secure Deliveries Inc. to the National Gallery (E10)

In First Order Logic:

P29 (x,y) ⊃ E10(x)
P29 (x,y) ⊃ E39(y)
P29(x,y) ⊃ P14(x,y)

P30 transferred custody of (custody transferred through)

Domain: E10 Transfer of Custody
Range: E18 Physical Thing
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies an item or items of E18 Physical Thing concerned in an E10 Transfer of Custody activity.

The property will typically describe the object that is handed over by an E39 Actor to another Actor's custody. On occasion, physical custody may be transferred involuntarily or illegally – through accident, unsolicited donation, or theft.

Examples:

the delivery of the paintings by Secure Deliveries Inc. to the National Gallery (E10) *transferred custody of* paintings from The Iveagh Bequest (E19)

In First Order Logic:

P30 (x,y) ⊃ E10(x)
P30 (x,y) ⊃ E18(y)

P31 has modified (was modified by)

Domain: E11 Modification
Range: E24 Physical Man-Made Thing
Subproperty of: E5 Event. P12 occurred in the presence of (was present at): E77 Persistent Item
Superproperty of: E12 Production. P108 has produced (was produced by): E24 Physical Man-Made Thing
E79 Part Addition. P110 augmented (was augmented by): E24 Physical Man-Made Thing
E80 Part Removal. P112 diminished (was diminished by): E24 Physical Man-Made Thing
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E24 Physical Man-Made Thing modified in an E11 Modification.

If a modification is applied to a non-man-made object, it is regarded as an E22 Man-Made Object from that time onwards.

Examples:

- rebuilding of the Reichstag (E11) *has modified* the Reichstag in Berlin (E24)

In First Order Logic:

P31(x,y) ⊃ E11(x)
P31(x,y) ⊃ E24(y)
P31(x,y) ⊃ P12(x,y)

P32 used general technique (was technique of)

Domain: E7 Activity
Range: E55 Type
Subproperty of: E7 Activity. P125 used object of type (was type of object used in): E55 Type
Superproperty of:
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the technique or method that was employed in an activity.
These techniques should be drawn from an external E55 Type hierarchy of consistent terminology of general techniques or methods such as embroidery, oil-painting, carbon dating, etc. Specific documented techniques should be described as instances of E29 Design or Procedure. This property identifies the technique that was employed in an act of modification.

Examples:

- ornamentation of silver cup 113 (E11) *used general technique* gold-plating (E55) (Design or Procedure Type)

In First Order Logic:
P32(x,y) ⊃ E7(x)
P32(x,y) ⊃ E55(y)
P32(x,y) ⊃ P125(x,y)

P33 used specific technique (was used by)

Domain: E7 Activity
Range: E29 Design or Procedure
Subproperty of: E7 Activity. P16 used specific object (was used for): E70 Thing
Quantification: many to many (0,n:0,n)

Scope note: This property identifies a specific instance of E29 Design or Procedure in order to carry out an instance of E7 Activity or parts of it.

The property differs from P32 used general technique (was technique of) in that P33 refers to an instance of E29 Design or Procedure, which is a concrete information object in its own right rather than simply being a term or a method known by tradition.

Typical examples would include intervention plans for conservation or the construction plans of a building

Examples:

- Ornamentation of silver cup 232 (E11) *used specific technique* 'Instructions for golden chase work by A N Other' (E29)
- Rebuilding of Reichstag (E11) *used specific technique* Architectural plans by Foster and Partners (E29)

In First Order Logic:
P33(x,y) ⊃ E7(x)
P33(x,y) ⊃ E29(y)
P33(x,y) ⊃ P16(x,y)

P34 concerned (was assessed by)

Domain: E14 Condition Assessment
Range: E18 Physical Thing
Subproperty of: E13 Attribute Assignment. P140 assigned attribute to (was attributed by): E1 CRM Entity
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E18 Physical Thing that was assessed during an E14 Condition Assessment activity.
Conditions may be assessed either by direct observation or using recorded evidence. In the latter case the E18 Physical Thing does not need to be present or extant.

Examples:

- 1997 condition assessment of the silver collection (E14) *concerned* silver cup 232 (E22)

In First Order Logic:
P34(x,y) ⊃ E14(x)
P34(x,y) ⊃ E18(y)
P34(x,y) ⊃ P140(x,y)

P35 has identified (was identified by)

Domain: E14 Condition Assessment
Range: E3 Condition State
Subproperty of: E13 Attribute Assignment. P141 assigned (was assigned by): E1 CRM Entity
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E3 Condition State that was observed in an E14 Condition Assessment activity.

Examples:

- 1997 condition assessment of silver cup 232 (E14) *has identified* oxidation traces were present in 1997 (E3) *has type* oxidation traces (E55)

In First Order Logic:

P35(x,y) ⊃E14(x)
P35(x,y) ⊃ E3(y)
P35(x,y) ⊃ P141(x,y)

P37 assigned (was assigned by)

Domain: E15 Identifier Assignment
Range: E42 Identifier
Subproperty of: E13 Attribute Assignment. P141 assigned (was assigned by): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property records the identifier that was assigned to an item in an Identifier Assignment activity.
The same identifier may be assigned on more than one occasion.
An Identifier might be created prior to an assignment.

Examples:

- 01 June 1997 Identifier Assignment of the silver cup donated by Martin Doerr (E15) *assigned* "232" (E42)

In First Order Logic:

P37(x,y) ⊃ E15(x)
P37(x,y) ⊃ E42(y)
P37(x,y) ⊃ P141(x,y)

P38 deassigned (was deassigned by)

Domain: E15 Identifier Assignment
Range: E42 Identifier
Subproperty of: E13 Attribute Assignment. P141 assigned (was assigned by): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property records the identifier that was deassigned from an instance of E1 CRM Entity.
Deassignment of an identifier may be necessary when an item is taken out of an inventory, a new numbering system is introduced or items are merged or split up.
The same identifier may be deassigned on more than one occasion.

Examples:

- 31 July 2001 Identifier Assignment of the silver cup OXCMS:2001.1.32 (E15) *deassigned* "232" (E42)

In First Order Logic:

P38(x,y) ⊃ E15(x)
P38(x,y) ⊃ E42(y)
P38(x,y) ⊃ P141(x,y)

P39 measured (was measured by)

Domain: E16 Measurement
Range: E1 CRM Entity
Subproperty of: E13 Attribute Assignment. P140 assigned attribute to (was attributed by): E1 CRM Entity
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property associates an instance of E16 Measurement with the instance of E1 CRM Entity to which it applied. An instance of E1 CRM Entity may be measured more than once. Material and immaterial things and processes may be measured, e.g. the number of words in a text, or the duration of an event.

Examples:

- 31 August 1997 measurement of height of silver cup 232 (E16) *measured* silver cup 232 (E22)

In First Order Logic:
P39(x,y) ⊃ E16(x)
P39(x,y) ⊃ E1(y)
P39(x,y) ⊃ P140(x,y)

P40 observed dimension (was observed in)

Domain: E16 Measurement
Range: E54 Dimension
Subproperty of: E13 Attribute Assignment. P141 assigned (was assigned by): E1 CRM Entity
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property records the dimension that was observed in an E16 Measurement Event.
E54 Dimension can be any quantifiable aspect of E70 Thing. Weight, image colour depth and monetary value are dimensions in this sense. One measurement activity may determine more than one dimension of one object.
Dimensions may be determined either by direct observation or using recorded evidence. In the latter case the measured Thing does not need to be present or extant.
Even though knowledge of the value of a dimension requires measurement, the dimension may be an object of discourse prior to, or even without, any measurement being made.

Examples:

- 31 August 1997 measurement of height of silver cup 232 (E16) *observed dimension* silver cup 232 height (E54) *has unit* mm (E58), *has value* 224 (E60)

In First Order Logic:
P40(x,y) ⊃ E16(x)
P40(x,y)⊃ E54(y)
P40(x,y) ⊃ P141(x,y)

P41 classified (was classified by)

Domain: E17 Type Assignment
Range: E1 CRM Entity
Subproperty of: E13 Attribute Assignment. P140 assigned attribute to (was attributed by): E1 CRM Entity
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property records the item to which a type was assigned in an E17 Type Assignment activity.
Any instance of a CRM entity may be assigned a type through type assignment. Type assignment events allow a more detailed path from '*E1 CRM Entity'* through *'P41i was classified by', 'E17 Type Assignment', 'P42 assigned', to 'E55 Type'* for assigning types to objects compared to the shortcut offered by *P2 has type (is type of)*.

Examples:

- 31 August 1997 classification of silver cup 232 (E17) *classified* silver cup 232 (E22)

In First Order Logic:
P41(x,y) ⊃ E17(x)
P41(x,y) ⊃ E1(y)
P41(x,y) ⊃ P140(x,y)

P42 assigned (was assigned by)

Domain: E17 Type Assignment
Range: E55 Type
Subproperty of: E13 Attribute Assignment. P141 assigned (was assigned by): E1 CRM Entity
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property records the type that was assigned to an entity by an E17 Type Assignment activity.

Type assignment events allow a more detailed path from '*E1 CRM Entity'* through *'P41i was classified by', 'E17 Type Assignment', 'P42 assigned', to 'E55 Type'* for assigning types to objects compared to the shortcut offered by *P2 has type (is type of)*.
For example, a fragment of an antique vessel could be assigned the type "attic red figured belly handled amphora" by expert A. The same fragment could be assigned the type "shoulder handled amphora" by expert B.
A Type may be intellectually constructed independent from assigning an instance of it.

Examples:

- 31 August 1997 classification of silver cup 232 (E17) *assigned* goblet (E55)

In First Order Logic:

P42(x,y) ⊃ E17(x)
P42(x,y)⊃ E55(y)
P42(x,y) ⊃ P141(x,y)

P43 has dimension (is dimension of)

Domain: E70 Thing
Range: E54 Dimension
Quantification: one to many, dependent (0,n:1,1)

Scope note: This property records a E54 Dimension of some E70 Thing.
It is a shortcut of the more fully developed path from '*E70 Thing'* through *'P39 measured', 'E16 Measurement', 'P40 observed dimension'*, to *'E54 Dimension'*. It offers no information about how and when an E54 Dimension was established, nor by whom.

An instance of E54 Dimension is specific to an instance of E70 Thing.

Examples:

- silver cup 232 (E22) *has dimension* height of silver cup 232 (E54) *has unit (P91)* mm (E58), *has value (P90)* 224 (E60)

In First Order Logic:

P43(x,y) ⊃ E70(x)
P43(x,y) ⊃ E54(y)

P44 has condition (is condition of)

Domain: E18 Physical Thing
Range: E3 Condition State
Quantification: one to many, dependent (0,n:1,1)

Scope note: This property records an E3 Condition State for some E18 Physical Thing.

It is a shortcut of the more fully developed path from '*E18 Physical Thing'* through *'P34 concerned', 'E14 Condition Assessment', 'P35 has identified'*, to *'E3 Condition State'*. It offers no information about how and when the E3 Condition State was established, nor by whom.

An instance of Condition State is specific to an instance of Physical Thing.

Examples:

- silver cup 232 (E22) *has condition* oxidation traces were present in 1997 (E3) *has type* oxidation traces (E55)

In First Order Logic:

P44(x,y) ⊃ E18(x)
P44(x,y) ⊃ E3(y)

P45 consists of (is incorporated in)

Domain: E18 Physical Thing
Range: E57 Material

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

Scope note: This property identifies the instances of E57 Materials of which an instance of E18 Physical Thing is composed.

All physical things consist of physical materials. *P45 consists of (is incorporated in)* allows the different Materials to be recorded. *P45 consists of (is incorporated in)* refers here to observed Material as opposed to the consumed raw material.

A Material, such as a theoretical alloy, may not have any physical instances.

Examples:

- silver cup 232 (E22) *consists of* silver (E57)

In First Order Logic:

P45(x,y) ⊃ E18(x)
P45(x,y) ⊃ E57(y)

P46 is composed of (forms part of)

Domain: E18 Physical Thing
Range: E18 Physical Thing
Subproperty of: E92 Spacetime Volume. P132 spatiotemporally overlaps with: E92 Spacetime Volume
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 allows instances of E18 Physical Thing to be analysed into component elements.

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 item of E18 Physical Thing is composed should be documented using *P45 consists of (is incorporated in)*.

Examples:

- the Royal carriage (E22) *forms part of* the Royal train (E22)
- the "Hog's Back" (E24) *forms part of* the "Fosseway" (E24)

In First Order Logic:

P46(x,y) ⊃ E18(x)
P46(x,y) ⊃ E18(y)
P46(x,y) ⊃ P132(x,y)
P46(x,y) ⊃ (∃uzw)[E93(u) ∧ P166 (x,u) ∧ E52(z) ∧ P164(u,z) ∧ E93(w) ∧ P166 (y,w) ∧ P164(w,z) ∧ P10(w,u)]

P48 has preferred identifier (is preferred identifier of)

Domain: E1 CRM Entity
Range: E42 Identifier

Subproperty of: E1 CRM Entity.P1 is identified by (identifies): E41 Appellation
Quantification: many to one (0,1:0,n)

Scope note: This property records the preferred E42 Identifier that was used to identify an instance of E1 CRM Entity at the time this property was recorded.

More than one preferred identifier may have been assigned to an item over time.
Use of this property requires an external mechanism for assigning temporal validity to the respective CRM instance.

The fact that an identifier is a preferred one for an organisation can be better expressed in a context independent form by assigning a suitable E55 Type to the respective instance of E15 Identifier Assignment using the *P2 has type* property.

Examples:

- the pair of Lederhosen donated by Dr Martin Doerr (E22) *has preferred identifier* "OXCMS:2001.1.32" (E42)

In First Order Logic:

P48(x,y) ⊃ E1(x)
P48(x,y) ⊃ E42(y)
P48(x,y) ⊃ P1(x,y)

P49 has former or current keeper (is former or current keeper of)

Domain: E18 Physical Thing
Range: E39 Actor
Superproperty of: E18 Physical Thing. P50 has current keeper (is current keeper of): E39 Actor
E78 Collection.P109 has current or former curator (is current or former curator of):E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E39 Actor or Actors who have or have had custody of an instance of E18 Physical Thing at some time. This property leaves open the question if parts of this physical thing have been added or removed during the time-spans it has been under the custody of this actor, but it is required that at least a part which can unambiguously be identified as representing the whole has been under this custody for its whole time. The way, in which a representative part is defined, should ensure that it is unambiguous who keeps a part and who the whole and should be consistent with the identity criteria of the kept instance of E18 Physical Thing.

The distinction with *P50 has current keeper (is current keeper of)* is that *P49 has former or current keeper (is former or current keeper of)* leaves open the question as to whether the specified keepers are current.

P49 has former or current keeper (is former or current keeper of) is a shortcut for the more detailed path from '*E18 Physical Thing'* through *'P30 transferred custody of', 'E10 Transfer of Custody', 'P28 custody surrendered by' or 'P29 custody received by'* to *' E39 Actor'*.

Examples:

- paintings from The Iveagh Bequest (E18) *has former or current keeper* Secure Deliveries Inc. (E40)

In First Order Logic:

P49(x,y) ⊃ E18(x)
P49(x,y) ⊃ E39(y)

P50 has current keeper (is current keeper of)

Domain: E18 Physical Thing
Range: E39 Actor
Subproperty of: E18 Physical Thing. P49 has former or current keeper (is former or current keeper of): E39 Actor

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

Scope note: This property identifies the E39 Actor or Actors who had custody of an instance of E18 Physical Thing at the time of validity of the record or database containing the statement that uses this property.

P50 has current keeper (is current keeper of) is a shortcut for the more detailed path from '*E18 Physical Thing'* through, *'P30i custody transferred through', 'E10 Transfer of Custody', 'P29 custody received by' ,to 'E39 Actor'*.

Examples:

- paintings from The Iveagh Bequest (E18) *has current keeper* The National Gallery (E40)

In First Order Logic:

P50(x,y) ⊃ E18(x)
P50(x,y) ⊃ E39(y)
P50(x,y) ⊃ P49(x,y)

P51 has former or current owner (is former or current owner of)

Domain: E18 Physical Thing
Range: E39 Actor
Superproperty of: E18 Physical Thing. P52 has current owner (is current owner of): E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E39 Actor that is or has been the legal owner (i.e. title holder) of an instance of E18 Physical Thing at some time.

The distinction with *P52 has current owner (is current owner of)* is that *P51 has former or current owner (is former or current owner of)* does not indicate whether the specified owners are current. *P51 has former or current owner (is former or current owner of)* is a shortcut for the more detailed path from '*E18 Physical Thing'* through *'P24i changed ownership through', 'E8 Acquisition', 'P23 transferred title from', or 'P22 transferred title to'*,to *'E39 Actor*.'

Examples:

- paintings from the Iveagh Bequest (E18) *has former or current owner* Lord Iveagh (E21)

In First Order Logic:

P51(x,y) ⊃ E18(x)
P51(x,y) ⊃ E39(y)

P52 has current owner (is current owner of)

Domain: E18 Physical Thing
Range: E39 Actor
Subproperty of: E18 Physical Thing. P51 has former or current owner (is former or current keeper of): E39 Actor
E72 Legal Object.P105 right held by (has right on):E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E21 Person, E74 Group or E40 Legal Body that was the owner of an instance of E18 Physical Thing at the time of validity of the record or database containing the statement that uses this property.

P52 has current owner (is current owner of) is a shortcut for the more detailed path from '*E18 Physical Thing through', 'P24i changed ownership through, 'E8 Acquisition', 'P22 transferred title to', to 'E39 Actor'*, if and only if this acquisition event is the most recent.

Examples:

- paintings from the Iveagh Bequest (E18) *has current owner* «English Heritage» (E40)

In First Order Logic:

P52 (x,y) ⊃ E18(x)
P52 (x,y) ⊃ E39(y)

P52(x,y) ⊃ P51(x,y)
P52(x,y) ⊃ P105(x,y)

P53 has former or current location (is former or current location of)

Domain: E18 Physical Thing
Range: E53 Place
Superproperty of: E19 Physical Object. P55 has current location (currently holds): E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property allows an instance of E53 Place to be associated as the former or current location of an instance of E18 Physical Thing.

In the case of E19 Physical Objects, the property does not allow any indication of the Time-Span during which the Physical Object was located at this Place, nor if this is the current location.

In the case of immobile objects, the Place would normally correspond to the Place of creation.
P53 has former or current location (*is former or current location of)* is a shortcut. A more detailed representation can make use of the fully developed (i.e. indirect) path from *'E19 Physical Object'*, though*, 'P25i moved by', 'E9 Move', 'P26 moved to'* or *'P27 moved from', to ' E53 Place'*.

Examples:

- silver cup 232 (E22) *has former or current location* Display Case 4, Room 23, Museum of Oxford (E53)

In First Order Logic:
P53(x,y) ⊃ E18(x)
P53(x,y) ⊃ E53(y)

P54 has current permanent location (is current permanent location of)

Domain: E19 Physical Object
Range: E53 Place
Quantification: many to one (0,1:0,n)

Scope note: This property records the foreseen permanent location of an instance of E19 Physical Object at the time of validity of the record or database containing the statement that uses this property.

P54 has current permanent location (is current permanent location of) is similar to *P55 has current location (currently holds).* However, it indicates the E53 Place currently reserved for an object, such as the permanent storage location or a permanent exhibit location. The object may be temporarily removed from the permanent location, for example when used in temporary exhibitions or loaned to another institution. The object may never actually be located at its permanent location.

Examples:

- silver cup 232 (E22) *has current permanent location* Shelf 3.1, Store 2, Museum of Oxford (E53)

In First Order Logic:
P54(x,y) ⊃ E19(x)
P54(x,y) ⊃ E53(y)

P55 has current location (currently holds)

Domain: E19 Physical Object
Range: E53 Place
Subproperty of: E18 Physical Thing. P53 has former or current location (is former or current location of): E53 Place
Quantification: many to one (0,1:0,n)

Scope note: This property records the location of an E19 Physical Object at the time of validity of the record or database containing the statement that uses this property.

This property is a specialisation of *P53 has former or current location (is former or current location of)*. It indicates that the E53 Place associated with the E19 Physical Object is the current location of the object. The property does not allow any indication of how long the Object has been at the current location.
P55 has current location (currently holds) is a shortcut. A more detailed representation can make use of the fully developed (i.e. indirect) path from '*E19 Physical Object'*,through, *'P25i moved by', 'E9 Move', 'P26 moved to', to, 'E53 Place*'if and only if this Move is the most recent.

Examples:

- silver cup 232 (E22) *has current location* Display cabinet 23, Room 4, British Museum (E53)

In First Order Logic:

P55(x,y) ⊃ E19(x)
P55(x,y) ⊃ E53(y)
P55(x,y) ⊃ P53(x,y)

P56 bears feature (is found on)

Domain: E19 Physical Object
Range: E26 Physical Feature
Subproperty of: E18 Physical Thing. P46 is composed of (forms part of): E18 Physical Thing
Quantification: one to many, dependent (0,n:1,1)

Scope note: This property links an instance of E19 Physical Object to an instance of E26 Physical Feature that it bears.
An E26 Physical Feature can only exist on one object. One object may bear more than one E26 Physical Feature. An E27 Site should be considered as an E26 Physical Feature on the surface of the Earth.
An instance B of E26 Physical Feature being a detail of the structure of another instance A of E26 Physical Feature can be linked to B by use of the property P46 is composed of (forms part of). This implies that the subfeature B is P56i found on the same E19 Physical Object as A.
P56 bears feature (is found on) is a shortcut. A more detailed representation can make use of the fully developed (i.e. indirect) path '*E19 Physical Object'*,through, *'P59 has section', 'E53 Place', 'P53i is former or current location of'*, to, *'E26 Physical Feature'*.

Examples:

- silver cup 232 (E22) *bears feature* 32 mm scratch on silver cup 232 (E26)

In First Order Logic:

P56(x,y) ⊃E19(x)
P56(x,y) ⊃ E26(y)
P56(x,y) ⊃ P46(x,y)

P57 has number of parts

Domain: E19 Physical Object
Range: E60 Number
Quantification: many to one (0,1:0,n)

Scope note: This property documents the E60 Number of parts of which an instance of E19 Physical Object is composed.

This may be used as a method of checking inventory counts with regard to aggregate or collective objects. What constitutes a part or component depends on the context and requirements of the documentation. Normally, the parts documented in this way would not be considered as worthy of individual attention.

For a more complete description, objects may be decomposed into their components and constituents using *P46 is composed of (forms parts of)* and *P45 consists of (is incorporated in)*. This allows each element to be described individually.

Examples:

- chess set 233 (E22) *has number of parts* 33 (E60)

In First Order Logic:
P57(x,y) ⊃ E19(x)
P57(x,y) ⊃ E60(y)

P58 has section definition (defines section)

Domain: E18 Physical Thing
Range: E46 Section Definition
Quantification: one to many, dependent, (0,n:1,1)

Scope note: This property links an area (section) named by a E46 Section Definition to the instance of E18 Physical Thing upon which it is found.

The CRM handles sections as locations (instances of E53 Place) within or on E18 Physical Thing that are identified by E46 Section Definitions. Sections need not be discrete and separable components or parts of an object.

This is part of a more developed path from '*E18 Physical Thing'* through *'P58 has section definition', 'E46 Section Definition, P87 is identified by, E44 Place Appellation* that allows a more precise definition of a location found on an object than the shortcut *P59 has section (is located on or within)*.
A particular instance of a Section Definition only applies to one instance of Physical Thing.

Examples:

- HMS Victory (E22) *has section definition* "poop deck of HMS Victory" (E46)

In First Order Logic:
P58(x,y) ⊃ E18(x)
P58(x,y) ⊃ E46(y)

P59 has section (is located on or within)

Domain: E18 Physical Thing
Range: E53 Place
Quantification: one to many (0,n:0,1)

Scope note: This property links an area to the instance of E18 Physical Thing upon which it is found.

It is typically used when a named E46 Section Definition is not appropriate.
E18 Physical Thing may be subdivided into arbitrary regions.

P59 has section (is located on or within) is a shortcut. If the E53 Place is identified by a Section Definition, a more detailed representation can make use of the fully developed (i.e. indirect) path from *E18 Physical Thing through P58 has section definition, E46 Section Definition, P87 is identified by E44 Place Appellation.* A Place can only be located on or within one Physical Object.

Examples:

- HMS Victory (E22) *has section* HMS Victory section B347.6 (E53)

In First Order Logic:
P59(x,y) ⊃ E18(x)
P59(x,y) ⊃ E53(y)

P62 depicts (is depicted by)

Domain: E24 Physical Man-Made Thing
Range: E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property identifies something that is depicted by an instance of E24 Physical Man-Made Thing. Depicting is meant in the sense that an E24 Physical Man-Made Thing intentionally shows, through its optical qualities or form, a representation of the entity depicted. Photographs are by default regarded as being intentional in this sense. Anything that is designed to change the properties of the depiction, such as an e-book reader, is specifically excluded. The property does not pertain to inscriptions or any other information encoding.

This property is a shortcut of the more fully developed path from E24 Physical Man-Made Thing through *P65 shows visual item*, E36 Visual Item, *P138 represents*, E1CRM Entity. P138.1 mode of representation "depiction" allows the nature of the depiction to be refined.

Examples:

- The painting "La Liberté guidant le peuple" by Eugène Delacroix (E84) *depicts* the French "July Revolution" of 1830 (E7)
- the 20 pence coin held by the Department of Coins and Medals of the British Museum under registration number 2006,1101.126 (E24) *depicts* Queen Elizabeth II (E21) *mode of depiction* Profile (E55)

In First Order Logic:

P62(x,y) ⊃ E24(x)
P62(x,y) ⊃ E1(y)
P62(x,y,z) ⊃ [P62(x,y) ∧ E55(z)]

Properties: P62.1 mode of depiction: E55 Type

P65 shows visual item (is shown by)

Domain: E24 Physical Man-Made Thing
Range: E36 Visual Item
Subproperty of: E18 Physical Thing. P128 carries (is carried by): E90 Symbolic Object
Quantification: many to many (0,n:0,n)

Scope note: This property documents an E36 Visual Item shown by an instance of E24 Physical Man-Made Thing.

This property is similar to *P62 depicts (is depicted by)* in that it associates an item of E24 Physical Man-Made Thing with a visual representation. However, *P65 shows visual item (is shown by)* differs from the *P62 depicts (is depicted by)* property in that it makes no claims about what the E36 Visual Item is deemed to represent. E36 Visual Item identifies a recognisable image or visual symbol, regardless of what this image may or may not represent.

For example, all recent British coins bear a portrait of Queen Elizabeth II, a fact that is correctly documented using *P62 depicts (is depicted by)*. Different portraits have been used at different periods, however. *P65 shows visual item (is shown by)* can be used to refer to a particular portrait.
P65 shows visual item (is shown by) may also be used for Visual Items such as signs, marks and symbols, for example the 'Maltese Cross' or the 'copyright symbol' that have no particular representational content.

This property is part of the fully developed path E24 Physical Man-Made Thing , *P65 shows visual item*, E36 Visual Item, *P138 represents*,E1 CRM Entity which is shortcut by, *P62 depicts (is depicted by)*.

Examples:

- My T-Shirt (E22) *shows visual item* Mona Lisa (E38)

In First Order Logic: P65(x,y) ⊃ E24(x)
P65(x,y) ⊃ E36(y)
P65(x,y) ⊃ P128(x,y)

P67 refers to (is referred to by)

Domain: E89 Propositional Object
Range: E1 CRM Entity
Superproperty of: E31 Document. P70 documents (is documented in): E1 CRM Entity
E32 Authority Document. P71 lists (is listed in): E1 CRM Entity
E89 Propositional Object. P129 is about (is subject of): E1 CRM Entity
E36 Visual Item. P138 represents (has representation): E1 CRM Entity
E29 Design or Procedure.P68 foresees use of (use foreseen by): E57 Material
Quantification: many to many (0,n:0,n)

Scope note: This property documents that an E89 Propositional Object makes a statement about an instance of E1 CRM Entity. *P67 refers to (is referred to by)* has the *P67.1 has type* link to an instance of E55 Type. This is intended to allow a more detailed description of the type of reference. This differs from *P129 is about (is subject of)*, which describes the primary subject or subjects of the E89 Propositional Object.

Examples:

the eBay auction listing of 4 July 2002 (E73) *refers to* silver cup 232 (E22) *has type* item for sale (E55)

In First Order Logic:

P67(x,y) ⊃ E89(x)
P67(x,y) ⊃ E1(y)
P67(x,y,z) ⊃ [P67(x,y) ∧ E55(z)]

Properties: P67.1 has type: E55 Type

P68 foresees use of (use foreseen by)

Domain: E29 Design or Procedure
Range: E57 Material
Subproperty of: E89 Propositional Object. P67 refers to (is referred to by): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an E57 Material foreseeen to be used by an E29 Design or Procedure.

E29 Designs and procedures commonly foresee the use of particular E57 Materials. The fabrication of adobe bricks, for example, requires straw, clay and water. This property enables this to be documented.

This property is not intended for the documentation of E57 Materials that were used on a particular occasion when an instance of E29 Design or Procedure was executed.

Examples:

- procedure for soda glass manufacture (E29) *foresees use of* soda (E57)

In First Order Logic:

P68(x,y) ⊃ E29(x)
P68(x,y) ⊃ E57(y)
P68(x,y) ⊃ P67(x,y)

P69 has association with (is associated with)

Domain: E29 Design or Procedure
Range: E29 Design or Procedure
Quantification: many to many (0,n:0,n)

Scope note: This property generalises relationships like whole-part, sequence, prerequisite or inspired by between instances of E29 Design or Procedure. Any instance of E29 Design or Procedure may be associated with other designs or procedures. The property is considered to be symmetrical unless otherwise indicated by *P69.1 has type*.
The *P69.1 has type* property of *P69 has association with* allows the nature of the association to be specified reading from domain to range; examples of types of association between instances of E29 Design or Procedure include: has part, follows, requires, etc.
The property can typically be used to model the decomposition of the description of a complete

workflow into a series of separate procedures.
This property is transitive.

Examples:

- Procedure for glass blowing (E29) *has association with* procedure for glass heating (E29)
- The set of instructions for performing Macbeth in Max Reinhardt's production in 1916 in Berlin at Deutsches Theater (E29) has association with the scene design drawing by Ernst Stern reproduced at http://www.glopad.org/pi/fr/record/digdoc/1003814 (E29) has type has part (E55)
- Preparation of parchment (E29) *has association with* soaking and unhairing of skin (E29) *has type* 'has part' (E55). Preparation of parchment (E29) *has association with* stretching of skin (E29) *has type* 'has part' (E55). Stretching of skin (E29) *has association with* soaking and unhairing of skin (E29) *has type* 'follows' (E55).
- The plan for reassembling the temples at Abu Simbel (E29) has association with the plan for storing and transporting the blocks (E29) has type 'follows' (E55)'.

In First Order Logic:

P69 (x,y) ⊃ E29(x)
P69 (x,y) ⊃ E29(y)
P69(x,y,z) ⊃ [P69(x,y) ∧ E55(z)]
P69(x,y) ⊃P69(y,x)

Properties: P69.1 has type: E55 Type

P70 documents (is documented in)

Domain: E31 Document
Range: E1 CRM Entity
Subproperty of: E89 Propositional Object. P67 refers to (is referred to by): E1 CRM Entity
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property describes the CRM Entities documented by instances of E31 Document.

Documents may describe any conceivable entity, hence the link to the highest-level entity in the CRM hierarchy. This property is intended for cases where a reference is regarded as being of a documentary character, in the scholarly or scientific sense.

Examples:

- the British Museum catalogue (E31) *documents* the British Museum's Collection (E78)

In First Order Logic:

P70 (x,y) ⊃ E31(x)
P70 (x,y) ⊃ E1(y)
P70(x,y) ⊃ P67(x,y)

P71 lists (is listed in)

Domain: E32 Authority Document
Range: E1 CRM Entity
Subproperty of: E89 Propositional Object. P67 refers to (is referred to by): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property documents a source E32 Authority Document for an instance of an E1 CRM Entity.

Examples:

- the Art & Architecture Thesaurus (E32) *lists* alcazars (E55)

In First Order Logic:

P71(x,y) ⊃ E32(x)
P71(x,y) ⊃ E1(y)
P71(x,y) ⊃ P67(x,y)

P72 has language (is language of)

Domain: E33 Linguistic Object
Range: E56 Language
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property describes the E56 Language of an E33 Linguistic Object.

Linguistic Objects are composed in one or more human Languages. This property allows these languages to be documented.

Examples:

- the American Declaration of Independence (E33*) has language* 18th Century English (E56)

In First Order Logic:

P72(x,y) ⊃ E33(x)
P72(x,y) ⊃ E56(y)

P73 has translation (is translation of)

Domain: E33 Linguistic Object
Range: E33 Linguistic Object
Subproperty of: E70 Thing. P130i features are also found on: E70 Thing
Quantification: one to many (0,n:0,1)

Scope note: This property describes the source and target of instances of E33Linguistic Object involved in a translation.

When a Linguistic Object is translated into a new language it becomes a new Linguistic Object, despite being conceptually similar to the source object.
This property is transitive

Examples:

- "Les Baigneurs" (E33) *has translation* "The Bathers" (E33)

In First Order Logic:

P73(x,y) ⊃ E33(x)
P73(x,y) ⊃ E33(y)
P73(x,y) ⊃ P130(y,x)

P74 has current or former residence (is current or former residence of)

Domain: E39 Actor
Range: E53 Place
Quantification: many to many (0,n:0,n)

Scope note: This property describes the current or former E53 Place of residence of an E39 Actor.

The residence may be either the Place where the Actor resides, or a legally registered address of any kind.

Examples:

- Queen Elizabeth II (E39) *has current or former residence* Buckingham Palace (E53)

In First Order Logic:

P74(x,y) ⊃ E39(x)
P74(x,y) ⊃ E53(y)

P75 possesses (is possessed by)

Domain: E39 Actor
Range: E30 Right
Quantification: many to many (0,n:0,n)

Scope note: This property identifies former or current instances of E30 Rights held by an E39 Actor.
Examples:

- Michael Jackson (E21) *possesses* Intellectual property rights on the Beatles' back catalogue (E30)

In First Order Logic:
P75(x,y) ⊃ E39(x)
P75(x,y) ⊃ E30(y)

P76 has contact point (provides access to)

Domain: E39 Actor
Range: E51 Contact Point
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an E51 Contact Point of any type that provides access to an E39 Actor by any communication method, such as e-mail or fax.
Examples:

- RLG (E40) *has contact point* "bl.ric@rlg.org" (E51)

In First Order Logic:
P76(x,y) ⊃ E39(x)
P76(x,y) ⊃ E51(y)

P78 is identified by (identifies)

Domain: E52 Time-Span
Range: E49 Time Appellation
Subproperty of: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an E52 Time-Span using an E49Time Appellation.
Examples:

- the time span 1926 to 1988 (E52) *is identified by* "Showa" (Japanese time appellation) (E49)

In First Order Logic:
P78(x,y) ⊃ E52(x)
P78(x,y) ⊃ E49(y)
P78(x,y) ⊃ P1(x,y)

P79 beginning is qualified by

Domain: E52 Time-Span
Range: E62 String
Subproperty of: E1 CRM Entity. P3 has note: E62 String
Quantification: many to one (0,1:0,n)

Scope note: This property qualifies the beginning of an E52 Time-Span in some way.

The nature of the qualification may be certainty, precision, source etc.
Examples:

- the time-span of the Holocene (E52) *beginning is qualified by* approximately (E62)

In First Order Logic:
P79 (x,y) ⊃ E52 (x)
P79 (x,y) ⊃ E62(y)

P79(x,y) ⊃ P3(x,y)

P80 end is qualified by

Domain: E52 Time-Span
Range: E62 String
Subproperty of: E1 CRM Entity. P3 has note: E62 String
Quantification: many to one (0,1:0,n)

Scope note: This property qualifies the end of an E52 Time-Span in some way.

The nature of the qualification may be certainty, precision, source etc.

Examples:

- the time-span of the Holocene (E52) *end is qualified by* approximately (E62)

In First Order Logic:

P80(x,y) ⊃ E52(x)
P80(x,y) ⊃ E62(y)
P80(x,y) ⊃ P3(x,y)

P81 ongoing throughout

Domain: E52 Time-Span
Range: E61 Time Primitive
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property describes the minimum period of time covered by an E52 Time-Span.

Since Time-Spans may not have precisely known temporal extents, the CRM supports statements about the minimum and maximum temporal extents of Time-Spans. This property allows a Time-Span's minimum temporal extent (i.e. its inner boundary) to be assigned an E61 Time Primitive value. Time Primitives are treated by the CRM as application or system specific date intervals, and are not further analysed.

Examples:

- the time-span of the development of the CIDOC CRM (E52) *ongoing throughout* 1996-2002 (E61)

In First Order Logic:

P81 (x,y) ⊃ E52(x)
P81 (x,y) ⊃ E61(y)

P82 at some time within

Domain: E52 Time-Span
Range: E61 Time Primitive
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property describes the maximum period of time within which an E52 Time-Span falls.

Since Time-Spans may not have precisely known temporal extents, the CRM supports statements about the minimum and maximum temporal extents of Time-Spans. This property allows a Time-Span's maximum temporal extent (i.e. its outer boundary) to be assigned an E61 Time Primitive value. Time Primitives are treated by the CRM as application or system specific date intervals, and are not further analysed.

Examples:

- the time-span of the development of the CIDOC CRM (E52) *at some time within* 1992-infinity (E61)

In First Order Logic:
P82 (x,y) ⊃ E52(x)
P82 (x,y) ⊃ E61(y)

P83 had at least duration (was minimum duration of)

Domain: E52 Time-Span
Range: E54 Dimension
Quantification: one to one (1,1:1,1)

Scope note: This property describes the minimum length of time covered by an E52 Time-Span.

It allows an E52 Time-Span to be associated with an E54 Dimension representing it's minimum duration (i.e. it's inner boundary) independent from the actual beginning and end.

Examples:

- the time span of the Battle of Issos 333 B.C.E. (E52) *had at least duration* Battle of Issos minimum duration (E54) *has unit (P91)* day (E58) *has value (P90)* 1 (E60)

In First Order Logic:
P83(x,y) ⊃ E52(x)
P83(x,y) ⊃ E54(y)

P84 had at most duration (was maximum duration of)

Domain: E52 Time-Span
Range: E54 Dimension
Quantification: one to one (1,1:1,1)

Scope note: This property describes the maximum length of time covered by an E52 Time-Span.

It allows an E52 Time-Span to be associated with an E54 Dimension representing it's maximum duration (i.e. it's outer boundary) independent from the actual beginning and end.

Examples:

- the time span of the Battle of Issos 333 B.C.E. (E52) *had at most duration* Battle of Issos maximum duration (E54) *has unit (P91)* day (E58) *has value (P90)* 2 (E60)

In First Order Logic:
P84(x,y) ⊃ E52(x)
P84(x,y) ⊃ E54(y)

P86 falls within (contains)

Domain: E52 Time-Span
Range: E52 Time-Span
Quantification: many to many (0,n:0,n)

Scope note: This property describes the inclusion relationship between two instances of E52 Time-Span.

This property supports the notion that a Time-Span's temporal extent falls within the temporal extent of another Time-Span. It addresses temporal containment only, and no contextual link between the two instances of Time-Span is implied.
This property is transitive.

Examples:

- the time-span of the Apollo 11 moon mission (E52) *falls within* the time-span of the reign of

Queen Elizabeth II (E52)

In First Order Logic:
P86(x,y) ⊃ E52(x)
P86(x,y) ⊃ E52(y)

P87 is identified by (identifies)

Domain: E53 Place
Range: E44 Place Appellation
Subproperty of: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an E53 Place using an E44 Place Appellation.

Examples of Place Appellations used to identify Places include instances of E48 Place Name, addresses, E47 Spatial Coordinates etc.

Examples:

- the location of the Duke of Wellington's House (E53) *is identified by* "No 1 London" (E45)

In First Order Logic:
P87(x,y) ⊃ E53(x)
P87(x,y) ⊃ E44(y)
P87(x,y) ⊃ P1(x,y)

P89 falls within (contains)

Domain: E53 Place
Range: E53 Place
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an instance of E53 Place that falls wholly within the extent of another E53 Place.

It addresses spatial containment only, and does not imply any relationship between things or phenomena occupying these places.
This property is transitive.

Examples:

- the area covered by the World Heritage Site of Stonehenge (E53) *falls within* the area of Salisbury Plain (E53)

In First Order Logic:
P89(x,y) ⊃ E53(x)
P89(x,y) ⊃ E53(y)

P90 has value

Domain: E54 Dimension
Range: E60 Number
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property allows an E54 Dimension to be approximated by an E60 Number primitive.

Examples:

- height of silver cup 232 (E54) *has value* 226 (E60)

In First Order Logic:

P90(x,y) ⊃ E54(x)
P90(x,y) ⊃ E60(y)

P91 has unit (is unit of)

Domain: E54 Dimension
Range: E58 Measurement Unit
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property shows the type of unit an E54 Dimension was expressed in.

Examples:

- height of silver cup 232 (E54) *has unit* mm (E58)

In First Order Logic:

P91(x,y) ⊃ E54(x)
P91(x,y) ⊃ E58(y)

P92 brought into existence (was brought into existence by)

Domain: E63 Beginning of Existence
Range: E77 Persistent Item
Subproperty of: E5 Event. P12 occurred in the presence of (was present at): E77 Persistent Item
Superproperty of: E65 Creation. P94 has created (was created by): E28 Conceptual Object
E66 Formation. P95 has formed (was formed by): E74 Group
E67 Birth. P98 brought into life (was born): E21 Person
E12 Production. P108 has produced (was produced by): E24 Physical Man-Made Thing
E81 Transformation. P123 resulted in (resulted from): E77 Persistent Item
Quantification: one to many, necessary, dependent (1,n:1,1)

Scope note: This property allows an E63 Beginning of Existence event to be linked to the E77 Persistent Item brought into existence by it.

It allows a "start" to be attached to any Persistent Item being documented i.e. E70 Thing, E72 Legal Object, E39 Actor, E41 Appellation, E51 Contact Point and E55 Type.

Examples:

- the birth of Mozart (E67*) brought into existence* Mozart (E21)

In First Order Logic:

P92(x,y) ⊃ E63(x)
P92(x,y) ⊃ E77(y)
P92(x,y) ⊃ P12(x,y)

P93 took out of existence (was taken out of existence by)

Domain: E64 End of Existence
Range: E77 Persistent Item
Subproperty of: E5 Event. P12 occurred in the presence of (was present at): E77 Persistent Item
Superproperty of: E6 Destruction. P13 destroyed (was destroyed by): E18 Physical Thing
E68 Dissolution. P99 dissolved (was dissolved by): E74 Group
E69 Death. P100 was death of (died in): E21 Person
E81 Transformation. P124 transformed (was transformed by): E77 Persistent Item
Quantification: one to many, necessary (1,n:0,1)

Scope note: This property allows an E64 End of Existence event to be linked to the E77 Persistent Item taken out of existence by it.
In the case of immaterial things, the E64 End of Existence is considered to take place with the destruction of the last physical carrier.
This allows an "end" to be attached to any Persistent Item being documented i.e. E70 Thing, E72 Legal Object, E39 Actor, E41 Appellation, E51 Contact Point and E55 Type. For many Persistent Items we

know the maximum life-span and can infer, that they must have ended to exist. We assume in that case an End of Existence, which may be as unnoticeable as forgetting the secret knowledge by the last representative of some indigenous nation.

Examples:

- the death of Mozart (E69) *took out of existence* Mozart (E21)

In First Order Logic:

P93 (x,y) ⊃ E64(x)
P93 (x,y) ⊃ E77(y)
P93(x,y) ⊃ P12(x,y)

P94 has created (was created by)

Domain: E65 Creation
Range: E28 Conceptual Object
Subproperty of: E63 Beginning of Existence. P92 brought into existence (was brought into existence by): E77 Persistent Item
Superproperty of: E83 Type Creation. P135 created type (was created by): E55 Type
Quantification: one to many, necessary, dependent (1,n:1,1)

Scope note: This property allows a conceptual E65 Creation to be linked to the E28 Conceptual Object created by it.

It represents the act of conceiving the intellectual content of the E28 Conceptual Object. It does not represent the act of creating the first physical carrier of the E28 Conceptual Object. As an example, this is the composition of a poem, not its commitment to paper.

Examples:

- the composition of "The Four Friends" by A. A. Milne (E65) *has created* "The Four Friends" by A. A. Milne (E28)

In First Order Logic:

P94(x,y) ⊃ E65(x)
P94(x,y) ⊃ E28(y)
P94(x,y) ⊃ P92(x,y)

P95 has formed (was formed by)

Domain: E66 Formation
Range: E74 Group
Subproperty of: E63 Beginning of Existence. P92 brought into existence (was brought into existence by): E77 Persistent Item
Quantification: one to many, necessary, dependent (1,n:1,1)

Scope note: This property links the founding or E66 Formation for an E74 Group with the Group itself.

Examples:

- the formation of the CIDOC CRM SIG at the August 2000 CIDOC Board meeting (E66) *has formed* the CIDOC CRM Special Interest Group (E74)

In First Order Logic:

P95(x,y) ⊃ E66(x)
P95(x,y) ⊃ E74(y)
P95(x,y) ⊃ P92(x,y)

P96 by mother (gave birth)

Domain: E67 Birth
Range: E21 Person
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property links an E67 Birth event to an E21 Person as a participant in the role of birth-giving mother.
Note that biological fathers are not necessarily participants in the Birth (see *P97 from father (was father for)*). The Person being born is linked to the Birth with the property *P98 brought into life (was born)*. This is not intended for use with general natural history material, only people. There is no explicit method for modelling conception and gestation except by using extensions. This is a sub-property of *P11 had participant (participated in)*.

Examples:

- the birth of Queen Elizabeth II (E67) *by mother* Queen Mother (E21)

In First Order Logic:

P96(x,y) ⊃ E67(x)
P96(x,y) ⊃ E21(y)
P96(x,y) ⊃ P11(x,y)

P97 from father (was father for)

Domain: E67 Birth
Range: E21 Person
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property links an E67 Birth event to an E21 Person in the role of biological father.

Note that biological fathers are not seen as necessary participants in the Birth, whereas birth-giving mothers are (see *P96 by mother (gave birth)*). The Person being born is linked to the Birth with the property *P98 brought into life (was born)*.

This is not intended for use with general natural history material, only people. There is no explicit method for modelling conception and gestation except by using extensions.
A Birth event is normally (but not always) associated with one biological father.

Examples:

- King George VI (E21) *was father for* the birth of Queen Elizabeth II (E67)

In First Order Logic:

P97(x,y) ⊃ E67(x)
P97(x,y) ⊃ E21(y)

P98 brought into life (was born)

Domain: E67 Birth
Range: E21 Person
Subproperty of: E63 Beginning of Existence. P92 brought into existence (was brought into existence by): E77 Persistent Item
Quantification: one to many, dependent (0,n:1,1)

Scope note: This property links an E67Birth event to an E21 Person in the role of offspring.

Twins, triplets etc. are brought into life by the same Birth event. This is not intended for use with general Natural History material, only people. There is no explicit method for modelling conception and gestation except by using extensions.

Examples:

- the Birth of Queen Elizabeth II (E67) *brought into life* Queen Elizabeth II (E21)

In First Order Logic:

P98(x,y) ⊃ E67(x)
P98(x,y) ⊃ E21(y)
P98(x,y) ⊃ P92(x,y)

P99 dissolved (was dissolved by)

Domain: E68 Dissolution
Range: E74 Group
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
E64 End of Existence. P93 took out of existence (was taken out of existence by): E77 Persistent Item
Quantification: one to many, necessary (1,n:0,n)

Scope note: This property links the disbanding or E68 Dissolution of an E74 Group to the Group itself.
Examples:

- the end of The Hole in the Wall Gang (E68) *dissolved* The Hole in the Wall Gang (E74)

In First Order Logic:
P99(x,y) ⊃ E68(x)
P99(x,y) ⊃ E74(y)
P99(x,y) ⊃ P11(x,y)
P99(x,y) ⊃ P93(x,y)

P100 was death of (died in)

Domain: E69 Death
Range: E21 Person
Subproperty of: E64 End of Existence. P93 took out of existence (was taken out of existence by): E77 Persistent Item
Quantification: one to many, necessary (1,n:0,n)

Scope note: This property links an E69 Death event to the E21 Person that died.

A Death event may involve multiple people, for example in the case of a battle or disaster.
This is not intended for use with general Natural History material, only people.

Examples:

- Mozart's death (E69) *was death of* Mozart (E21)

In First Order Logic:
P100(x,y) ⊃ E69(x)
P100(x,y) ⊃ E21(y)
P100(x,y) ⊃ P93(x,y)
P101(x,y) ⊃ E70(x)
P101(x,y) ⊃ E55(y)

P101 had as general use (was use of)

Domain: E70 Thing
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property links an instance of E70 Thing to an E55 Type of usage.

It allows the relationship between particular things, both physical and immaterial, and general methods and techniques of use to be documented. Thus it can be asserted that a baseball bat had a general use for sport and a specific use for threatening people during the Great Train Robbery.

Examples:

- Tony Gill's Ford Mustang (E22) *had as general use* transportation (E55)

In First Order Logic:
P101(x,y) ⊃ E70(x)
P101(x,y) ⊃ E55(y)

P102 has title (is title of)

Domain: E71 Man-Made Thing
Range: E35 Title
Subproperty of: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property describes the E35 Title applied to an instance of E71 Man-Made Thing. The E55 Type of Title is assigned in a sub property.

The *P102.1 has type* property of the *P102 has title (is title of)* property enables the relationship between the Title and the thing to be further clarified, for example, if the Title was a given Title, a supplied Title etc.
It allows any man-made material or immaterial thing to be given a Title. It is possible to imagine a Title being created without a specific object in mind.

Examples:

- the first book of the Old Testament (E33) *has title* "Genesis" (E35)
  has type translated (E55)

In First Order Logic:

P102(x,y) ⊃ E71(x)
P102(x,y) ⊃ E35(y)
P102(x,y,z) ⊃ [P102(x,y) ∧ E55(z)]
P102(x,y) ⊃ P1(x,y)

Properties: P102.1 has type: E55 Type

P103 was intended for (was intention of)

Domain: E71 Man-Made Thing
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property links an instance of E71 Man-Made Thing to an E55 Type of usage.

It creates a property between specific man-made things, both physical and immaterial, to Types of intended methods and techniques of use. Note: A link between specific man-made things and a specific use activity should be expressed using *P19 was intended use of (was made for).*

Examples:

- this plate (E22) *was intended for* being destroyed at wedding reception (E55)

In First Order Logic:

P103(x,y) ⊃ E71(x)
P103(x,y) ⊃ E55(y)

P104 is subject to (applies to)

Domain: E72 Legal Object
Range: E30 Right
Quantification: many to many (0,n:0,n)

Scope note: This property links a particular E72 Legal Object to the instances of E30 Right to which it is subject.

The Right is held by an E39 Actor as described by *P75 possesses (is possessed by)*.

Examples:

- Beatles back catalogue (E72) *is subject to* reproduction right on Beatles back catalogue (E30)

In First Order Logic:

P104(x,y) ⊃ E72(x)
P104(x,y) ⊃ E30(y)

P105 right held by (has right on)

Domain: E72 Legal Object
Range: E39 Actor
Superproperty of: E18 Physical Thing .P52 has current owner (is current owner of): E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E39 Actor who holds the instances of E30 Right to an E72 Legal Object.
It is a superproperty of *P52 has current owner (is current owner of)* because ownership is a right that is held on the owned object.

P105 right held by (has right on) is a shortcut of the fully developed path E72 Legal Object,*P104 is subject to*, E30 Right, *P75i is possessed by*, E39 Actor.

Examples:

- Beatles back catalogue (E73) *right held by* Michael Jackson (E21)

In First Order Logic:
P105(x,y) ⊃ E72(x)
P105(x,y) ⊃ E39(y)

P106 is composed of (forms part of)

Domain: E90 Symbolic Object
Range: E90 Symbolic Object

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

Scope note: This property associates an instance of E90 Symbolic Object with a part of it that is by itself an instance of E90 Symbolic Object, such as fragments of texts or clippings from an image.
This property is transitive.

Examples:

- This Scope note P106 (E33) is composed of fragments of texts (E33)
- 'recognizable' P106 (E90) is composed of 'ecognizabl' (E90)

In First Order Logic:
P106(x,y) ⊃ E90(x)
P106(x,y) ⊃ E90(y)

P107 has current or former member (is current or former member of)

Domain: E74 Group
Range: E39 Actor
Quantification: many to many (0,n:0,n)

Scope note: This property relates an E39 Actor to the E74 Group of which that E39 Actor is a member.

Groups, Legal Bodies and Persons, may all be members of Groups. A Group necessarily consists of more than one member.

This property is a shortcut of the more fully developed path *E74 Group , P144i gained member by, E85 Joining, P143 joined , E39 Actor*
The property P107.1 *kind of member* can be used to specify the type of membership or the role the member has in the group.

Examples:

- Moholy Nagy (E21) *is current or former member of* Bauhaus (E74)
- National Museum of Science and Industry (E40) *has current or former member* The National

Railway Museum (E40)
- The married couple Queen Elisabeth and Prince Phillip (E74) *has current or former member* Prince Phillip (E21) with P107.1 *kind of member* husband (E55 Type)

In First Order Logic:
P107(x,y) ⊃ E74(x)
P107(x,y) ⊃ E39(y)
P107(x,y,z) ⊃ [P107(x,y) ∧ E55(z)]

Properties: P107.1 *kind of member*: E55 Type

P108 has produced (was produced by)

Domain: E12 Production
Range: E24 Physical Man-Made Thing
Subproperty of: E11 Modification. P31 has modified (was modified by): E24 Physical Man-Made Thing
E63 Beginning of Existence. P92 brought into existence (was brought into existence by): E77 Persistent Item
Quantification: one to many, necessary, dependent (1,n:1,1)

Scope note: This property identifies the E24 Physical Man-Made Thing that came into existence as a result of an E12 Production.

The identity of an instance of E24 Physical Man-Made Thing is not defined by its matter, but by its existence as a subject of documentation. An E12 Production can result in the creation of multiple instances of E24 Physical Man-Made Thing.

Examples:
- The building of Rome (E12) *has produced* The Colosseum (E22)

In First Order Logic:
P108(x,y) ⊃ E12(x)
P108(x,y) ⊃ E24(y)
P108(x,y) ⊃ P31(x,y)
P108(x,y) ⊃ P92(x,y)

P109 has current or former curator (is current or former curator of)

Domain: E78 Collection
Range: E39 Actor
Subproperty of: E18 Physical Thing.P49 has former or current keeper (is former or current keeper of): E39 Actor
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E39 Actor or Actors who assume or have assumed overall curatorial responsibility for an E78 Collection.

It does not allow a history of curation to be recorded. This would require use of an Event initiating a curator being responsible for a Collection.

Examples:
- the Robert Opie Collection (E78) *has current or former curator* Robert Opie (E39)
- the Mikael Heggelund Foslie's coralline red algae Herbarium (E78) *has current or former curator* Mikael Heggelund Foslie

In First Order Logic:
P109(x,y) ⊃ E78(x)
P109(x,y) ⊃ E39(y)
P109(x,y) ⊃ P49(x,y)

P110 augmented (was augmented by)

Domain: E79 Part Addition
Range: E24 Physical Man-Made Thing
Subproperty of: E11 Modification. P31 has modified (was modified by): E24 Physical Man-Made Thing
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E24 Physical Man-Made Thing that is added to (augmented) in an E79 Part Addition.

Although a Part Addition event normally concerns only one item of Physical Man-Made Thing, it is possible to imagine circumstances under which more than one item might be added to (augmented). For example, the artist Jackson Pollock trailing paint onto multiple canvasses.

Examples:

- the final nail-insertion Event (E79) *augmented* Coffin of George VI (E24)

In First Order Logic:

P110(x,y) ⊃ E79(x)
P110(x,y) ⊃ E24(y)
P110(x,y) ⊃ P31(x,y)

P111 added (was added by)

Domain: E79 Part Addition
Range: E18 Physical Thing
Subproperty of: E5 Event. P12 occurred in the presence of (was present at):E77 Persistent Item
E7 Activity.P16 used specific object (was used for):E70 Thing
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E18 Physical Thing that is added during an E79 Part Addition activity
Examples:

- the insertion of the final nail (E79) *added* the last nail in George VI's coffin (E18)

In First Order Logic:

P111(x,y) ⊃ E79(x)
P111(x,y) ⊃ E18(y)
P111(x,y) ⊃ P12(x,y)
P111(x,y) ⊃ P16(x,y)

P112 diminished (was diminished by)

Domain: E80 Part Removal
Range: E24 Physical Man-Made Thing
Subproperty of: E11 Modification. P31 has modified (was modified by): E24 Physical Man-Made Thing
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E24 Physical Man-Made Thing that was diminished by E80 Part Removal.

Although a Part removal activity normally concerns only one item of Physical Man-Made Thing, it is possible to imagine circumstances under which more than one item might be diminished by a single Part Removal activity.

Examples:

- the coffin of Tut-Ankh-Amun (E22) *was diminished by* The opening of the coffin of Tut-Ankh-Amun (E80)

In First Order Logic:

P112(x,y) ⊃ E80(x)
P112(x,y) ⊃ E24(y)

P112(x,y) ⊃ P31(x,y)

P113 removed (was removed by)

Domain: E80 Part Removal
Range: E18 Physical Thing
Subproperty of: E5 Event. P12 occurred in the presence of (was present at):E77 Persistent Item
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E18 Physical Thing that is removed during an E80 Part Removal activity.
Examples:

- the opening of the coffin of Tut-Ankh-Amun (E80) *removed* The mummy of Tut-Ankh-Amun (E20,E22)

In First Order Logic:

P113(x,y) ⊃ E80(x)
P113(x,y) ⊃ E18(y)
P113(x,y) ⊃ P12(x,y)

P114 is equal in time to

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note: This symmetric property allows the instances of E2 Temporal Entity with the same E52 Time-Span to be equated.
This property is only necessary if the time span is unknown (otherwise the equivalence can be calculated).

This property is the same as the "equal" relationship of Allen's temporal logic (Allen, 1983, pp. 832-843).
This property is transitive.

Examples:

- the destruction of the Villa Justinian Tempus (E6) *is equal in time to* the death of Maximus Venderus (E69)

In First Order Logic:

P114(x,y) ⊃ E2(x)
P114(x,y) ⊃ E2(y)
P114(x,y) ⊃ P114(y,x)

P115 finishes (is finished by)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note: This property identifies a situation in which the ending point of an instance of E2 Temporal Entity is equal to the ending point of another temporal entity of longer duration. There is no causal relationship implied by this property.
This property is only necessary if the time span is unknown (otherwise the relationship can be calculated). This property is the same as the "finishes / finished-by" relationships of Allen's temporal logic (Allen, 1983, pp. 832-843).
This property is transitive.

Examples:

- Late Bronze Age (E4) *finishes* Bronze Age (E4)

In First Order Logic:

P115(x,y) ⊃ E2(x)
P115(x,y) ⊃ E2(y)

P116 starts (is started by)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note: This property allows the starting point for a E2 Temporal Entity to be situated by reference to the starting point of another temporal entity of longer duration.

This property is only necessary if the time span is unknown (otherwise the relationship can be calculated). This property is the same as the "starts / started-by" relationships of Allen's temporal logic (Allen, 1983, pp. 832-843).
This property is transitive.

Examples:

- Early Bronze Age (E4) *starts* Bronze Age (E4)

In First Order Logic:

P116(x,y) ⊃ E2(x)
P116(x,y) ⊃ E2(y)

P117 occurs during (includes)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note: This property allows the entire E52 Time-Span of an E2 Temporal Entity to be situated within the Time-Span of another temporal entity that starts before and ends after the included temporal entity.

This property is only necessary if the time span is unknown (otherwise the relationship can be calculated). This property is the same as the "during / includes" relationships of Allen's temporal logic (Allen, 1983, pp. 832-843).
This property is transitive.

Examples:

- Middle Saxon period (E4) *occurs during* Saxon period (E4)

In First Order Logic:

P117(x,y) ⊃ E2(x)
P117(x,y) ⊃ E2(y)

P118 overlaps in time with (is overlapped in time by)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an overlap between the instances of E52 Time-Span of two instances of E2 Temporal Entity.

It implies a temporal order between the two entities: if A overlaps in time B, then A must start before B, and B must end after A. This property is only necessary if the relevant time spans are unknown (otherwise the relationship can be calculated).

This property is the same as the "overlaps / overlapped-by" relationships of Allen's temporal logic (Allen, 1983, pp. 832-843).

Examples:

- the Iron Age (E4) *overlaps in time with* the Roman period (E4)

In First Order Logic:

P118(x,y) ⊃ E2(x)
P118(x,y) ⊃ E2(y)

P119 meets in time with (is met in time by)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note: This property indicates that one E2 Temporal Entity immediately follows another.

It implies a particular order between the two entities: if A meets in time with B, then A must precede B. This property is only necessary if the relevant time spans are unknown (otherwise the relationship can be calculated).

This property is the same as the "meets / met-by" relationships of Allen's temporal logic (Allen, 1983, pp. 832-843).

Examples:

- Early Saxon Period (E4) *meets in time with* Middle Saxon Period (E4)

In First Order Logic:

P119(x,y) ⊃ E2(x)
P119(x,y) ⊃ E2(y)

P120 occurs before (occurs after)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the relative chronological sequence of two temporal entities.

It implies that a temporal gap exists between the end of A and the start of B. This property is only necessary if the relevant time spans are unknown (otherwise the relationship can be calculated).

This property is the same as the "before / after" relationships of Allen's temporal logic (Allen, 1983, pp. 832-843).
This property is transitive.

Examples:

- Early Bronze Age (E4) *occurs before* Late Bronze age (E4)

In First Order Logic:

P120(x,y) ⊃ E2(x)
P120(x,y) ⊃ E2(y)

P121 overlaps with

Domain: E53 Place
Range: E53 Place
Quantification: many to many (0,n:0,n)

Scope note: This symmetric property allows the instances of E53 Place with overlapping geometric extents to be associated with each other.

It does not specify anything about the shared area. This property is purely spatial, in contrast to Allen operators, which are purely temporal.

Examples:

- the territory of the United States (E53) *overlaps with* the Arctic (E53)
- The maximal extent of the Greek Kingdom (E53) *overlaps with* the maximal extent of the Ottoman Empire(E53)

In First Order Logic:

P121(x,y) ⊃ E53(x)
P121(x,y) ⊃ E53(y)
P121(x,y) ⊃ P121(y,x)

P122 borders with

Domain: E53 Place
Range: E53 Place
Quantification: many to many (0,n:0,n)

Scope note: This symmetric property allows the instances of E53 Place which share common borders to be related as such.

This property is purely spatial, in contrast to Allen operators, which are purely temporal.

Examples:

- Scotland (E53) *borders with* England (E53)

In First Order Logic:

P122(x,y) ⊃ E53(x)
P122(x,y) ⊃ E53(y)
P122(x,y) ⊃ P122(y,x)

P123 resulted in (resulted from)

Domain: E81 Transformation
Range: E77 Persistent Item
Subproperty of: E63 Beginning of Existence. P92 brought into existence (was brought into existence by): E77 Persistent Item
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the E77 Persistent Item or items that are the result of an E81 Transformation.

New items replace the transformed item or items, which cease to exist as units of documentation. The physical continuity between the old and the new is expressed by the link to the common Transformation.

Examples:

- the transformation of the Venetian Loggia in Heraklion into a city hall (E81) *resulted in* the City Hall of Heraklion (E22)
- the death and mummification of Tut-Ankh-Amun (E81) resulted in the Mummy of Tut Tut-Ankh-Amun (E22 and E20)

In First Order Logic:
P123(x,y) ⊃ E81(x)
P123(x,y) ⊃ E77(y)
P123(x,y) ⊃ P92(x,y)

P124 transformed (was transformed by)

Domain: E81 Transformation
Range: E77 Persistent Item
Subproperty of: E64 End of Existence. P93 took out of existence (was taken out of existence by): E77 Persistent Item
Quantification: one to many, necessary (1,n:0,1)

Scope note: This property identifies the E77 Persistent Item or items that cease to exist due to a E81 Transformation.

It is replaced by the result of the Transformation, which becomes a new unit of documentation. The continuity between both items, the new and the old, is expressed by the link to the common Transformation.

Examples:

- the transformation of the Venetian Loggia in Heraklion into a city hall (E81) *transformed* the Venetian Loggia in Heraklion (E22)
- the death and mummification of Tut-Ankh-Amun (E81) *transformed* the ruling Pharao Tut-Ankh-Amun (E21)

In First Order Logic:
P124(x,y) ⊃ E81(x)
P124(x,y) ⊃ E77(y)
P124(x,y) ⊃ P93(x,y)

P125 used object of type (was type of object used in)

Domain: E7 Activity
Range: E55 Type

Superproperty of: E7 Activity.P32 used general technique (was technique of): E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property defines the kind of objects used in an E7 Activity, when the specific instance is either unknown or not of interest, such as use of "a hammer".

Examples:

- at the Battle of Agincourt (E7), the English archers *used object of type* long bow (E55)

In First Order Logic:
P125(x,y) ⊃ E7(x)
P125(x,y) ⊃ E55(y)

P126 employed (was employed in)

Domain: E11 Modification
Range: E57 Material
Quantification: many to many (0,n:0,n)

Scope note: This property identifies E57 Material employed in an E11 Modification.

The E57 Material used during the E11 Modification does not necessarily become incorporated into the E24 Physical Man-Made Thing that forms the subject of the E11 Modification.

Examples:

- the repairing of the Queen Mary (E11) *employed* Steel (E57)
- distilled water (E57) *was employed in* the restoration of the Sistine Chapel (E11)

In First Order Logic:
P126(x,y) ⊃ E11(x)
P126(x,y) ⊃ E57(y)

P127 has broader term (has narrower term)

Domain: E55 Type
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property identifies a super-Type to which an E55 Type is related.

It allows Types to be organised into hierarchies. This is the sense of "broader term generic (BTG)" as defined in ISO 2788
This property is transitive.

Examples:

- dime (E55) *has broader term* coin (E55)

In First Order Logic:
P127(x,y) ⊃ E55(x)
P127(x,y) ⊃ E55(y)

P128 carries (is carried by)

Domain: E18 Physical Thing
Range: E90 Symbolic Object
Subproperty of: E70 Thing.P130 shows features of (features are also found on):E70 Thing
Superproperty of: E24 Physical Man-Made Thing. P65 shows visual item (is shown by): E36 Visual Item
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an E90 Symbolic Object carried by an instance of E18 Physical Thing.

Examples:

- Matthew's paperback copy of Reach for the Sky (E84) *carries* the text of Reach for the Sky (E73)

In First Order Logic:
P128(x,y) ⊃ E18(x)
P128(x,y) ⊃ E90(y)
P128(x,y) ⊃ P130(x,y)

P129 is about (is subject of)

Domain: E89 Propositional Object
Range: E1 CRM Entity
Subproperty: E89 Propositional Object. P67 refers to (is referred to by): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property documents that an E89 Propositional Object has as subject an instance of E1 CRM Entity.

This differs from P67 refers to (is referred to by), which refers to an E1 CRM Entity, in that it describes the primary subject or subjects of an E89 Propositional Object.

Examples:

- The text entitled 'Reach for the sky' (E33*) is about* Douglas Bader (E21)

In First Order Logic:
P129(x,y) ⊃ E89(x)

P129(x,y) ⊃ E1(y)
P129(x,y) ⊃ P67(x,y)

P130 shows features of (features are also found on)

Domain: E70 Thing
Range: E70 Thing
Superproperty of: E33 Linguistic Object. P73i has translation (is translation of): E33 Linguistic Object
E18 Physical Thing. P128 carries (is carried by): E90 Symbolic Object
Quantification: many to many (0,n:0,n)

Scope note: This property generalises the notions of "copy of" and "similar to" into a directed relationship, where the domain expresses the derivative or influenced item and the range the source or influencing item, if such a direction can be established. The property can also be used to express similarity in cases that can be stated between two objects only, without historical knowledge about its reasons. The property expresses a symmetric relationship in case no direction of influence can be established either from evidence on the item itself or from historical knowledge. This holds in particular for siblings of a derivation process from a common source or non-causal cultural parallels, such as some weaving patterns.

The *P130.1 kind of similarity* property of the *P130 shows features of (features are also found on)* property enables the relationship between the domain and the range to be further clarified, in the sense from domain to range, if applicable. For example, it may be expressed if both items are product "of the same mould", or if two texts "contain identical paragraphs".

If the reason for similarity is a sort of derivation process, i.e., that the creator has used or had in mind the form of a particular thing during the creation or production, this process should be explicitly modelled. In these cases, *P130 shows features of* can be regarded as a shortcut of such a process. However, the current model does not contain any path specific enough to infer this property. Specializations of the CIDOC CRM may however be more explicit, for instance describing the use of moulds etc.

In First Order Logic:
P130 (x,y) ⊃ E70(x)
P130 (x,y) ⊃ E70(y)
P130(x,y,z) ⊃ [P130(x,y) ∧ E55(z)]
P130(x,y) ⊃ P130(y,x)

Properties: P130.1 kind of similarity: E55 Type

P131 is identified by (identifies)

Domain: E39 Actor
Range: E82 Actor Appellation
Subproperty of: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property identifies a name used specifically to identify an E39 Actor.

This property is a specialisation of *P1 is identified by (identifies)* is identified by.

Examples:
- Tyler Withersopp IV (E39) *is identified by* "US social security number 619-17-4204" (E82)

In First Order Logic:
P131(x,y) ⊃ E39(x)
P131(x,y) ⊃ E82(y)
P131(x,y) ⊃ P1(x,y)

P132 spatiotemporally overlaps with

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Superproperty of: E18 Physical Thing. P46 is composed of (forms part of): E18 Physical Thing
E4 Period.P9 consists of (forms part of): E4 Period
E92 Spacetime Volume.P10 falls within (contains): E92 Spacetime Volume
Quantification: many to many (0,n:0,n)

Scope note: This symmetric property associates two instances of E92 Spacetime Volume that have some of their extents in common. If only the fuzzy boundaries of the instances of E92 Spacetime Volume overlap, this property cannot be determined from observation alone and therefore should not be applied. However, there may be other forms of justification that the two instances of E92 Spacetime Volume must have some of their extents in common regardless of where and when precisely.

If this property holds for two instances of E92 Spacetime Volume then it cannot be the case that P133 also holds for the same two instances. Furthermore, there are cases where neither P132 nor P133 holds between two instances of E92 Spacetime Volume. This would occur where only an overlap of the fuzzy boundaries of the two instances of E92 Spacetime Volume occurs and no other evidence is available.

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Examples:

- the "Urnfield" period (E4*) spatiotemporally overlaps with* the "Hallstatt" period (E4)
- Yale Peabody Collection of Artefacts(E78) *spatiotemporally overlaps with* Cuzco Museum(E27) [after repatriation]
- Catedral de Nuestra Señora de la Asunción (E92) *spatiotemporally overlaps with* Great Mosque of Córdoba (E92)
- The facade of the Roman temple acquired by Hearst (E92) *spatiotemporally overlaps with* the Hearst Neptune Pool (E92)
  -

In First Order Logic:

P132(x,y) ⊃ E92(x)
P132(x,y) ⊃ E92(y)
P132(x,y) ⊃ P132(y,x)
P132(x,y) ⊃ ¬P133(x,y)

P133 is spatiotemporally separated from

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Quantification: many to many (0,n:0,n)

Scope note: This symmetric property associates two instances of E92 Spacetime Volume that have no extents in common. If only the fuzzy boundaries of the instances of E92 Spacetime Volume overlap, this property cannot be determined from observation alone and therefore should not be applied. However, there may be other forms of justification that the two instances of E92 Spacetime Volume must not have any of their extents in common regardless of where and when precisely.

If this property holds for two instances of E92 Spacetime Volume then it cannot be the case that P132 also holds for the same two instances. Furthermore, there are cases where neither P132 nor P133 holds between two instances of E92 Spacetime Volume. This would occur where only an overlap of the fuzzy boundaries of the two instances of E92 Spacetime Volume occurs and no other evidence is available.

Examples:

- the "Hallstatt" period (E4) *is spatiotemporally separated from* the "La Tène" era (E4)
- Parthenon Marbles (E22) *is spatiotemporally separated from* Acropolis Museum (E27) [through expropriation]
- Kingdom of Greece (1831-1924) (E92) *is spatiotemporally separated from* Ottoman Empire (1299-1922) (E92)
- The path of the army of Alexander (335-323 B.C.) (E92) *is spatiotemporally separated from* the

Mauryan Empire (E92)

In First Order Logic:

P133(x,y) ⊃ E92(x)
P133(x,y) ⊃ E92(y)
P133(x,y) ⊃ P133(y,x)
P133(x,y) ⊃ ¬P132(x,y)

P134 continued (was continued by)

Domain: E7 Activity
Range: E7 Activity
Subproperty of: E7 Activity. P15 was influenced by (influenced): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property associates two instances of E7 Activity, where the domain is considered as an intentional continuation of the range. A continuation of an activity may happen when the continued activity is still ongoing or after the continued activity has completely ended. The continuing activity may have started already before it decided to continue the other one. Continuation implies a coherence of intentions and outcomes of the involved activities.

Examples:

- the construction of the Kölner Dom (Cologne Cathedral) (E7), abandoned in the 15th century, *was continued by* construction in the 19th century adapting the initial plans so as to preserve the intended appearance (E7)

In First Order Logic:

P134(x,y) ⊃ E7(x)
P134(x,y)⊃ E7(y)
P134(x,y) ⊃ P15(x,y)

P135 created type (was created by)

Domain: E83 Type Creation
Range: E55 Type
Subproperty: E65 Creation. P94 has created (was created by): E28 Conceptual Object
Quantification: one to many, necessary (1,n:0,1)

Scope note: This property identifies the E55 Type, which is created in an E83Type Creation activity.
Examples:

- The description of a new ribbon worm species by Bürger (E83) *created type* '*Lineus coxinus* (Bürger, 1892)' (E55)

In First Order Logic:

P135(x,y) ⊃ E83(x)
P135(x,y) ⊃ E55(y)
P135(x,y) ⊃ P94(x,y)

P136 was based on (supported type creation)

Domain: E83 Type Creation
Range: E1 CRM Entity
Subproperty of: E7 Activity. P15 was influenced by (influenced): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property identifies one or more items that were used as evidence to declare a new E55 Type.

The examination of these items is often the only objective way to understand the precise characteristics of a new Type. Such items should be deposited in a museum or similar institution for that reason. The taxonomic role renders the specific relationship of each item to the Type, such as "holotype" or "original element".

Examples:

- the taxon creation of the plant species '*Serratula glauca* Linné, 1753.' (E83) *was based on* Object BM000576251 of the Clayton Herbarium (E20) *in the taxonomic role* original element (E55)

In First Order Logic:

P136(x,y) ⊃ E83(x)
P136(x,y) ⊃ E1(y)
P136(x,y,z) ⊃ [P136(x,y) ∧ E55(z)]
P136(x,y) ⊃ P15(x,y)

Properties: P136.1 in the taxonomic role: E55 Type

P137 exemplifies (is exemplified by)

Domain: E1 CRM Entity
Range: E55 Type
Subproperty of: E1 CRM Entity. P2 has type (is type of):E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property allows an item to be declared as a particular example of an E55 Type or taxon
The *P137.1 in the taxonomic role* property of *P137 exemplifies (is exemplified by)* allows differentiation of taxonomic roles. The taxonomic role renders the specific relationship of this example to the Type, such as "prototypical", "archetypical", "lectotype", etc. The taxonomic role "lectotype" is not associated with the Type Creation (E83) itself, but selected in a later phase.

Examples:

- Object BM000098044 of the Clayton Herbarium (E20) *exemplifies Spigelia marilandica* (L.) L. (E55) *in the taxonomic role* lectotype

In First Order Logic:

P137(x,y) ⊃ E1(x)
P137(x,y) ⊃ E55(y)
P137(x,y,z) ⊃ [P137(x,y) ∧ E55(z)]
P137(x,y) ⊃ P2(x,y)

Properties: P137.1 in the taxonomic role: E55 Type

P138 represents (has representation)

Domain: E36 Visual Item
Range: E1 CRM Entity
Subproperty of: E89 Propositional Object. P67 refers to (is referred to by): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property establishes the relationship between an E36 Visual Item and the entity that it visually represents.

Any entity may be represented visually. This property is part of the fully developed path from E24 Physical Man-Made Thing through *P65 shows visual item (is shown by)*, E36 Visual Item, *P138 represents (has representation)* to E1 CRM Entity, which is shortcut by *P62depicts (is depicted by)*. P138.1 mode of representation allows the nature of the representation to be refined.

This property is also used for the relationship between an original and a digitisation of the original by the use of techniques such as digital photography, flatbed or infrared scanning. Digitisation is here seen as a process with a mechanical, causal component rendering the spatial distribution of structural and optical properties of the original and does not necessarily include any visual similarity identifiable by

human observation."

Properties: P138.1 mode of representation: E55 Type

Examples:

- the digital file found at http://www.emunch.no/N/full/No-MM_N0001-01.jpg (E36) represents page 1 of Edward Munch's manuscript MM N 1, Munch-museet (E73) mode of representation Digitisation(E55)
- The 3D model VAM_A.200-1946_trace_1M.ply (E73) represents Victoria & Albert Museum's Madonna and child sculpture (visual work) A.200-1946 (E22) mode of representation 3D surface (E55)

In First Order Logic:

P138(x,y) ⊃ E36(x)
P138(x,y) ⊃ E1(y)
P138(x,y,z) ⊃ [P138(x,y) ∧ E55(z)]
P138(x,y) ⊃ P67(x,y)

P139 has alternative form

Domain: E41 Appellation
Range: E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property establishes a relationship of equivalence between two instances of E41 Appellation independent from any item identified by them. It is a dynamic asymmetric relationship, where the range expresses the derivative, if such a direction can be established. Otherwise, the relationship is symmetric. The relationship is not transitive.

The equivalence applies to all cases of use of an instance of E41 Appellation. Multiple names assigned to an object, which are not equivalent for all things identified with a specific instance of E41 Appellation, should be modelled as repeated values of *P1 is identified by (identifies)*.

P139.1 has type allows the type of derivation, such as "transliteration from Latin 1 to ASCII" be refined..

Examples:

- "Martin Doerr" (E41) *has alternative form* "Martin Dörr" (E41) *has type* Alternate spelling (E55)
- "Гончарова, Наталья Сергеевна" (E41) *has alternative form* "Gončarova, Natal´â Sergeevna" (E41) *has type* ISO 9:1995 transliteration (E55)
- "Αθήνα" has alternative form "Athina" has type transcription.

In First Order Logic:

P139(x,y) ⊃ E41(x)
P139 (x,y) ⊃ E41(y)
P139(x,y,z) ⊃ [P139(x,y) ∧ E55(z)]
P139(x,y) ⊃ P139(y,x)

Properties: P139.1 has type: E55 Type

P140 assigned attribute to (was attributed by)

Domain: E13 Attribute Assignment
Range: E1 CRM Entity
Superproperty of: E14 Condition Assessment. P34 concerned (was assessed by): E18 Physical Thing
E16 Measurement. P39 measured (was measured by): E70 Thing
E17 Type Assignment. P41 classified (was classified by): E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property indicates the item to which an attribute or relation is assigned.
Examples:

- February 1997 Current Ownership Assessment of Martin Doerr's silver cup (E13) *assigned attribute to* Martin Doerr's silver cup (E19)
- 01 June 1997 Identifier Assignment of the silver cup donated by Martin Doerr (E15) *assigned attribute to* silver cup 232 (E19)

In First Order Logic:
P140(x,y) ⊃ E13(x)
P140(x,y) ⊃ E1(y)

P141 assigned (was assigned by)

Domain: E13 Attribute Assignment
Range: E1 CRM Entity
Superproperty of: E14 Condition Assessment. P35 has identified (identified by): E3 Condition State
E15 Identifier Assignment. P37 assigned (was assigned by): E42 Identifier
E15 Identifier Assignment. P38 deassigned (was deassigned by): E42 Identifier
E16 Measurement. P40 observed dimension (was observed in): E54 Dimension
E17 Type Assignment. P42 assigned (was assigned by): E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property indicates the attribute that was assigned or the item that was related to the item denoted by a property P140 assigned attribute to in an Attribute assignment action.
Examples:

- February 1997 Current Ownership Assessment of Martin Doerr's silver cup (E13) *assigned* Martin Doerr (E21)
- 01 June 1997 Identifier Assignment of the silver cup donated by Martin Doerr (E15) *assigned* object identifier 232

In First Order Logic:
P141(x,y) ⊃ E13(x)
P141(x,y) ⊃ E1(y)

P142 used constituent (was used in)

Domain: E15 Identifier Assignment
Range: E90 Symbolic Object
Subproperty of: E7 Activity. P16 used specific object (was used for): E70 Thing

Quantification: (0:n,0:n)

Scope note: This property associates the event of assigning an instance of E42 Identifier with the instances of E90 Symbolic Object that were used as constituents of the identifier.

Examples:

- On June 1, 2001 assigning the personal name identifier "Guillaume, de Machaut, ca. 1300-1377" (E15) *used constituent* "ca. 1300-1377" (E49)
- Assigning a uniform title to the anonymous textual work known as 'The Adoration of the Shepherds'(E15) *used constituent* 'Coventry' (E48)
- Assigning a uniform title to Pina Bausch's choreographic work entitled 'Rite of spring' (E15) *used constituent* '(Choreographic Work: Bausch)'(E90)
- Assigning a uniform title to the motion picture directed in 1933 by Merian C. Cooper and Ernest B. Schoedsack and entitled 'King Kong' (E15) *used constituent* '1933' (E50)
- Assigning the corporate name identifier 'Univerza v Ljubljani. Oddelek za bibliotekarstvo' to The Department for library science of the University of Ljubljana (E15) *used constituent* 'Univerza v Ljubljani' (E42)

In First Order Logic:
P142(x,y) ⊃ E15(x)
P142(x,y) ⊃ E90(y)

P142(x,y) ⊃ P16(x,y)

P143 joined (was joined by)

Domain: E85 Joining
Range: E39 Actor
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor

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

Scope note: This property identifies the instance of E39 Actor that becomes member of a E74 Group in an E85 Joining.

Joining events allow for describing people becoming members of a group with the more detailed path E74 Group, *P144i gained member by*, E85 Joining, *P143 joined* , E39 Actor, compared to the shortcut offered by *P107 has current or former member (is current or former member of).*

Examples:

- The election of Sir Isaac Newton as Member of Parliament to the Convention Parliament of 1689 (E85) *joined* Sir Isaac Newton (E21)
- The inauguration of Mikhail Sergeyevich Gorbachev as leader of the Union of Soviet Socialist Republics (USSR) in 1985 (E85) *joined* Mikhail Sergeyevich Gorbachev (E21)
- The implementation of the membership treaty January 1. 1973 between EU and Denmark (E85) joined Denmark (E40)

In First Order Logic:

P143(x,y) ⊃ E85(x)
P143(x,y) ⊃ E39(y)
P143(x,y) ⊃ P11(x,y)

P144 joined with (gained member by)

Domain: E85 Joining
Range: E74 Group
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the instance of E74 Group of which an instance of E39 Actor becomes a member through an instance of E85 Joining.

Although a Joining activity normally concerns only one instance of E74 Group, it is possible to imagine circumstances under which becoming member of one Group implies becoming member of another Group as well.

Joining events allow for describing people becoming members of a group with a more detailed path from E74 Group through, P144i gained member by, E85 Joining, P143 joined , E39 Actor, compared to the shortcut offered by P107 has current or former member (is current or former member of).
The property P144.1 *kind of member* can be used to specify the type of membership or the role the member has in the group.

Examples:

- The election of Sir Isaac Newton as Member of Parliament to the Convention Parliament of 1689 (E85) *joined with* the Convention Parliament (E40)
- The inauguration of Mikhail Sergeyevich Gorbachev as Leader of the Union of Soviet Socialist Republics (USSR) in 1985 (E85) *joined with* the office of Leader of the Union of Soviet Socialist Republics (USSR) (E40) with *P144.1 kind of member* President (E55)
- The implementation of the membership treaty January 1. 1973 between EU and Denmark (E85) *joined with* EU (E40)

In First Order Logic:

P144(x,y) ⊃ E85(x)
P144(x,y)⊃ E74(y)
P144(x,y,z) ⊃ [P144(x,y) ∧ E55(z)]
P144(x,y) ⊃ P11(x,y)

Properties: P144.1 *kind of member*: E55 Type

P145 separated (left by)

Domain: E86 Leaving
Range: E39 Actor
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the instance of E39 Actor that leaves an instance of E74 Group through an instance of E86 Leaving.

Examples:

- The end of Sir Isaac Newton's duty as Member of Parliament for the University of Cambridge to the Convention Parliament in 1702 *separated* Sir Isaac Newton
- George Washington's leaving office in 1797 *separated* George Washington
- The implementation of the treaty regulating the termination of Greenland membership in EU between EU, Denmark and Greenland February 1. 1985 (E86) *separated* Greenland (E40)

In First Order Logic:

P145(x,y) ⊃ E86(x)
P145(x,y) ⊃ E39(y)
P145(x,y) ⊃ P11(x,y)

P146 separated from (lost member by)

Domain: E86 Leaving
Range: E74 Group
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the instance of E74 Group an instance of E39 Actor leaves through an instance of E86 Leaving.

Although a Leaving activity normally concerns only one instance of E74 Group, it is possible to imagine circumstances under which leaving one E74 Group implies leaving another E74 Group as well.

Examples:

- The end of Sir Isaac Newton's duty as Member of Parliament for the University of Cambridge to the Convention Parliament in 1702 *separated from* the Convention Parliament
- George Washington's leaving office in 1797 *separated from* the office of President of the United States
- The implementation of the treaty regulating the termination of Greenland membership in EU between EU, Denmark and Greenland February 1. 1985 *separated from* EU (E40)

In First Order Logic:

P146(x,y) ⊃ E86(x)
P146(x,y) ⊃ E74(y)
P146(x,y) ⊃ P11(x,y)

P147 curated (was curated by)

Domain: E87 Curation Activity
Range: E78 Collection
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property associates an instance of E87 Curation Activity with the instance of E78 Collection or

collections with that is subject of that curation activity following some implicit or explicit curation plan.

Examples:

- The activities (E87) by the Benaki Museum *curated* the acquisition of dolls and games of urban and folk manufacture dating from the 17th to the 20th century, from England, France and Germany for the "Toys, Games and Childhood Collection (E78) of the Museum
- The activities (E87) of the Historical Museum of Crete, Heraklion, Crete, *curated* the development of the permanent Numismatic Collection (E78)
- The activities (E87) by Mikael Heggelund Foslie *curated* the Mikael Heggelund Foslie's coralline red algae Herbarium

In First Order Logic:

P147(x,y) ⊃ E87(x)
P147(x,y) ⊃ E78(y)

P148 has component (is component of)

Domain: E89 Propositional Object
Range: E89 Propositional Object
Quantification: (0:n,0:n)

Scope note: This property associates an instance of E89 Propositional Object with a structural part of it that is by itself an instance of E89 Propositional Object.
This property is transitive

Examples:

- Dante's "Divine Comedy" (E89) *has component* Dante's "Hell" (E89)

In First Order Logic:

P148(x,y) ⊃ E89(x)
P148(x,y) ⊃ E89(y)

P149 is identified by (identifies)

Domain: E28 Conceptual Object
Range: E75 Conceptual Object Appellation
Subproperty of: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an instance of E28 Conceptual Object using an instance of E75 Conceptual Object Appellation.

Examples:

- The German edition of the CIDOC CRM (E73) *is identified by* ISBN 978-3-00-030907-6 (E75)

In First Order Logic:

P149(x,y) ⊃ E28(x)
P149(x,y) ⊃ E75(y)
P149(x,y) ⊃ P1(x,y)

P150 defines typical parts of (defines typical wholes for)

Domain: E55 Type
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property associates an instance of E55 Type "A" with an instance of E55 Type "B", when items of type "A" typically form part of items of type "B", such as "car motors" and "cars". The property is in general not transitive.

It allows types to be organised into hierarchies based on one type describing a typical part of another. This property is equivalent to "broader term partitive (BTP)" as defined in ISO 2788 and "broaderPartitive" in SKOS.

Examples:

- Car motors (E55) *defines typical parts of* cars (E55)

In First Order Logic:

P150(x,y) ⊃ (E55 Type)
P150(x,y) ⊃ E55(y)

P151 was formed from (participated in)

Domain: E66 Formation
Range: E74 Group
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Quantification: (0,n:0:n)

Scope note: This property associates an instance of E66 Formation with an instance of E74 Group from which the new group was formed preserving a sense of continuity such as in mission, membership or tradition.

Examples:

- The formation of the House of Bourbon-Conti in 1581 (E66) *was formed from* House of Condé (E74)

In First Order Logic:

P151(x,y) ⊃ E66(x)
P151(x,y) ⊃ E74(y)
P151(x,y) ⊃ P11(x,y)

P152 has parent (is parent of)

Domain: E21 Person
Range: E21 Person
Subproperty of:
Quantification: (2,n:0:n)

Scope note: This property associates an instance of E21 Person with another instance of E21 Person who plays the role of the first instance's parent, regardless of whether the relationship is biological parenthood, assumed or pretended biological parenthood or an equivalent legal status of rights and obligations obtained by a social or legal act. This property is, among others, a shortcut of the fully developed paths from '*E21Person' through 'P98i was born', 'E67 Birth', 'P96 by mother' to 'E21 Person',* and from '*E21Person' through 'P98i was born', 'E67 Birth', 'P97 from father' to 'E21 Person'*.

Examples:

- Gaius Octavius (E29) has parent Julius Caesar (E29)
- Steve Jobs (E29) has parent Joanne Simpson (biological mother)(E29)
- Steve Jobs (E29) has parent Clara Jobs (adoption mother) (E29)

In First Order Logic:

P152(x,y) ⊃ E21(x)
P152(x,y) ⊃ E21(y)

P156 occupies (is occupied by)

Domain: E18 Physical Thing
Range: E53 Place
Subproperty of: E92 Spacetime Volume. P161 has spatial projection: E53 Place

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

Scope note: This property describes the largest volume in space that an instance of E18 Physical Thing has occupied at any time during its existence, with respect to the reference space relative to itself. This allows you to describe the thing itself as a place that may contain other things, such as a box that may contain coins. In other words, it is the volume that contains all the points which the thing has covered at some time during its existence. In the case of an E26 Physical Feature the default reference space is the one in which the object that bears the feature or at least the surrounding matter of the feature is at rest. In this case there is a 1:1 relation of E26 Feature and E53 Place. For simplicity of implementation multiple inheritance (E26 Feature IsA E53 Place) may be a practical approach.

For instances of E19 Physical Objects the default reference space is the one which is at rest to the object itself, i.e. which moves together with the object. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

This property is a subproperty of P161 has spatial projection because it refers to its own domain as reference space for its range, whereas P161 has spatial projection may refer to a place in terms of any reference space. For some instances of E18 Physical Object the relative stability of form may not be sufficient to define a useful local reference space, for instance for an amoeba. In such cases the fully developed path to an external reference space and using a temporal validity component may be adequate to determine the place they have occupied.

In contrast to P156 occupies, the property P53 has former or current location identifies an instance of E53 Place at which a thing is or has been for some unspecified time span. Further it does not constrain the reference space of the referred instance of P53 Place.

In First Order Logic:

P156 (x,y) = [E18(x) ∧ E53(y) ∧ P161(x,y) ∧ P157(y,x)]

P157 is at rest relative to (provides reference space for)

Domain: E53 Place

Range: E18 Physical Thing

Superproperty of: E53 Place. P59i is located on or within: E18 Physical Thing

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

Scope note: This property associates an instance of E53 Place with the instance of E18 Physical Thing that determines a reference space for this instance of E53 Place by being at rest with respect to this reference space. The relative stability of form of an E18 Physical Thing defines its default reference space. The reference space is not spatially limited to the referred thing. For example, a ship determines a reference space in terms of which other ships in its neighbourhood may be described. Larger constellations of matter, such as continental plates, may comprise many physical features that are at rest with them and define the same reference space.

Examples:

- The spatial extent of the municipality of Athens in 2014 (E53) *is at rest relative to* The Royal Observatory in Greenwich (E25)
- The place where Lord Nelson died on H.M.S. Victory (E53) *is at rest relative to* H.M.S. Victory (E22)

In First Order Logic:

P157(x,y) ⊃ E53(x)
P157(x,y) ⊃ E18(y)

P160 has temporal projection (is temporal projection of)

Domain: E92 Spacetime Volume
Range: E52 Time-Span
Quantification: one to one (1,1:1,1)

Scope note: This property describes the temporal projection of an instance of an E92 Spacetime Volume. The property P4 has time-span is the same as P160 has temporal projection if it is used to document an instance of E4 Period or any subclass of it.

Example:

In First Order Logic:

P160(x,y) ⊃ E92(x)
P160(x,y)⊃ E52(y)

P161 has spatial projection (is spatial projection of)

Domain: E92 Spacetime Volume
Range: E53 Place
Superproperty of: E18 Physical Thing. P156 occupies (is occupied by): E53 Place
Quantification: one to many, necessary, dependent (1,n:1,1)

Scope note: This property associates an instance of an E92 Spacetime Volume with an instance of E53 Place that is the result of the spatial projection of the instance of the E92 Spacetime Volume on a reference space.

In general there can be more than one useful reference space (for reference space see *p156 occupies* and *p157 is at rest relative to*) to describe the spatial projection of a spacetime volume, for example, in describing a sea battle, the difference between the battle ship and the seafloor as reference spaces. Thus it can be seen that the projection is not unique.

The spatial projection is the actual spatial coverage of a spacetime volume, which normally has fuzzy boundaries except Spacetime volumes which are geometrically defined in the same reference system as the range of this property are an exception to this and do not have fuzzy boundaries. Modelling explicitly fuzzy spatial projections serves therefore as a common topological reference of different spatial approximations rather than absolute geometric determination, for instance for relating outer or inner spatial boundaries for the respective spacetime volumes.

In case the domain of an instance of *P161 has spatial projection* is an instance of E4 Period, the spatial projection describes all areas that period was ever present at, for instance, the Roman Empire. In case the domain of an instance of *P161 has spatial projection* is an instance of E19 Physical Object, the spatial projection has to be understood as the complete path along which the object has or has been moved during its existence.

This property is part of the fully developed path from E4 Period through *P161 has spatial projection*, E53 Place, *P89 falls within (contains)* to E53 Place, which in turn is shortcut by *P7took place at (witnessed.)*

Example:

The Roman Empire *P161 has spatial projection* all areas ever claimed by Rome.

In First Order Logic:

P161(x,y) ⊃ E92(x), P161(x,y) ⊃ E53(y)

P164 during (was time-span of)

Domain: E93 Presence
Range: E52 Time-Span

Subproperty of: E92 Spacetime Volume.P160 has temporal projection: E52 Time-Span

Quantification: (1,1 :0,n)

Scope note: This property relates an instance of E93 Presence with the chosen instance of E52 Time-Span that defines the time-slice of the spacetime volume that this instance of E93 Presence is related to by the property *P166 was a presence of (had presence)*.

Examples:

2016-02-09 (E52) *was time-span of* the last day of the 2016 Carnival in Cologne (E93).

In First Order Logic:

P164 (x,y) ⊃ E93(x)
P164 (x,y) ⊃ E52(y)

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) ⊃ E73(x)
P165(x,y) ⊃ E90(y)
P165(x,y) ⊃ P106(x,y)

P166 was a presence of (had presence)

Domain: E93 Presence
Range: E92 Spacetime Volume
Subproperty of: E92 Spacetime Volume. P10 falls within (contains): E92 Spacetime Volume
Quantification: (1,1 : 0,n)
Scope note: This property associates an instance of E93 Presence with the instance of E92 Spacetime Volume of which it represents a temporal restriction (i.e.: a time-slice). Instantiating this property constitutes a necessary part of the identity of the respective instance of E93 Presence.

In First Order Logic:
P166(x,y) ⊃ E93(x),
P166(x,y) ⊃ E92(y),
P166(x,y) ⊃ P10(x,y)

P167 at (was place of)

Domain: E93 Presence
Range: E53 Place

Quantification:

Scope note: This property associates an instance of E93 Presence with an instance of E53 Place that geometrically includes the spatial projection of the respective instance of E93 Presence. Besides others, this property may be used to state in which space an object has been for some known time, such as a room of a castle or in a drawer. It may also be used to describe a confinement of the spatial extent of some realm during a known time-span. It is a shortcut of the more fully developed path from E93 Presence through P161 has spatial projection, E53 Place, P89 falls within (contains) to E53 Place.

In First Order Logic:
P167(x,y) ⊃ E93(x), P167(x,y) ⊃ E53(y), P167(x,y) ⊃ (∃z)[E53(z) ∧ P161(x,z) ∧ P89(z,y)]

P168 place is defined by (defines place)

Domain: E53 Place
Range: E94 Space Primitive
Quantification: (0,n:1,1)

Scope note: This property associates an instance of E53 Place with an instance of E94 Space Primitive that defines it. Syntactic variants or use of different scripts may result in multiple instances of E94 Space Primitive defining exactly the same place. Transformations between different reference systems always result in new definitions of places approximating each other and not in alternative definitions.

In First Order Logic:
P168(x,y) ⊃ E53(x)
P168(x,y) ⊃ E94(y)

P169 defines spacetime volume (spacetime volume is defined by)

Domain: E95 Spacetime Primitive
Range: E92 Spacetime Volume

Scope note: This property associates an instance of E95 Spacetime Primitive with the instance of E92 Spacetime Volume it defines.

P170 defines time (time is defined by)

Domain: E61Time Primitive
Range: E52 Time Span

Scope note: This property associates an instance of E61 Time Primitive with the instance of E52 Time Span it defines.

P171 at some place within

Domain: E53 Place

Range: E94 Space Primitive

Scope note: This property describes the maximum spatial extent within which an E53 Place falls. Since instances of E53 Places may not have precisely known spatial extents, the CRM supports statements about maximum spatial extents of E53 Places. This property allows an instance of an E53 Places's maximum spatial extent (i.e. its outer boundary) to be assigned an E94 Space Primitive value.
P171 at some place within is a shortcut of the fully developed path *E53 Place, P89 falls within, E53 Place, P168 place is defined by, E94 Space Primitive* through a not represented declarative Place as defined in CRMgeo (Doerr and Hiebel 2013) to a Space Primitive.

Examples:

- the spatial extent of the Acropolis of Athens (E53) is *at some place within* POLYGON ((37.969172 23.720787, 37.973122 23.721495 37.972741 23.728994, 37.969299 23.729735, 37.969172 23.720787)) (E94)

P172 contains

Domain: E53 Place

Range: E94 Space Primitive

Scope note: This property describes a minimum spatial extent which is contained within an E53 Place. Since instances of E53 Place may not have precisely known spatial extents, the CRM supports statements about minimum spatial extents of instances of E53 Place. This property allows an instance of E53 Places's minimum spatial extent (i.e. its inner boundary or a point being within a Place) to be assigned an E94 Space Primitive value.
This property is a shortcut of the fully developed path: *E53 Place, P89i contains, E53 Place, P168 place is defined by, E94 Space Primitive*

Examples:

- the spatial extent of the Acropolis of Athens (E53) *contains* POINT (37.971431 23.725947) (E94)

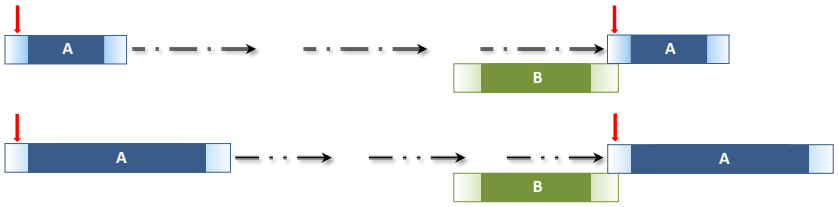
P173 starts before or at the end of (ends with or after the start of)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of:
Superproperty of: E2 Temporal Entity. P174 starts before the end of (ends after the start of):
E2 Temporal Entity
E2 Temporal Entity. P119i is met in time by: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note:
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity starts before or simultaneously with the end of the temporal extent of the range instance B of E2 Temporal Entity.
In other words, if A = [A^{start}, A^{end}] and B = [B^{start}, B^{end}], we mean $A^{start} \leq B^{end}$ is true.

This property is part of the set of temporal primitives P173 – P176, P182 – P185.

This property corresponds to the disjunction (logical OR) of the following Allen temporal relations [Allen, 1983]: {before, meets, met-by, overlaps, starts, started-by, contains, finishes, finished-by, equals, during, overlapped by}



P174 starts before the end of (ends after the start of)

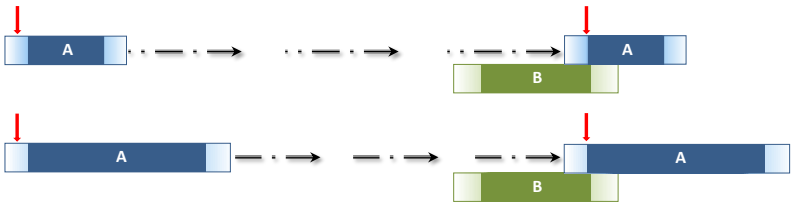
Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of:E2 Temporal Entity. P173 starts before or at the end of (ends after or with the start of): E2 Temporal Entity
Superproperty of: E2 Temporal Entity. P175 starts before or with the start of (starts after or with the start of):E2 Temporal Entity
E2 Temporal Entity. P184 ends before or with the end of (ends with or after the end of): E2 Temporal Entity
E7 Activity. P134 continued (was continued by): E7 Activity
E2 Temporal Entity. P118i is overlapped in time by: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note:
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity starts definitely before the end of the temporal extent of the range instance B of E2 Temporal Entity.
In other words, if A = [A^{start}, A^{end}] and B = [B^{start}, B^{end}], we mean $A^{start} < B^{end}$ is true.

This property is part of the set of temporal primitives P173 – P176, P182 – P185.

This property corresponds to a disjunction (logical OR) of the following Allen temporal relations [Allen, 1983] :{before, meets, overlaps, starts, started-by, contains, finishes, finished-by, equals, during, overlapped by}

Typically, this property is a consequence of a known influence of some event on another event or activity, such as a novel written by someone being continued by someone else, or the knowledge of a defeat on a distant battlefield causing people to end their ongoing activities



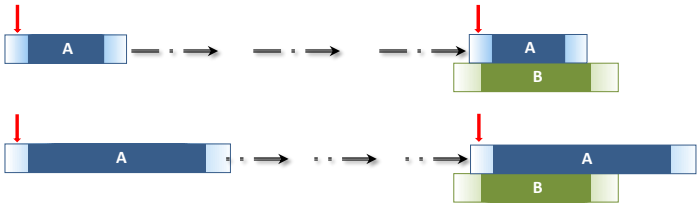
P175 starts before or with the start of (starts with or after the start of)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E2 Temporal Entity. P174 starts before the end of (ends after the start of):
E2 Temporal Entity
Superproperty of:
E2 Temporal Entity. P176 starts before the start of (starts after the start of): E2 Temporal Entity
E2 Temporal Entity. P116 starts (is started by): E2 Temporal Entity
E2 Temporal Entity. P116i is started by: E2 Temporal Entity
E2 Temporal Entity. P114 is equal in time to: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note:
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity starts before or simultaneously with the start of the temporal extent of the range instance B of E2 Temporal Entity.
In other words, if A = [A^{start}, A^{end}] and B = [B^{start}, B^{end}], we mean $A^{start} \leq B^{start}$ is true.

This property is part of the set of temporal primitives P173 – P176, P182 – P185.

This property corresponds to a disjunction (logical OR) of the following Allen temporal relations [Allen, 1983]: {before, meets, overlaps, starts, started-by, contains, finished-by, equals}



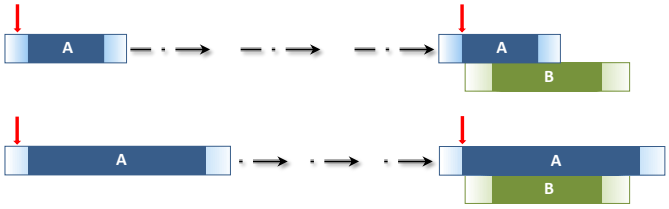
P176 starts before the start of (starts after the start of)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E2 Temporal Entity. P175 starts before or with the start of (starts after or with the start of):E2 Temporal Entity
Superproperty of: E2 Temporal Entity. P182 ends before or at the start of (starts after or with the end of): E2 Temporal Entity
E2 Temporal Entity. P118 overlaps in time with (is overlapped in time by): E2 Temporal Entity
E2 Temporal Entity. P115i is finished by: E2 Temporal Entity
E2 Temporal Entity. P117i includes: E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note:
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity starts definitely before the start of the temporal extent of the range instance B of E2 Temporal Entity.
In other words, if A = [A^{start}, A^{end}] and B = [B^{start}, B^{end}], we mean $A^{start} < B^{start}$ is true.

This property is part of the set of temporal primitives P173 – P176, P182 – P185.

This property corresponds to a disjunction (logical OR) of the following Allen temporal relations [Allen, 1983]: {before, meets, overlaps, contains, finished-by}



P179 had sales price (was sales price of)

Domain: E96 Purchase
Range: E97 Monetary Amount
Subproperty of:

Scope note: This property establishes the relationship between an instance of E96 Purchase and the instance of E97 Monetary Amount that forms the compensation for the transaction.

Examples:

- The sale of Vincent van Gogh's "Vase with Fifteen Sunflowers" on 1987/03/30 (E96) had sales price Christies' hammer price for "Vase with Fifteen Sunflowers" (E97)

P180 has currency (was currency of)

Domain: E97 Monetary Amount
Range: E98 Currency
Subproperty of: P91 has unit (is unit of)
Superproperty of:

Scope note: This property establishes the relationship between an instance of E97 Monetary Amount and the currency that it is measured in.

Examples:

- Christies' hammer price for "Vase with Fifteen Sunflowers" (E97) has currency British Pounds (E98)

P181 has amount

Domain: E97 Monetary Amount
Range: E60 Number
Subproperty of: P90 has value

Scope note: This property establishes the relationship between an instance of E97 Monetary Amount and the amount of currency that it consists of.

Examples:

- Christies hammer price for "Vase with Fifteen Sunflowers" (E97) *has amount* 24,750,000 (E60)

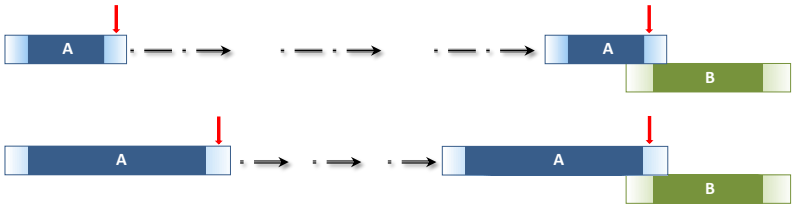
P182 ends before or at the start of (starts with or after the end of)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E2 Temporal Entity .P176 starts before the start of (starts before or with the end of): E2 Temporal Entity
E2 Temporal Entity. P185 ends before the end of (ends after the end of): E2 Temporal Entity
Superproperty of: E2 Temporal Entity. P183 ends before the start of (starts after the end of): E2 Temporal Entity
E2 Temporal Entity. P119 meets in time with (is met in time by): E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note:
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity ends before or simultaneously with the start of the temporal extent of the range instance B of E2 Temporal Entity.
In other words, if A = [A^{start}, A^{end}] and B = [B^{start}, B^{end}], we mean $A^{end} \leq B^{start}$ is true.

This property is part of the set of temporal primitives P173 – P176, P182 – P185.

This property corresponds to a disjunction (logical OR) of the following Allen temporal relations [Allen, 1983]: {before, meets}



P183 ends before the start of (starts after the end of)

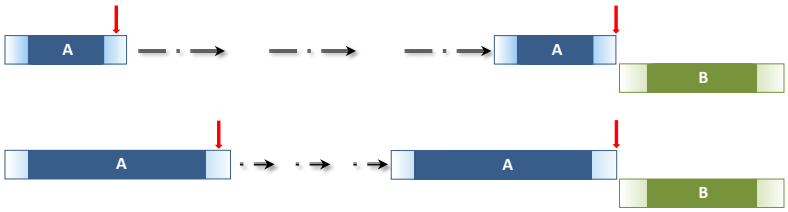
Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E2 Temporal Entity. P182 ends before or at the start of (starts after or with the end of): E2 Temporal Entity
Superproperty of: E2 Temporal Entity. P120 occurs before (occurs after): E2 Temporal Entity

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

Scope note:
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity ends definitely before the start of the temporal extent of the range instance B of E2 Temporal Entity.
In other words, if A = [A^{start}, A^{end}] and B = [B^{start}, B^{end}], we mean $A^{end} < B^{start}$ is true.

This property is part of the set of temporal primitives P173 – P176, P182 – P185.

This property corresponds to a disjunction (logical OR) of the following Allen temporal relations [Allen, 1983]: {before}



P184 ends before or with the end of (ends with or after the end of)

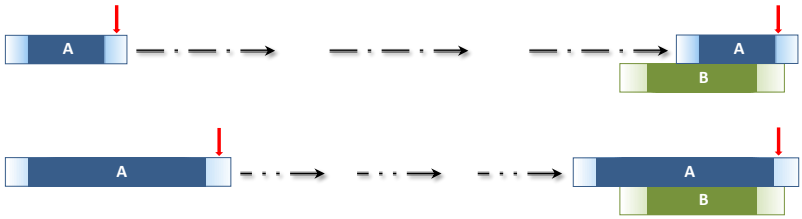
Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E2 Temporal Entity.P174 starts before the end of (ends after the start of): E2 Temporal Entity
Superproperty of: E2 Temporal Entity. P185 ends before the end of (ends after the end of): E2 Temporal Entity
E2 Temporal Entity. P114 is equal in time to: E2 Temporal Entity
E2 Temporal Entity. P115 finishes (is finished by): E2 Temporal Entity
E2 Temporal Entity. P115i is finished by: E2 Temporal Entity

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

Scope note:
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity ends before or simultaneously with the end of the temporal extent of the range instance B of E2 Temporal Entity.
In other words, if A = [A^{start}, A^{end}] and B = [B^{start}, B^{end}], we mean $A^{end} \leq B^{end}$ is true.

This property is part of the set of temporal primitives P173 – P176, P182 – P185.

This property corresponds to a disjunction (logical OR) of the following Allen temporal relations [Allen, 1983]: {before, meets, overlaps, finished by, start, equals, during, finishes}



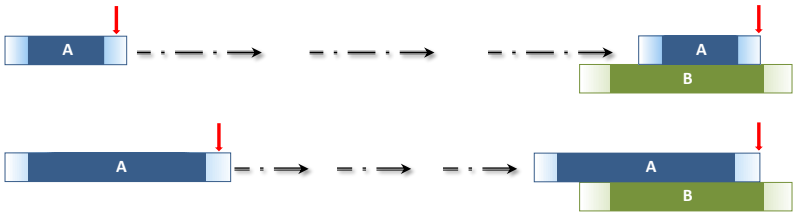
P185 ends before the end of (ends after the end of)

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E2 Temporal Entity. P184 ends before or with the end of (ends with or after the end of): E2 Temporal Entity
Superproperty of:
E2 Temporal Entity.P182 ends before or at the start of (starts after or with the end of): E2 Temporal Entity
E2 Temporal Entity.P116 starts (is started by): E2 Temporal Entity
E2 Temporal Entity.P117 occurs during (includes): E2 Temporal Entity
E2 Temporal Entity.P118 overlaps in time with (is overlapped in time by): E2 Temporal Entity
Quantification: many to many (0,n:0,n)

Scope note:
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity ends definitely before the end of the temporal extent of the range instance B of E2 Temporal Entity.
In other words, if A = [A^{start}, A^{end}] and B = [B^{start}, B^{end}], we mean $A^{end} < B^{end}$ is true.

This property is part of the set of temporal primitives P173 – P176, P182 – P185.

This property corresponds to a disjunction (logical OR) of the following Allen temporal relations [Allen, 1983]: {before, meets, overlaps, starts, during}



P186 produced thing of product type (is produced by)

Domain: E12 Production
Range: E99 Product Type
Quantification: many to many (0,n:0,n)

Scope note: This property associates an instance of E12 Production with the instance of E99 Production Type, that is, the type of the things it produces.
Examples:

- The production activity of the Volkswagen factory during 1949-1953 (E12) *produced thing of product type* Volkswagen Type 11 (Beetle) (E99).

References:

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APPENDIX

Editorial notes

Editors:	Nick Crofts	Martin Doerr,	Tony Gill	Stephen Stead,	Matthew Stiff
	City of Geneva,	ICS-FORTH,	RLG,	Paveprime Ltd,	English Heritage
	Geneva,	Heraklion-Crete,	Mountain View,	London	Swindon,
	Switzerland	Greece	CA, USA	UK	UK

Creation Date: 11-07-1998
Last Modified: 24-10-2003

The present version of the CIDOC CRM incorporates a series of amendments to version 3.2.1, submitted to ISO and accepted as Committee Draft ISO/CD 21127. These amendments were the result of a systematic exploration of the requirements for the intended scope of the CIDOC CRM as decided in summer 2001. This includes in particular documentation in Natural History, archaeology and the ability to communicate with traditional and Digital Libraries. These amendments have been developed and approved by the CIDOC CRM Special Interest Group, ISO/TC46/SC4/WG9 in a series of meetings together with various invited experts in the period from July 2001 to October 2003.

With this version, the cycle of amendments to extend the functionality of the CIDOC CRM ends. The development team felt that the task to cover the intended scope as outlined in July 2001 and the general functionality required by members of the team up to now has been successfully fulfilled. Further amendments should only concern editorial changes to improve the clarity of the text. Therefore, the modelling constructs of the CIDOC CRM are expected to undergo no changes from this version until the final International Standard.

With version 3.3.2, we have changed the format of the Definition of the CIDOC CRM. We present:

1. A general introduction to the model (as before)
2. The hierarchy of entities as an indented list (as before)
3. The hierarchy of properties as an indented list
4. The definition of each entity
5. The definition of each property.

We took out all cross-reference information, i.e. inherited properties, direct and inherited inverse references of properties at the range entity, as well as the indices to properties, alphabetically, by range and by domain. So this document remains the pure definition, whereas the full cross-referenced text will appear as an additional hypertext document, which will be semi-automatically generated. The reason for this change are: (1) the size of the cross-referenced document exceeds what one would normally print in one document. (2) the cross-referencing does not contribute to the definition. (3) Translators of the document are forced to manually trace the consistency of the cross-referencing, a nearly impossible task. The cross-referenced document is of course the only one, that allows for fully understanding the model by reading and for using it in conceptual modelling.

We further removed the references to the metamodel under which the CIDOC CRM was initially developed. Even though the use of this metamodel has contributed a lot to the rigidity of developing the CIDOC CRM, it seems to be of minor importance for the use of the Model itself. Moreover it needs reworking, and metamodelling is still not a standard procedure in conceptual modelling. Therefore the development team decided not to make it a part of the standard to become.

We present in the Annex the amendment history from version 3.2.1 on. This, together with the meeting minutes and the "issues list" on the CIDOC CRM home page, allows for tracing the correctness of this document with respect to the decisions of the development team.

Amendments to version 3.3

In the Second Joined Meeting of ISO/TC46/SC4/WG9 and CIDOC CRM SIG the following has been decided: 3, new entities and 14 new properties have been declared, domain of 3 properties and range of 2 properties was changed and 1 property renamed

1) New Entities and their properties
   E78 Collection is curated by (curates): Actor
   E79 Part Addition added to (was augmented by): Physical Man-Made Thing
   E79 Part Addition added (was added by): Physical Thing
   E80 Part Removal removed from (was diminished by): Physical Man-Made Thing
   E80 Part Removal removed (was removed by): Physical Thing

2) New properties
   E2 Temporal Entity. removed (was removed by): Temporal Entity
   E2 Temporal Entity. equal in time: Temporal Entity
   E2 Temporal Entity. finishes (finished-by): Temporal Entity
   E2 Temporal Entity. starts (started-by): Temporal Entity
   E2 Temporal Entity. during (includes): Temporal Entity
   E2 Temporal Entity. overlaps in time (overlapped-by in time): Temporal Entity
   E2 Temporal Entity. meets in time (met-by in time): Temporal Entity
   E2 Temporal Entity. before (after): Temporal Entity
   E53 Place overlaps. with: E53 Place
   E53 Place borders. with: E53 Place

3) The Property:
   E19 Physical Object. has former or current location (is former or current location of): Place
   has been redirected to:
   E18 Physical Thing. has former or current location (is former or current location of): Place

4) The Property:
   E19 Physical Object. has current permanent location (is current permanent location of): Place
   has been redirected to:
   E18 Physical Thing. has current permanent location (is current permanent location of): Place

5) The Property:
   E19 Physical Object. has current location (currently holds): Place
   has been redirected to:
   E18 Physical Thing. has current location (currently holds): Place

6) The Property:
   E7 Activity. was motivation for (motivated): Conceptual Object
   has been redirected to:
   E7 Activity. was motivation for (motivated): Man-Made Thing

7) The Property:
   E7 Activity. motivated the creation of (was created for): Conceptual Object
   has been redirected and changed to:
   E7 Activity. motivated the creation of (was created because of): Man-Made Thing

8) The property “P33 used specific technique” was declared as subproperty of “P15 took into account”

9) The property “P111 added to” was declared as subproperty of “P31 has modified”

10) The property “P113 removed from” was declared as subproperty of “P31 has modified”
11) Scope note for Actors Hierarchy, Actor and Title have been revised.

12) Scope notes for properties have been added.

Amendments to version 3.3.1

In the 3rd joined meeting of the CIDOC Special Interest Group and ISO/TC46//SC4/WG9 the following have been decided: 1 new entity and 5 new properties have been declared, domain of 4 properties was changed and 1 property renamed, 1 entity has been deleted, 7 entities was renamed.

1) New Entity and its properties
   E81 Transformation resulted in (was result on): Persistent Item
   E81 Transformation transformed (was transformed by): Persistent Item

2) New properties
   E7 Activity. used general object (was used for): Type
   E11 Modification. employed (was employed by): Material
   E55 Type. has broader term (has narrower term): Type

3) The Property:
   E19 Physical Object. has former or current keeper (is former or current keeper of): Actor
   has been redirected to:
   E18 Physical Thing. has former or current keeper (is former or current keeper of): Actor

4) The Property:
   E19 Physical Object. has keeper (is current keeper of): Actor
   has been redirected to:
   E18 Physical Thing. has keeper (is current keeper of): Actor

5) The Property:
   E19 Physical Object. has former or current owner (is former or current owner of): Actor
   has been redirected to:
   E18 Physical Thing. has former or current owner (is former or current owner of): Actor

6) The Property:
   E19 Physical Object. has owner (is current owner of): Actor
   has been redirected to:
   E18 Physical Thing. has owner (is current owner of): Actor

7) The Property:
   E7 Activity. used object (was used for): Physical Object
   has been renamed to:
   E7 Activity. used specific object (was used for): Physical Object

8) The entity
   E76 Gender and the property P61 has gender
   have been deleted

9) 7 entities has been renamed:

E8 Acquisition	E8 Acquisition
E11 Modification	E11 Modification
E12 Production	E12 Production
E16 Measurement	E16 Measurement
E65 Conceptual Creation	E65 Creation
E66 Formation	E66 Formation
E77 Existence	E77 Persistent Item

Amendments to version 3.3.2

In the 3th joined meeting of the CIDOC Special Interest Group and ISO/TC46//SC4/WG9 the following have been decided: 2 new entities and 12 new properties have been declared, 1 entity has been renamed, domain of 4 properties was changed, range of 8 properties was changed, 6 properties renamed, 7 properties has been deleted.

Note: a typing mistake was corrected in item number 17 of the list on 16/01/2008.
The property:
E9 Move. P27 moved from (vacated): E53 Place
has been renamed to :
E9 Move. P26 moved from (was origin of): E53 Place
This was corrected to:
The property:
E9 Move. P27 moved from (vacated): E53 Place
has been renamed to :
E9 Move. P27 moved from (was origin of): E53 Place

1) New Entities:
E82 Actor Appellation.
It was declared as subclass of E41 Appellation

E83 Type Creation.
It was declared as subclass of E65 Creation

2) New properties:
E23 Information Carrier**.** P128 is carried of (is materialized by): E73 Information Object

E73 Information Object. P129 is about (is subject of): E1 CRM Entity
It was declared as subproperty of
E28 Conceptual Object. P67 refers to (is referred to by): E1 CRM Entity

E70 Thing. P130 shows features of (features are also found on): E70 Thing
(kind of similarity: Type)
It was declared as superproperty of
E33 Linguistic Object. P73 has translation (is translation of): E33 Linguistic Object

E4 Period. P132 overlaps with: E4 Period

E4 Period. P133 is separated from: E4 Period

E7 Activity. P134 continued (was continued by): E7 Activity
It was declared as subproperty of
E7 Activity. P15 (was influenced by (influenced): E7 Activity

E83 Type Creation. P135 created type (was created by): E55 Type.
It was declared as subproperty of
E65 Creation. P94 has created (was created by): E28 Conceptual Object

E83 Type Creation. P136 was based on (supported type creation): E1 CRM Entity
(in the taxonomic role: E55 Type)
It was declared as subproperty of
E7 Activity. P15 was influenced by (influenced): E1 CRM Entity.

E55 Type. P137 is exemplified by (exemplifies): E1 CRM Entity
(in the taxonomic role: E55 Type)

E36 Visual Item. P138 visualizes (has visualization): E1 CRM Entity,
It was declared as subpropertry of
E28 Conceptual Object. P67 refer to (is referred to by): E1 CRM Entity

E41 Appellation. P139 also represented by: E41 Appellation

3) The entity E23 Iconographic Object has been renamed to E23 Information Carrier

4) The domain of the following properties was changed:

The property:
E18 Physical Thing. P43 has dimension (is dimension of): E54 Dimension
has been redirected to:
E70 Thing. P43 has dimension (is dimension of): E54 Dimension.

The property:
E28 Conceptual Object. P67 refers to (is referred to by): E1 CRM Entity
has been redirected to:
E73 Information Object. P67 refers to (is referred to by): E1 CRM Entity

The property:
E18 Physical Thing. P54 has current permanent location (is current permanent location of): E53 Place
has been redirected to:
E19 Physical Object. P54 has current permanent location (is current permanent location of): E53 Place

The property:
E18 Physical Thing. P55 has current location (currently holds): E53 Place
has been redirected to:
E19 Physical Object. P55 has current location (currently holds): E53 Place

5) The ranges of the following properties were changed:

The property:
E16 Measurement. P39 measured (was measured by): E18 Physical Thing
has been redirected to:
E16 Measurement. P39 measured (was measured by): E70 Thing

The property:
E7 Activity. P16 used specific object (was used for): E19 Physical Object
has been redirected to:
E7 Activity. P16 used specific object (was used for): E70 Thing

The property:
E8 Acquisition. P24 transferred title of (changed ownership through): E19 Physical Object
has been redirected to:
E8 Acquisition. P24 transferred title of (changed ownership through): E18 Physical Thing

The property:
E5 Event. P12 occurred in the presence of (was present at): E70 Thing
has been redirected to:
E5 Event. P12 occurred in the presence of (was present at): E77 Persistent Item

7) The property:
E7 Activity. P15 took into account (was taken into account by): E77 Persistent Item
has been renamed and redirected to:
E7 Activity. P15 was influenced by (influenced): E1 CRM Entity

8) The property:
E7 Activity. P17 was motivation for (motivated): E71 Man-Made Thing
has been renamed and redirected to:
E7 Activity. P17 was motivated by (motivated): E1 CRM Entity

9) The property:
E24 Physical Man-Made Thing. P62 depicts object (is depicted by): E18 Physical Thing
has been renamed and redirected to:

E24 Physical Man-Made Thing. P62 depicts (is depicted by): E1 CRM Entity

10) The property:
E74 Group. P107 had member (was member of): E39 Actor
has been renamed to :
E74 Group. P107 has current or former member (is current or former member of): E39 Actor

11) The property:
E52 Time-Span. P81 at least covering: E61 Time Primitive
has been renamed to :
E52 Time-Span. P81 ongoing throughout: E61 Time Primitive

12) The property:
E52 Time-Span. P82 at most within: E61 Time Primitive
has been renamed to :
E52 Time-Span. P82 at some time within: E61 Time Primitive

13) The following properties was deleted:
E3 Condition State. P6 falls within (contains): E3 Condition State
E7 Activity. P18 motivated the creation of (was created because of): E71 Man-Made Thing
E21 Person. P60 is member of: E40 Legal Body
E24 Physical Man-Made Thing. P63 depicts event (is depicted by):E5 Event
E24 Physical Man-Made Thing. P64 depicts concept (is depicted by):E55 Type
E28 Conceptual Object. P66 refer to concept (is referred to by): E55 Type
E52 Time-Span. P85 consists of (forms part of): E52 Time-Span

14) The property:
E5 Event. P11 had participants (participated in): E39 Actor
has been renamed to :
E5 Event. P11 had participant (participated in): E39 Actor

15) The property:
E7 Activity. P21 had as general purpose (was purpose of): E55 Type
has been renamed to :
E7 Activity. P21 had general purpose (was purpose of): E55 Type

16) The property:
E9 Move. P26 moved to (occupied): E53 Place
has been renamed to :
E9 Move. P26 moved to (was destination of): E53 Place

17) The property:
E9 Move. P27 moved from (vacated): E53 Place
has been renamed to :
E9 Move. P27 moved from (was origin of): E53 Place

18) The property:
E15 Identifier Assignment. P37 assigns (is assigned by): E42 Object identifier
has been renamed to :
E15 Identifier Assignment. P37 assigned (was assigned by): E42 Object identifier

19) The property:
E15 Identifier Assignment. P38 deassigns (is deassigned by): E42 Object identifier
has been renamed to :
E15 Identifier Assignment. P38 deassigned (was deassigned by): E42 Object identifier

20) The property:
E19 Physical Object. P48 preferred identifier is (is preferred identifier of): E42 Object identifier
has been renamed to :
E19 Physical Object. P48 has preferred identifier (is preferred identifier of): E42 Object identifier

21) The property:
E32 Authority Document. P71 contains (is part of): E55 Type
has been renamed to :
E32 Authority Document. P71 lists (is listed in): E55 Type

21) The property:
E39 Actor. P76 has contact points (provides access to): E51 Contact Point
has been renamed to :
E39 Actor. P76 has contact point (provides access to): E51 Contact Point

22) The property:
E52 Time-Span. P83 had at least duration: E54 Dimension
has been renamed to :
E52 Time-Span. P83 had at least duration (was minimum duration of): E54 Dimension

23) The property:
E52 Time-Span. P84 had at most duration: E54 Dimension
has been renamed to :
E52 Time-Span. P84 had at most duration (was maximum duration of): E54 Dimension

24) The property:
E54 Dimension. P90 value: E60 Number
has been renamed to :
E54 Dimension. P90 has value: E60 Number

25) The property:
P15 was influenced by (influenced)
was declared as superproperty of
P16 used specific object (was used for)
P17 was motivated by (motivated)
P19 was intended use of (was made for)
P20 had specific purpose (was purpose of)
P134 continued (was continued by)

26) The property:
P11 had participant (participated in)
was declared as subproperty of
P12 occurred in the presence of (was present at)

27) The entity
E72 Legal Object was declared as subclass of E70 Thing

28) The entity
E55 Type was declared as subclass of E28 Conceptual Object

29) All uses of the word “link” as synonym for “property” have been replaced by the term “property”

The following changes for internal consistency have been proposed, but they have not been decided in the Copenhagen meeting. They are incorporated in this document, in expectation of a positive decision:

1) The property:
E40 Legal Body. consists of (belongs to): E40 Legal Body
was deleted (new issue 104).

2) The property
P105.2 has note: E62 String
was deleted (new issue 106).

3) The property:
P33 used specific technique
was declared as subproperty of
P12 occurred in the presence of (was present at)
4) New property
E39 Actor. P131 is identified by (identifies): E82 Actor Appellation.
It was declared as subproperty of
E1 CRM Entity. P1 is identified by (identifies): E41 Appellation

Amendments to version 3.4

In the 5th joined meeting of the CIDOC Special Interest Group and ISO/TC46//SC4/WG9 the following have been decided: 3 entities were deleted and 1 new entity was declared, 24 properties has been renamed, domain of 1 property was changed, and range of 1 property was changed.

Note: a typing mistake was corrected in item number 14 of the list on 16/01/2008.
The property
E79 Part Removal. P112 removed from (was diminished by): E24 Physical Man-Made Thing
has been renamed to :
E79 Part Removal. P112 diminished (was diminished by): E24 Physical Man-Made Thing
This was corrected to:
The property
E80 Part Removal. P112 removed from (was diminished by): E24 Physical Man-Made Thing
has been renamed to :
E80 Part Removal. P112 diminished (was diminished by): E24 Physical Man-Made Thing

1) The entity:
E23 Information Carrier
was deleted.

2) New entity
E84 Information Carrier
was declared.

3) The property
E8 Acquisition. P22 transferred title to (acquired title to): E39 Actor
has been renamed to :
E8 Acquisition. P22 transferred title to (acquired title through): E39 Actor

4) The property
E10 Transfer of Custody. P28 custody surrendered by (surrendered custody): E39 Actor
has been renamed to :
E10 Transfer of Custody. P28 custody surrendered by (surrendered custody through): E39 Actor

5) The property
E10 Transfer of Custody. P29 custody received by (received custody): E39 Actor
has been renamed to :
E10 Transfer of Custody. P29 custody received by (received custody through): E39 Actor

6) The property
E10 Transfer of Custody. P30 transferred custody of (custody changed by): E19 Physical Object
has been redirected and renamed to :
E10 Transfer of Custody. P30 transferred custody of (custody transferred through): E18 Physical Thing

7) The property
E16 Measurement. P40 observed dimension (was observed): E54 Dimension
has been renamed to :

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

8) The property
E19 Physical Object. P58 has section definition (defines section): E46 Section Definition
has been redirected to:
E18 Physical Thing. P58 has section definition (defines section): E46 Section Definition

9) The property
E52 Time-Span. P79 begins at qualify: E62 String
has been renamed to :
E52 Time-Span. P79 beginning is qualified by: E62 String

10) The property
E52 Time-Span. P80 ends at qualify: E62 String
has been renamed to :
E52 Time-Span. P80 end is qualified by: E62 String

11) The property
E54 Dimension. P91 unit: E58 Measurement Unit
has been renamed to :
E54 Dimension. P91 has unit (is unit of): E58 Measurement Unit

12) The property
E78 Collection. P109 is curated by (curates): E39 Actor
has been renamed to :
E78 Collection. P109 has current or former curator (is current or former curator of): E39 Actor

13) The property
E79 Part Addition. P110 added to (was augmented by): E24 Physical Man-Made Thing
has been renamed to :
E79 Part Addition. P110 augmented (was augmented by): E24 Physical Man-Made Thing

14) The property
E80 Part Removal. P112 removed from (was diminished by): E24 Physical Man-Made Thing
has been renamed to :
E80 Part Removal. P112 diminished (was diminished by): E24 Physical Man-Made Thing

15) The property
E2 Temporal Entity. P114 equal in time: E2 Temporal Entity
has been renamed to :
E2 Temporal Entity. P114 is equal in time to: E2 Temporal Entity

16) The property
E2 Temporal Entity. P115 finishes (finished-by): E2 Temporal Entity
has been renamed to :
E2 Temporal Entity. P115 finishes (is finished by): E2 Temporal Entity

17) The property
E2 Temporal Entity. P116 starts (started-by): E2 Temporal Entity
has been renamed to :
E2 Temporal Entity. P116 starts (is started by): E2 Temporal Entity

18) The property
E2 Temporal Entity. P117 during (includes): E2 Temporal Entity
has been renamed to :
E2 Temporal Entity. P117 occurs during (includes): E2 Temporal Entity

19) The property
E2 Temporal Entity. P118 overlaps in time (overlapped-by in time): E2 Temporal Entity
has been renamed to :

E2 Temporal Entity. P118 overlaps in time with (is overlapped in time by): E2 Temporal Entity

20) The property
E2 Temporal Entity. P119 meets in time (met-by in time): E2 Temporal Entity
has been renamed to :
E2 Temporal Entity. P119 meets in time with (is met in time by): E2 Temporal Entity

21) The property
E2 Temporal Entity. P120 before (after): E2 Temporal Entity
has been renamed to :
E2 Temporal Entity. P120 occurs before (occurs after): E2 Temporal Entity

22) The property
E81 Transformation. P123 resulted in (was resulted on): E77 Persistent Item
has been renamed to :
E81 Transformation. P123 resulted in (resulted from): E77 Persistent Item

23) The property
E7 Activity. P125 used general object (was used for): E55 Type
has been renamed to :
E7 Activity. P125 used object of type (was type of object used in): E55 Type

24) The property
E11 Modification. P126 employed (was employed by): E57 Material
has been renamed to :
E11 Modification. P126 employed (was employed in): E57 Material

25) The property
E23 Information Carrier. P128 is carried of (is materialized by): E73 Information Object
has been redirected and renamed to :
E24 Physical Man-Made thing. P128 carries (is carried by): E73 Information Object

26) The property
E36 Visual Item. P138 visualizes (has visualization): E1 CRM Entity
has been renamed to :
E36 Visual Item. P138 represents (has representation): E1 CRM Entity

27) The property
E41 Appellation. P139 also represented: E41 Appellation
has been renamed to :
E41 Appellation. P139 has alternative form: E41 Appellation

28) The property
P3 has note
has been declared as superproperty of
P79 beginning is qualified by
P80 end is qualified by

29) The property
P11 had participant (participated in)
was declared as superproperty of
P14 carried out by (performed)
P96 by mother (gave birth)
P99 dissolved (was dissolvedby)

30) The property
P12 occured in the presence of (was present at)
was declared as superproperty of
P11 had participant (participated in)
P16 used specific object (was used for)

P25 moved (moved by)
P31 has modified (was modified by)
P33 used specific technique (was used by)
P92 brought into existence (was brought into existence by)
P93 took out of existence (was taken out of existence by)

31) The property:
P15 was influenced by (influenced)
was declared as superproperty of
P16 used specific object (was used for)
P17 was motivated by (motivated)
P33 used specific technique (was used by)
P134 continued (was continued by)
P136 was based on (supported type creation)

32) The property:
E40 Legal Body. consists of (belongs to): E40 Legal Body
was deleted

33) The property
P105.2 has note: E62 String
was deleted

34) New property
E39 Actor. P131 is identified by (identifies): E82 Actor Appellation.
It was declared as subproperty of
E1 CRM Entity. P1 is identified by (identifies): E41 Appellation

Amendments to version 3.4.1

Introduction and Scope Notes for classes E21 – E84 have been revised, and 2 new paragraphs were inserted (CIDOC CRM Class Declarations and CIDOC CRM Property Declarations).

Amendments to version 3.4.2

Scope Notes for all entities and properties have been revised, 2 new properties was declared, 1 property was redirected and two properties was renamed:

1) New property
E13 Attribute Assignment. P140 assigned attribute to (was attributed by): E1 CRM Entity
It was declared as superproperty of
E14 Condition Assessment. P34 concerned (was assessed by): E18 Physical Thing
E15 Identifier Assignment. P36 registered (was registered by): E19 Physical Object
E16 Measurement. P39 measured (was measured by): E70 Thing
E17 Type Assignment. P41 classified (was classified by): E1 CRM Entity

2) New property
E13 Attribute Assignment. P141 assigned (was assigned by): E1 CRM Entity
It was declared as superproperty of
E14 Condition Assessment. P35 has identified (identified by): E3 Condition State
E15 Identifier Assignment. P37 assigned (was assigned by): E42 Object Identifier
E15 Identifier Assignment. P38 deassigned (was deassigned by): E42 Object Identifier
E16. Measurement. P40 observed dimension (was observed in): E54 Dimension
E17 Type Assignment. P42 assigned (was assigned by): E55 Type

3) The Property:
E6 Destruction. P13 destroyed (was destroyed by): E19 Physical Object
has been redirected to:
E6 Destruction. P13 destroyed (was destroyed by): E18 Physical Thing

4) The property:
E8 Acquisition. P23 transferred title from (surrendered title of): E39 Actor
has been renamed to:
E8 Acquisition. P23 transferred title from (surrendered title through): E39 Actor

5) The property:
E8 Acquisition. P24 transferred title of (changed ownership by): E18 Physical Thing
has been renamed to:
E8 Acquisition. P24 transferred title of (changed ownership through): E18 Physical Thing

Amendments to version 3.4.9

The property
105.1 has type:E55 Type
was deleted

Amendments to version 4.2

(This amendments list has been added in version 4.2.2 on 11/03/2008 because it was omitted in the due version 4.2)

In the 11th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 which tool place in Zagreb Croatia on May 25th and 27th, 2005 the following decisions have been taken:

1) Stuff has been renamed in Thing, thus
E18 Physical Stuff
has been renamed to:
E18 Physical Thing

E24 Physical Man-Made Stuff
has been renamed to:
E24 Physical Man-Made Thing

E70 Stuff
has been renamed to:
E70 Thing

E71 Man-Made Stuff
has been renamed to:
E71 Man-Made Thing

2) From compounds with Event the word Event has been removed, thus
E8 Acquisition Event
has been renamed to:
E8 Acquisition

E11 Modification Event
has been renamed to:
E11 Modification

E12 Production Event
has been renamed to:
E12 Production

E16 Measurement Event
has been renamed to:
E16 Measurement

E65 Creation Event
has been renamed to:
E65 Creation

E66 Formation Event
has been renamed to:
E66 Formation

Amendments to version 4.2.1

In the 14th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 which tool place in Crete, Greece on October 23-27, 2006 the following decisions have been taken:

1. The domain of the properties
   P32 used general technique (was technique of): E55 Type
   P33 used specific technique (was used by): E29 Design or Procedure
   has been changed from E11 Modification to E7 Activity

2. The scope note of E28 Conceptual Object has been changed

   New scope note:

   This class comprises non-material products of our minds and information produced by humans with or without using technical devices that have become objects of a discourse about their identity, circumstances of creation and historical implications.

   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 papers,
   electronic signals, marks, audio media, paintings, photos, human memories, etc.

   They cannot be destroyed as long as they exist on at least one carrier or in memory.
   Their existence ends when the last carrier is lost. A greater distinction can be made between products having a clear identity, such as a specific text, or photographs, and the ideas and concepts shared and traded by groups of people.

   Current scope note:

   This class comprises non-material products of our minds, in order to allow for reasoning about their identity, circumstances of creation and historical implications.

   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 may be found on more than one particular carrier, such as papers, electronic signals, marks,
   audio media, paintings, photos, human memories, etc.

   They cannot be destroyed as long as they exist on at least one carrier or in memory.
   Their existence ends when the last carrier is lost. A greater distinction can be made between products having a clear identity, such as a specific text, or photographs, and the ideas and concepts shared and traded by groups of people.

P16 used specific object (was used for)

Became superproperty to of E7 Activity.P33 used specific technique (was used by):E29 Design or Procedure

P32 used general technique (was technique of)

Became subproperty of E7 Activity. P125 used object of type (was type of object used in): E55 Type

P33 used specific technique (was used by)

Became subproperty E7 Activity. P16 used specific object (was used for): E70 Thing

P35 has identified (identified by)

The name of P35B is changed to P35 has identified (was identified by)

Amendments to version 4.2.2

In 15th CIDOC CRM Harmonization meeting, which took place in Edinburgh in 9 – 12 July 2007 the following changes tool place.

Changes to entities:

E1 CRM Entity

In the second paragraph of the scope note, in the item numbered 1, the phrase ", and in particular by a preferred identifier" has been added.

.

E3 Condition State

In the second paragraph of the scope note the "It" has been substituted by "An instance of this class"

E4 Period

The first and the last sentence of the 4th paragraph of the scope note has been changed.

From :

> Artistic style may be modelled as E4 Period. There are two different conceptualisations of '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 consistent with E4 Period, and the second defines morphological object types that fall under E55 Type.

To:

> 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 E4 Period, and the second defines morphological object types that fall under E55 Type.

E15 Identifier Assignment

The scope note and the examples are changed and the property P36 is deleted and P142 is added.

BEFORE

Scope note: This class comprises actions assigning or deassigning object identifiers.

Examples of such identifiers include Find Numbers and Inventory Numbers. Documenting the act of identifier assignment and deassignment is especially useful when objects change custody or the identification system of an organization is changed. In order to keep track of the identity of an object in such cases, it is important to document by whom, when and for what purpose an identifier is assigned to an object.

Examples:

- replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens

Properties:

P36 registered (was registered by): E19 Physical Object
P37 assigned (was assigned by): E42 Object Identifier
P38 deassigned (was deassigned by): E42 Object Identifier

AFTER

Scope note: This class comprises activities that result in the allocation of an identifier to an instance of E1 CRM Entity. An E15 Identifier Assignment may include the creation of the identifier from multiple constituents, which themselves may be instances of E41 Appellation. The syntax and kinds of constituents to be used may be declared in a rule constituting an instance of E29 Design or Procedure.

Examples of such identifiers include Find Numbers, Inventory Numbers, uniform titles in the sense of librarianship and Digital Object Identifiers (DOI). Documenting the act of identifier assignment and deassignment is especially useful when objects change custody or the identification system of an organization is changed. In order to keep track of the identity of things in such cases, it is important to document by whom, when and for what purpose an identifier is assigned to an item.

The fact that an identifier is a preferred one for an organisation can be expressed by using the property *E1 CRM Entity. P48 has preferred identifier (is preferred identifier of): E42 Identifier*. It can better be expressed in a context independent form by assigning a suitable E55 Type, such as "preferred identifier assignment", to the respective instance of E15 Identifier Assignment via the *P2 has type* property.

Examples:

- Replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens
- Assigning the author-uniform title heading "Goethe, Johann Wolfgang von, 1749-1832. Faust. 1. Theil." for a work (E28)
- On June 1, 2001 assigning the personal name heading "Guillaume, de Machaut, ca. 1300-1377" (E42,E82) to Guillaume de Machaut (E21)

Properties:

P37 assigned (was assigned by): E42 Identifier
P38 deassigned (was deassigned by): E42 Identifier
P142 used constituent (was used in): E41 Appellation

E29 Design or Procedure

"This class comprises documented plans for the execution of actions in order to achieve a result of a specific quality, form or contents. In particular it comprises plans for deliberate human activities that result in the modification or production of instances of E24 Physical Thing."

To:

"This class comprises documented plans for the execution of actions in order to achieve a result of a specific quality, form or contents. In particular it comprises plans for deliberate human activities that may result in the modification or production of instances of E24 Physical Thing."

E33 Linguistic Object

A third paragraph added to the scope note text which is the following:

"The text of an instance of E33 Linguistic Object can be documented in a note by P3 has note: E62 String"

E41 Appellation

The Appellation became subclass of E28 Conceptual Object and super class of E51 Contact Point

E42 Identifier

The name of E42 is changed from E42 Object Identifier to E42 Identifier. Also the scope note and the examples are changed
BEFORE:

This class comprises codes assigned to objects in order to identify them uniquely within the context of one or more organisations.

Such codes are often known as inventory numbers, registration codes, etc. and are typically composed of alphanumeric sequences. The class E42 Object Identifier is not normally used for machine-generated identifiers used for automated processing unless these are also used by human agents.

Examples:

- MM.GE.195
- 13.45.1976
- DPS_1000
- OXCMS: 1997.4.1

AFTER:

"This class comprises codes assigned to instances of E1 CRM Entity in order to identify them uniquely and permanently within the context of one or more organisations. Such codes are often known as inventory numbers, registration codes, etc. and are typically composed of alphanumeric sequences. The class E42 Identifier is not normally used for machine-generated identifiers used for automated processing unless these are also used by human agents

Examples:

- "MM.GE.195"
- "13.45.1976"
- "OXCMS: 1997.4.1"
- ISSN "0041-5278"

- ISRC “FIFIN8900116”
- Shelf mark “Res 8 P 10”
- “Guillaume de Machaut (1300?-1377)” [a controlled personal name heading that follows the French rules]

E51 Contact Point

The subclass of E51 is changed from E77 Persistent Item became E41 Appellation

E54 Dimension

BEFORE

Scope note: This class comprises quantifiable properties that are measured by some calibrated means and can be approximated by numerical values.

An instance of E54 Dimension is thought to be the true quantity, independent from its numerical approximation, e.g. in inches or in cm.

AFTER

Scope note: This class comprises quantifiable properties that are measured by some calibrated means and can be approximated by numerical values.

An instance of E54 Dimension is regarded as the true quantity, independent from its numerical approximation, e.g. in inches or in cm.

E74 Group

The scope note is changed

From

This class comprises any gatherings or organizations of two or more people that act collectively or in a similar way due to any form of unifying relationship

A gathering of people becomes an E74 Group when it exhibits organizational characteristics usually typified by a set of ideas or beliefs held in common, or actions performed together. These might be communication, creating some common artifact, a common purpose such as study, worship, business, sports, etc. Nationality can be modeled as membership in an E74 Group (cf. HumanML markup).

Examples:

- the impressionists
- the Navajo
- the Greeks
- the peace protestors in New York City on February 15 2003
- Exxon-Mobil

To:

This class comprises any gatherings or organizations of two or more people that act collectively or in a similar way due to any form of unifying relationship. In the wider sense this class also comprises official positions which used to be regarded in certain contexts as one actor, independent of the current holder of the office, such as the president of a country.

A gathering of people becomes an E74 Group when it exhibits organizational characteristics usually typified by a set of ideas or beliefs held in common, or actions performed together. These might be communication, creating some common artifact, a common purpose such as study, worship, business, sports, etc. Nationality can be modeled as membership in an E74 Group (cf. HumanML markup). Married couples and other concepts of family are regarded as particular examples of E74 Group.

Examples:

- the impressionists
- the Navajo
- the Greeks
- the peace protestors in New York City on February 15 2003
- Exxon-Mobil
- King Solomon and his wives
- The President of the Swiss Confederation

E85, E80 have been added

E85 Joining

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in an instance of E49 Actor becoming a member of an instance of E74 Group. This class does not imply initiative by either party.

Typical scenarios include becoming a member of a social organisation, becoming employee of a company, the adoption of a child by a family and the inauguration of somebody into an official position.

Examples:

- The election of Sir Isaac Newton as Member of Parliament for the University of Cambridge to the Convention Parliament of 1689
- The inauguration of Mikhail Sergeyevich Gorbachev as leader of the Union of Soviet Socialist Republics (USSR) in 1985

Properties:

P143 joined (was joined by): E39 Actor
P144 joined with (gained member by) E74 Group

E80 Leaving

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in an instance of E49 Actor to be separated from an instance of E74 Group. This class does not imply initiative by either party.

Typical scenarios include the termination of membership in a social organisation, ending the employment at a company, and the end of tenure of somebody in an official position.

Examples:

- The end of Sir Isaac Newton's duty as Member of Parliament for the University of Cambridge to the Convention Parliament in 1702
- George Washington's leaving office in 1797

Properties:

P145 separated (left by) E39 Actor
P146 separated from (lost member by) E74 Group

P3 has note

The scope note is changed
BEFORE:

This property is a container for all informal descriptions about an object that cannot be expressed in

terms of CRM constructs.

In particular it captures the characterisation of the item itself, its internal structures, appearance etc.
Like property *P2 has type (is type of)*, this property is a consequence of the restricted focus of the CRM. The aim is not to capture, in a structured form, everything that can be said about an item; indeed, the CRM formalism is not regarded as sufficient to express everything that can be said. Good practice requires use of distinct note fields for different aspects of a characterisation. The *P2 has type (is type of)* property of *P3 has note* allows differentiation of specific notes, e.g. "construction", "decoration" etc.
An item may have many notes, but a note is attached to a specific item.

AFTER :

This property is a container for all informal descriptions about an object that have not been expressed in terms of CRM constructs.

In particular it captures the characterisation of the item itself, its internal structures, appearance etc.
Like property *P2 has type (is type of)*, this property is a consequence of the restricted focus of the CRM. The aim is not to capture, in a structured form, everything that can be said about an item; indeed, the CRM formalism is not regarded as sufficient to express everything that can be said. Good practice requires use of distinct note fields for different aspects of a characterisation. The *P3.1 has type* property of *P3 has note* allows differentiation of specific notes, e.g. "construction", "decoration" etc.
An item may have many notes, but a note is attached to a specific item.

P36

Is deleted

P37 assigned (was assigned by)

The scope note of P37 is changed

BEFORE

Scope note: This property records the identifier that was assigned to an object in an Identifier Assignment activity.
P47 is identified by (identifies) - a property of an E19 Physical Object - is a short cut of the fully developed path from E19 Physical Object through P36, E15 Identifier Assignment, *P37 assigned (was assigned by)* to E42 Object Identifier.
The same identifier may be assigned on more than one occasion.
An Object Identifier might be created prior to an assignment.

AFTER
Scope note: This property records the identifier that was assigned to an item in an Identifier Assignment activity.
The same identifier may be assigned on more than one occasion.
An Identifier might be created prior to an assignment.

P38 deassigned (was deassigned by)

The scope note of P38 is changed

BEFORE
Scope note: This property records the identifier that was deassigned from an object.
Deassignment of an identifier may be necessary when an object is taken out of an inventory, a new numbering system is introduced or objects are merged or split up.
The same identifier may be deassigned on more than one occasion.

AFTER

Scope note: This property records the identifier that was deassigned from an instance of E1 CRM Entity.
Deassignment of an identifier may be necessary when an item is taken out of an inventory, a new numbering system is introduced or items are merged or split up.
The same identifier may be deassigned on more than one occasion.

P47 is identified by(identifies)

Is deleted

P48 has preferred identifier (is preferred identifier of

The domain, range and the scope note of P48 is changed
BEFORE
Domain: E19 Physical Object
Range: E42 Object Identifier
Subproperty of: E19 Physical Object. P47 is identified by (identifies): E42 Object Identifier
Quantification: many to one (0,1:0,n)

Scope note: This property records the preferred E42 Object Identifier that was used to identify the E19 Physical Object at the time this property was recorded.

More than one preferred identifier may have been assigned to an object during its history.
Use of this property requires an external mechanism for assigning temporal validity to the respective CRM instance.

P48 has preferred identifier (is preferred identifier of), like *P47 is identified by (identifies)* is a shortcut for the path from E19 Physical Object through *P36 registered (was registered by)*, E15 Identifier Assignment, *P37 assigned (was assigned by)* to E42 Object Identifier.

AFTER
Domain: E1 CRM Entity
Range: E42 Identifier
Subproperty of: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to one (0,1:0,n)

Scope note: This property records the preferred E42 Identifier that was used to identify an instance of E1 CRM Entity at the time this property was recorded.

More than one preferred identifier may have been assigned to an item over time.
Use of this property requires an external mechanism for assigning temporal validity to the respective CRM instance.

P48 has preferred identifier (is preferred identifier of), is a shortcut for the path from E1 CRM Entity through *P140 assigned attribute to (was attributed by)*, E15 Identifier Assignment, *P37 assigned (was assigned by)* to E42 Identifier. The fact that an identifier is a preferred one for an organisation can be better expressed in a context independent form by assigning a suitable E55 Type to the respective instance of E15 Identifier Assignment using the *P2 has type* property.

P69 is associated with

A property is added to this property

Properties: P69.1 has type: E55 Type

P139 has alternative form

The scope note is changed and a property is added

BEFORE
Scope note: This property establishes a relationship of synonymy between two instances of E41 Appellation.

The synonymy applies to all cases of use of an instance of E41 Appellation. Multiple names assigned to an object, which, are not always synonymous should be instantiated as repeated values of the "is identified by " property. This property is symmetric but not transitive

AFTER
Scope note: This property establishes a relationship of synonymy between two instances of E41 Appellation, independent from any item identified by them. The property is a dynamic, asymmetric relationship, where the domain expresses a derivative, if such a direction can be established. Otherwise, the relationship is symmetric.

The synonymy applies to all cases of use of an instance of E41 Appellation. Multiple names assigned to an object, which, are not always synonymous should be instantiated as repeated values of the "is identified by " property. This property is not transitive.

P139.1 has type allows the type of derivation, such as "transliteration from Latin 1 to ASCII" be refined.

Properties: P139.1 has type: E55 Type

P142, P143, P144, P145, P146, P148

Six new properties have been added

P142 used constituent (was used in)

Domain: E15 Identifier Assignment
Range: E41 Appellation
Subproperty of: E7 Activity. P16 used specific object (was used for): E70 Thing

Quantification: (0:n,0:n)

Scope note: This property associates the event of assigning an instance of E42 Identifier to an entity, with the instances of E41 Appellation that were used as elements of the identifier.

Examples:

- On June 1, 2001 assigning the personal name heading "Guillaume, de Machaut, ca. 1300-1377" (E15) *used constituent* "Guillaume, de Machaut" (E82 Actor Appellation)
- On June 1, 2001 assigning the personal name heading "Guillaume, de Machaut, ca. 1300-1377" (E15) *used constituent* "ca. 1300-1377" (E49 Time Appellation)

P143 joined (was joined by)

Domain: E85 Joining
Range: E39 Actor
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor

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

Scope note: This property identifies the instance of E39 Actor that becomes member of a E74 Group in an E85 Joining.

Examples:

- The election of Sir Isaac Newton as Member of Parliament to the Convention Parliament of 1689 *joined* Sir Isaac Newton
- The inauguration of Mikhail Sergeyevich Gorbachev as leader of the Union of Soviet Socialist Republics (USSR) in 1985 *joined* Mikhail Sergeyevich Gorbachev

P144 joined with (gained member by)

Domain: E85 Joining
Range: E74 Group
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the instance of E74 Group of which an instance of E39 Actor becomes a member through an instance of E85 Joining.
Although a Joining activity normally concerns only one instance of E74 Group, it is possible to imagine circumstances under which becoming member of one Group implies becoming member of another Group as well.

Examples:

- The election of Sir Isaac Newton as Member of Parliament to the Convention Parliament of 1689 *joined with* the Convention Parliament
- The inauguration of Mikhail Sergeyevich Gorbachev as Leader of the Union of Soviet Socialist Republics (USSR) in 1985 *joined with* the office of Leader of the Union of Soviet Socialist Republics (USSR)

P145 separated (left by)

Domain: E86 Leaving
Range: E39 Actor
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the instance of E39 Actor that leaves an instance of E74 Group through an instance of E86 Leaving.

Examples:

- The end of Sir Isaac Newton's duty as Member of Parliament for the University of Cambridge to the Convention Parliament in 1702 *separated* Sir Isaac Newton
- George Washington's leaving office in 1797 *separated* George Washington

P146 separated from (lost member by)

Domain: E86 Leaving
Range: E74 Group
Subproperty of: E5 Event. P11 had participant (participated in): E39 Actor
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the instance of E74 Group an instance of E39 Actor leaves through an instance of E86 Leaving.

Although a Leaving activity normally concerns only one instance of E74 Group, it is possible to imagine circumstances under which leaving one E74 Group implies leaving another E74 Group as well.

Examples:

- The end of Sir Isaac Newton's duty as Member of Parliament for the University of Cambridge to the Convention Parliament in 1702 *separated from* the Convention Parliament
- George Washington's leaving office in 1797 *separated from* the office of President of the United States

P148 is identified by (identifies)

Domain: E28 Conceptual Object
Range: E75 Conceptual Object Appellation
Subproperty: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property identifies a name used specifically to identify an E28 Conceptual Object.

This property is a specialisation of *P1 is identified by (identifies)* is identified by.

Examples:

- The publication „Germanisches Nationalmuseum (GNM), Fuehrer durch die Sammlungen" (broschiert), Prestl 1995 (E73) *is identified by* ISBN 3-7913-1418-1 (E75)

Amendments to version 4.2.4

In 16th CIDOC CRM Harmonization meeting which took place in Nuremberg on 4 – 7 December 2007, the following changes took place

Delete the word "domain"

From the introduction, the characterization of the CRM ontology as a domain ontology is deleted.
The text was changed as:

BEFORE

Applied Form

The CRM is a domain ontology in the sense used in computer science. ……..

AFTER

Applied Form

T
he CRM is an ontology in the sense used in computer science. ……..

E15

The first letter of the first word in the first example was capitalized.

BEFORE

- replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens

AFTER

- Replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens

E42

The first sentence of the scope note is changed
BEFORE
This class comprises codes assigned to instances…
AFTER
This class comprices strings or codes assigned to instances….

E85 and E86

The scope note is changed to include marriage as a social organization and also to correct misspelled class numbers and names.

BEFORE

E85 Joining

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in an instance of E49 Actor becoming a member of an instance of E74 Group. This class does not imply initiative by either party.

Typical scenarios include becoming a member of a social organisation, becoming employee of a company, the adoption of a child by a family and the inauguration of somebody into an official position.

Examples:

- The election of Sir Isaac Newton as Member of Parliament for the University of Cambridge to the Convention Parliament of 1689
- The inauguration of Mikhail Sergeyevich Gorbachev as leader of the Union of Soviet Socialist Republics (USSR) in 1985

Properties:

P143 joined (was joined by): E39 Actor
P144 joined with (gained member by) E74 Group

E80 Leaving

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in an instance of E49 Actor to be separated from an instance of E74 Group. This class does not imply initiative by either party.

Typical scenarios include the termination of membership in a social organisation, ending the employment at a company, and the end of tenure of somebody in an official position.

Examples:

- The end of Sir Isaac Newton's duty as Member of Parliament for the University of Cambridge to the Convention Parliament in 1702
- George Washington's leaving office in 1797

Properties:

P145 separated (left by) E39 Actor
P146 separated from (lost member by) E74 Group

AFTER

E85 Joining

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in an instance of E39 Actor becoming a member of an instance of E74 Group. This class does not imply initiative by either party.
Typical scenarios include becoming a member of a social organisation, becoming employee of a company, marriage,

the adoption of a child by a family and the inauguration of somebody into an official position.

Examples:

- The election of Sir Isaac Newton as Member of Parliament for the University of Cambridge to the Convention Parliament of 1689
- The inauguration of Mikhail Sergeyevich Gorbachev as leader of the Union of Soviet Socialist Republics (USSR) in 1985

Properties:

P143 joined (was joined by): E39 Actor
P144 joined with (gained member by) E74 Group

E86 Leaving

Subclass of: E7 Activity

Scope note: This class comprises the activities that result in an instance of E39 Actor to be disassociated from an instance of E74 Group. This class does not imply initiative by either party.
Typical scenarios include the termination of membership in a social organisation, ending the employment at a company, divorce, and the end of tenure of somebody in an official position.

Examples:

- The end of Sir Isaac Newton's duty as Member of Parliament for the University of Cambridge to the Convention Parliament in 1702
- George Washington's leaving office in 1797

Properties:

P145 disassociated (left by) E39 Actor
P146 disassociated from (lost member by) E74 Group

Amendments to version 4.2.5

The following changes have been made to the 17th SIG meeting May 12-15 at Heraklion Crete

Changes in the terminology

In the terminology there were two instance paragraphs. In this version they have been merged.

BEFORE

instance	An instance of a **class** is an item that has the traits that match the criteria of the **intension** of the class**.** For example: The painting known as the "The Mona Lisa" is an instance of the class Physical Man Made Object. An instance of a **property** is a factual relation between an instance of the **domain** and an instance of the **range** of the property that matches the criteria of the **intension** of the property. For example: "The Louvre *is current owner of* The Mona Lisa" is an instance of the property "*is current owner of".*

instance An instance of a **class** is a real world item that fulfils the criteria of the **intension** of the class. Note, that the number of **instances** declared for a class in an information system is typically less than the total in the real world. For example, you are an instance of Person, but you are not mentioned in all information systems describing Persons.

AFTER

instance An instance of a **class** is a real world item that fulfils the criteria of the **intension** of the class. Note, that the number of **instances** declared for a class in an information system is typically less than the total in the real world. For example, you are an instance of Person, but you are not mentioned in all information systems describing Persons.
For example:
The painting known as the "The Mona Lisa" is an instance of the class Physical Man Made Object.

An instance of a **property** is a factual relation between an instance of the **domain** and an instance of the **range** of the property that matches the criteria of the **intension** of the property.

For example:
"The Louvre *is current owner of* The Mona Lisa" is an instance of the property "*is current owner of*".

E89, E90 have been added:

E89 Propositional Object

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 mental 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.

Examples:

- Maxwell's Equations
- The ideational contents of Aristotle's book entitled 'Metaphysics' as rendered in the Greek texts translated in … Oxford edition…
- The underlying prototype of any "no-smoking" sign (E36)
- The common ideas of the plots of the movie "The Seven Samurai" by Akira Kurosawa and the movie "The Magnificent Seven" by John Sturges
- The image content of the photo of the Allied Leaders at Yalta 1945 (E38)

Properties**:**

P148 has component (is component of): E89 Propositional Object
P67 refers to (is referred to by): E1 CRM Entity
(P67.1 has type: E55 Type)
P129 is about (is subject of): E1 CRM Entity

E90 Symbolic Object

Subclass of: E28 Conceptual Object
E72 Legal Object
Superclass of: E73 Information Object
E41 Appellation

Scope note:
This class comprises identifiable symbols and any aggregation of symbols, such as characters, identifiers, traffic signs, emblems, texts, data sets, images, musical scores, multimedia objects, computer program code or mathematical formulae that have an objectively recognizable structure and that are documented as single units.

It includes sets of signs of any nature, which may serve to designate something, or to communicate some propositional content.

An instance of E90 Symbolic Object does not depend on a specific physical carrier, which can include human memory, and it can exist on one or more carriers simultaneously. An instance of E90 Symbolic Object may or may not have a specific meaning, for example an arbitrary character string.

Examples:
- 'ecognizabl'
- The "no-smoking" sign (E36)
- 'BM000038850.JPG' (E75)
- image BM000038850.JPG from the Clayton Herbarium in London (E38)
- The distribution of form, tone and colour found on Leonardo da Vinci's painting named "Mona Lisa" (E38)
- The Italian text of Dante's "Divina Commedia" 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) (E33)

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

P148 has been changed

BEFORE

P148 is identified by (identifies)

Domain: E28 Conceptual Object
Range: E75 Conceptual Object Appellation
Subproperty: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property identifies a name used specifically to identify an E28 Conceptual Object.

This property is a specialisation of *P1 is identified by (identifies)* is identified by.

Examples:
- The publication „Germanisches Nationalmuseum (GNM), Fuehrer durch die Sammlungen" (broschiert), Prestl 1995 (E73) *is identified by* ISBN 3-7913-1418-1 (E75)

AFTER

P148 has component (is component of)

Domain: E89 Propositional Object
Range: E89 Propositional Object
Superproperty of:
Subproperty of:

Quantification: (0:n,0:n)

Scope note: This property associates an instance of E89 Propositional Object with a structural part of it that is by itself an instance of E89 Propositional Object.

Examples: The Italian text of Dante's textual work entitled "Divina Commedia" (E33) *P148 has component* The Italian text of Dante's textual work entitled "Inferno" (E33)

P67, P129 changed domain

BEFORE
E73 Information Object.P67 refers to (is referred to by): E1 CRM Entity
E73 Information Object.P129 is about (is subject of): E1 CRM Entity
AFTER
E89 Propositional Object.P67 refers to (is referred to by): E1 CRM Entity
E89 Propositional Object.P129 is about (is subject of): E1 CRM Entity

P106 changed domain and range

BEFORE
E73 Information Object. P106 is composed of (forms part of): E73 Information Object

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

Changes in the scope note of E7 Activity P16

Changes in the scope note of E7 Activity P16 have been made for the name use and new examples have been added to both of them.

E7 Activity

Subclass of: E5 Event
Superclass of: E8 Acquisition
E9 Move
E10 Transfer of Custody
E11 Modification
E13 Attribute Assignment
E65 Creation
E66 Formation
E85 Joining
E86 Leaving

Scope note: This class comprises actions intentionally carried out by instances of E39 Actor that result in changes of state in the cultural, social, or physical systems documented.

This notion includes complex, composite and long-lasting actions such as the building of a settlement or a war, as well as simple, short-lived actions such as the opening of a door.

Examples:

- the Battle of Stalingrad
- the Yalta Conference

- my birthday celebration 28-6-1995
- the writing of "Faust" by Goethe (E65)
- the formation of the Bauhaus 1919 (E66)
- calling the place identified by TGN '7017998' 'Quyunjig' by the people of Iraq

Properties:

P14 carried out by (performed): E39 Actor
(P14.1 in the role of: E55 Type)
P15 was influenced by (influenced): E1 CRM Entity
P16 used specific object (was used for): E70 Thing
(P16.1 mode of use: E55 Type)
P17 was motivated by (motivated): E1 CRM Entity
P19 was intended use of (was made for): E71 Man-Made Thing
(P19.1 mode of use: E55 Type)
P20 had specific purpose (was purpose of): E7 Activity
P21 had general purpose (was purpose of): E55 Type
P32 used general technique (was technique of): E55 Type
P33 used specific technique (was used by): E29 Design or Procedure
P125 used object of type (was type of object used in): E55 Type
P134 continued (was continued by): E7 Activity

P16 used specific object (was used for)

Domain: E7 Activity
Range: E70 Thing
Subproperty of: E5 Event. P12 occurred in the presence of (was present at): E77 Persistent Item
E7 Activity. P15 was influenced by (influenced): E1 CRM Entity
Superproperty of: E7 Activity. P33 used specific technique (was used by): E29 Design or Procedure
E15 Identifier Assignment. P142 used constituent (was used in): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property describes the use of material or immaterial things in a way essential to the performance or the outcome of an E7 Activity.

This property typically applies to tools, instruments, moulds, raw materials and items embedded in a product. It implies that the presence of the object in question was a necessary condition for the action. For example, the activity of writing this text required the use of a computer. An immaterial thing can be used if at least one of its carriers is present. For example, the software tools on a computer.

Another example is the use of a particular name by a particular group of people over some span to identify a thing, such as a settlement. In this case, the physical carriers of this name are at least the people understanding its use.

Examples:

- the writing of this scope note (E7) *used specific object* Nicholas Crofts' computer (E22) *mode of use* Typing Tool; Storage Medium (E55)
- the people of Iraq calling the place identified by TGN '7017998' (E7) *used specific object* "Quyunjig" (E44) *mode of use* Current; Vernacular (E55)

Properties: P16.1 mode of use: E55 Type

Changes to E54

BEFORE

E54 Dimension (old)

Subclass of: E1 CRM Entity

Scope note: This class comprises quantifiable properties that are measured by some calibrated means and can be approximated by numerical values.

An instance of E54 Dimension is regarded as the true quantity, independent from its numerical approximation, e.g. in inches or in cm. The properties of the class E54 Dimension allow for expressing the numerical approximation. It is recommended to record all numerical approximations of instances of E54 Dimension as intervals of indeterminacy. Numerical approximations in archaic instances of E58 Measurement Unit used in historical records should be preserved. Equivalents corresponding to current knowledge should be recorded as additional instances of E54 Dimension as appropriate.

Examples:

- currency: £26.00
- length: 3.9-4.1 cm
- diameter 26 mm
- weight 150 lbs
- density: 0.85 gm/cc
- luminescence: 56 ISO lumens
- tin content: 0.46 %
- taille au garot: 5 hands
- calibrated C14 date: 2460-2720 years, etc

Properties:

P90 has value: E60 Number
P91 has unit (is unit of): **E58** Measurement Unit

AFTER

E54 Dimension

Subclass of: E1 CRM Entity

Scope note: This class comprises quantifiable properties that can be measured by some calibrated means and can be approximated by values, i.e. points or regions in a mathematical or conceptual space, such as natural or real numbers, RGB values etc.

An instance of E54 Dimension represents the true quantity, independent from its numerical approximation, e.g. in inches or in cm. The properties of the class E54 Dimension allow for expressing the numerical approximation of the values of an instance of E54 Dimension. If the true values belong to a non-discrete space, such as spatial distances, it is recommended to record them as approximations by intervals or regions of indeterminacy enclosing the assumed true values. For instance, a length of 5 cm may be recorded as 4.5-5.5 cm, according to the precision of the respective observation. Note, that interoperability of values described in different units depends critically on the representation as value regions.

Numerical approximations in archaic instances of E58 Measurement Unit used in historical records should be preserved. Equivalents corresponding to current knowledge should be recorded as additional instances of E54 Dimension as appropriate.

Examples:

- the height of silver cup 232
- The RGB value matrix of my digital image IMG_0025 from 4-5-2007
- the wingspan of my stuffed chaffinch *'Fringilla coelebs* Linnaeus, 1758'
- the calibrated C14 date of bone splinter AC-1983-04532
- The number of coins in the silver hoard XXXX

Properties:

P90 has value: E60 Number
P91 has unit (is unit of): E58 Measurement Unit

Changes to the text of E28

BEFORE

E28 Conceptual Object

Subclass of: E71 Man-Made Thing
Superclass of: E30 Right
E55 Type
E73 Information Object

Scope note: This class comprises non-material products of our minds and information produced by humans with or without using technical devices that have become objects of a discourse about their identity, circumstances of creation and historical implications.

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 papers,
electronic signals, marks, audio media, paintings, photos, human memories, etc.

They cannot be destroyed as long as they exist on at least one carrier or in memory.
Their existence ends when the last carrier is lost. A greater distinction can be made between products having a clear identity, such as a specific text, or photographs, and the ideas and concepts shared and traded by groups of people.

Examples:

- Beethoven's "Ode an die Freude" (Ode to Joy), (E73)
- the definition of "ontology" in the Oxford English Dictionary
- the knowledge about the victory at Marathon carried by the famous runner

Properties :

P148 is identified by (identifies) : E75 Conceptual Object Appellation

AFTER

E28 Conceptual Object

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

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.

Examples:

- Beethoven's "Ode an die Freude" (Ode to Joy), (E73)
- the definition of "ontology" in the Oxford English Dictionary
- the knowledge about the victory at Marathon carried by the famous runner

Changes in the domain, range and superproperty of P137

BEFORE

P137 is exemplified by (exemplifies) (old)

Domain: E55 Type
Range: E1 CRM Entity
Quantification: many to many (0,n:0,n)

Scope note: This property allows an item to be declared as an example of an E55 Type or taxon.

The taxonomic role renders the specific relationship of this example to the Type, such as "prototypical", "archetypical" "lectotype", etc. The taxonomic role "lectotype" is not associated with the Type Creation (E83) itself, but selected in a later phase.

Examples:

- '*Spigelia marilandica* (L.) L.' (E55) *is exemplified by* Object BM000098044 of the Clayton Herbarium (E20) *in the taxonomic role* lectotype

Properties: P137.1 in the taxonomic role: E55 Type

AFTER

P137 exemplifies (is exemplified by) (NEW)

Domain: E1 CRM Entity
Range: E55 Type
Quantification: many to many (0,n:0,n)
subproperty of: E1 CRM Entity. P2 has type: E55 Type

Scope note: This property allows an item to be declared as a particular example of an E55 Type or taxon.

The *P137.1 in the taxonomic role* property of *P137 exemplifies (is exemplified by)* allows differentiation of taxonomic roles. The taxonomic role renders the specific relationship of this example to the Type, such as "prototypical", "archetypical", "lectotype", etc. The taxonomic role "lectotype" is not associated with the Type Creation (E83) itself, but selected in a later phase.

Examples:

- Object BM000098044 of the Clayton Herbarium (E20) *exemplifies Spigelia marilandica* (L.) L. (E55) *in the taxonomic role* lectotype

Properties: P137.1 in the taxonomic role: E55 Type

P39

Changes in the range and the scope note of P39

BEFORE

P39 measured (was measured by):

Domain: E16 Measurement
Range: E70 Thing
Subproperty of: E13 Attribute Assignment. P140 assigned attribute to (was attributed by): E1 CRM Entity
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property records the E70 Thing that was the subject of an instance of E16 Measurement Event.Thing may be measured more than once. Both material and immaterial sThing may be measured, e.g. the number of words in a text.

Examples:

- 31 August 1997 measurement of height of silver cup 232 (E16) *measured* silver cup 232 (E22)

AFTER

P39 measured (was measured by):

Domain: E16 Measurement
Range: E1 CRM Entity
Subproperty of: E13 Attribute Assignment. P140 assigned attribute to (was attributed by): E1 CRM Entity
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property associates an instance of E16 Measurement with the instance of E1 CRM Entity to which it applied. An instance of E1 CRM Entity may be measured more than once. Material and immaterial things and processes may be measured, e.g. the number of words in a text, or the duration of an event.

Examples:

- 31 August 1997 measurement of height of silver cup 232 (E16) *measured* silver cup 232 (E22)

Amendments to version 4.2.5a

The range and the scope note of P20 has been changed

P20 had specific purpose (was purpose of)

Domain: E7 Activity
Range: E5 Event
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the relationship between a preparatory activity and the event it is intended to be preparation for.

This includes activities, orders and other organisational actions, taken in preparation for other activities or events.

P20 had specific purpose (was purpose of) implies that an activity succeeded in achieving its aim. If it does not succeed, such as the setting of a trap that did not catch anything, one may document the unrealized intention using *P21 had general purpose (was purpose of):E55 Type* and/or *P33 used specific technique (was used by): E29 Design or Procedure*.

Examples:

- Van Eyck's pigment grinding in 1432 (E7) *had specific purpose* the painting of the Ghent alter piece (E12)

The scope note of P21 has been changed and an example is added

P21 had general purpose (was purpose of)

Domain: E7 Activity
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property describes an intentional relationship between an E7 Activity and some general goal or purpose.

This may involve activities intended as preparation for some type of activity or event. *P21had general purpose (was purpose of)* differs from *P20 had specific purpose (was purpose of)* in that no occurrence of an event is implied as the purpose.

Examples:

- Van Eyck's pigment grinding (E7) *had general purpose* painting (E55)
- The setting of trap 2742 on May 17th 1874 (E7) *had general purpose* Catching Moose (E55) (Activity type)

P105 has been superproperty of P52

The scope note of P105 has been changed

P105 right held by (has right on)

Domain: E72 Legal Object
Range: E39 Actor
Superproperty of: P52 has current owner (is current owner of)
Quantification: many to many (0,n:0,n)

Scope note: This property identifies the E39 Actor who holds the instances of E30 Right to an E72 Legal Object. It is a superproperty of *P52 has current owner (is current owner of)* because ownership is a right that is held on the owned object.

P105 right held by (has right on) is a shortcut of the fully developed path from E72 Legal Object through *P104 is subject to (applies to)*, E30 Right, *P75 possesses (is possessed by)* to E39 Actor.

Examples:

- J.M.Barrie's Peter Pan (E73) *right held by* Great Ormond Street Hospital (E40)

Proofreading:

1. 2nd paragraph of chapter "APPLIED FORM"

   Before:
   Although the definition of the CRM provided here is complete, it is an intentionally compact and concise presentation of the CRM's 86 classes and 132 unique properties. It does not attempt to articulate the inheritance of properties by subclasses throughout the class hierarchy (this would require the declaration of several thousand properties, as opposed to 132)

   After:
   Although the definition of the CRM provided here is complete, it is an intentionally compact and concise presentation of the CRM's 86 classes and 137 unique properties. It does not attempt to articulate the inheritance

of properties by subclasses throughout the class hierarchy (this would require the declaration of several thousand properties, as opposed to 137)

2. In chapter "Terminology" the paragraph that gives the definition of the instance (page v)

   Before:
   An instance of a **class** is a real world item that fulfils the criteria of the **intension** of the class. Note, that the number of **instances** declared for a class in an information system is typically less than the total in the real world. For example, you are an instance of Person, but you are not mentioned in all information systems describing Persons.
   For example:
   The painting known as the "The Mona Lisa" is an instance of the class Physical Man Made Object.

   After:
   An instance of a **class** is a real world item that fulfils the criteria of the **intension** of the class. Note, that the number of **instances** declared for a class in an information system is typically less than the total in the real world. For example, you are an instance of Person, but you are not mentioned in all information systems describing Persons.
   For example:
   The painting known as the "The Mona Lisa" is an instance of the class Man Made Object.

Amendments to version 4.3

P68 usually employs (is usually employed by)

The name of P68 usually employs (is usually employed by) was changed from *P68 usually employs (is usually employed by)* to *P68 foresees use of (use foreseen by)*:

FROM:

P68 usually employs (is usually employed by):

Domain: E29 Design or Procedure
Range: E57 Material
Quantification: many to many (0,n:0,n)

Scope note: This property describes an E57 Material usually employed in an E29 Design or Procedure.

Designs and procedures commonly employ particular Materials. The fabrication of adobe bricks, for example, requires straw, clay and water. This property enables this to be documented.

This property is not intended for the documentation of Materials that were required on a particular occasion when a Design or Procedure was executed.

Examples:
procedure for soda glass manufacture (E29) *usually employs* soda (E57)

TO:

P68 foresees use of (use foreseen by):

Domain: E29 Design or Procedure
Range: E57 Material
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an E57 Material foreseeen to be used by an E29 Design or Procedure.

E29 Designs and procedures commonly foresee the use of particular E57 Materials. The fabrication of adobe bricks, for example, requires straw, clay and water. This property enables this to be documented.

This property is not intended for the documentation of E57 Materials that were used on a particular occasion when an instance of E29 Design or Procedure was executed.

Examples:

- procedure for soda glass manufacture (E29) *foresees use of* soda (E57)
-

Compatibility

The text of compatibility was changed.

FROM:

Compatibility with the CRM

Users intending to take advantage of the semantic interoperability offered by the CRM may want to make parts of their data structures compatible with the CRM. The respective parts should pertain either to the associations by which users would like their data to be accessible in an integrated environment, or to contents intended for transport to other environments, so that the meaning encoded by its structure is preserved in another target system.

In that sense, the CRM is not aimed at proposing a complete matching of user documentation structures with the CRM, nor that a user should always implement all CRM concepts and associations; rather it is intended to leave room for all kinds of extensions to capture the richness of cultural information, but also for simplifications for reasons of economy.

Further, the CRM is a means to interpret structured information in a way, so that large amounts of data contents can be transformed or mediated automatically. As a consequence, the CRM aims not at resolving free text information into a formal logical form. In other terms, it does not intend to provide more structuring than the users have done before, and free text information does not fall under the scope of compatibility considerations. The CRM foresees however the associations to transport such information in relation to structured information.
The CRM is a formal ontology, expressible in terms of logic or a suitable knowledge representation language. Its concepts can be instantiated as sets of statements that form models of the assumed reality referred to in a structured document. Any encoding of CRM instances in a formal language that preserves the relations to the CRM classes, properties and inheritance rules among them is regarded a "CRM-compatible form".

A part of a documentation structure is compatible with the CRM, if a deterministic logical algorithm can be found, that transforms any data correctly encoded in this structure into a CRM-compatible form without loss of meaning. No assumptions are made about the nature of this algorithm. It may in particular draw on other formal ontologies expressing background knowledge such as thesauri. The algorithm itself can only be found and verified intellectually by understanding the meaning intended by the designer of the data structure and the CRM concepts. By the term "correctly encoded" we mean that the data are encoded so that the meaning intended by the designer of the data structure is correctly applied to the intended meaning of the data.

Information system implementers may choose to provide **export** facilities of selected data into a CRM-compatible form. They may further choose to provide a service to **access** selected data by querying with CRM concepts. It is not regarded a loss of compatibility, if certain subclasses and subproperties of the CRM are not supported in such a service. In that case it is regarded essential that the services publishes the set of CRM concepts it supports.

TO:

Utility of CRM compatibility

The goal of the CRM is to enable the integration of the largest number of information resources. Therefore it aims to provide the greatest flexibility of systems to become compatible, rather than imposing one particular solution.

Users intending to take advantage of the semantic interoperability offered by the CRM may want to make parts of their data structures compatible with the CRM. Compatibility may pertain either to the associations by which users would like their data to be accessible in an integrated environment, or to the contents intended for transport to other environments, allowing encoded meaning to be preserved in a target system.

The CRM does not require complete matching of all user documentation structures with the CRM, nor that systems should always implement all CRM concepts and associations; instead it leaves room both for extensions, needed to capture the full richness of cultural information, and for simplifications, required for reasons of economy.

Furthermore, the CRM provides a means of interpreting structured information so that large amounts of data can be transformed or mediated automatically. It does not require unstructured or semi-structured free text information to be analysed into a formal logical representation. In other words, it does not aim to provide more structure than users have previously provided. The interpretation of information in the form of free text falls outside the scope of compatibility considerations. The CRM does, however, allow free text information to be integrated with structured information.

The Information Integration Environment

The notion of CRM compatibility is based on *interoperability*. Interoperability is best defined on the basis of specific communication practices between *information systems*. Following current practice, we distinguish the following types of information integration environments pertaining to information systems:

3. *Local information systems*. These are either *collection management systems* or *content management systems* that constitute institutional memories and are maintained by an institution. They are used for primary data entry, i.e. a relevant part of the information, be it data or metadata, is primary information in digital form that fulfils institutional needs.

4. *Integrated access systems*. These provide an homogeneous access layer to multiple local systems. The information they manage resides primarily on local systems. We distinguish between:
    a. *Materialized access systems*, which physically *import* data provided by local systems, using a data warehouse approach. Such systems may employ so-called metadata harvesting techniques or rely on data submission. Data may be transformed to respect the schema of the access system before being merged.
    b. *Mediation systems*, [Gio Wiederholt] which send out queries, formulated according to a virtual global schema, to multiple local systems and then collect and integrate the answers. The queries may be transformed to a local schema either by the mediation system or by the receiving local system itself.

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Local systems may also *import* data from other systems, in order to complement collections, or to merge information from other systems. An information system may *export* information for migration and preservation.

Compatibility with the CRM pertains to one or more of the following data communication capabilities or *use cases*:

5. data falling within the scope of the CRM can be *exported* from an information system into an encoded form without loss of meaning with respect to CRM concepts;
6. data falling within the scope of the CRM can be *transformed* into another encoded form without loss of meaning with respect to CRM concepts;
7. data falling within the scope of the CRM can be *imported* from an encoded form into an information system without loss of meaning with respect to CRM concepts;
8. data falling within the scope of the CRM that is contained in an information system can be *queried and retrieved exhaustively* in terms of CRM concepts, subject to the expressive power of a particular query language.

Any declaration of CRM compatibility must specify one or more of the above use cases. System and data structure providers shall not declare their products as "CRM compatible" without specifying the appropriate use cases as detailed below.

In the context of this chapter, the expression "without loss of meaning with respect to the CRM concepts" means the following: The CRM concepts are used to classify items of discourse and their relationships. By virtue of this classification, data can be understood as propositions of a kind declared by the CRM about real world facts, such as "Object x. forms part of: Object y". In case the encoding, i.e. the language used to describe a fact, is changed, only an expert conversant with both languages can assess if the two propositions do indeed describe the same fact. If this is the case, then there is no loss of meaning with respect to CRM concepts. Communities of practice requiring fewer concepts than the CRM declares may restrict CRM compatibility with respect to an explicitly declared subset of the CRM.

Users of this standard may communicate CRM compatible data, as detailed below, with data structures and systems that are either more detailed and specialized than the CRM or whose scope extends beyond that of the CRM. In such cases, the standard guarantees only the preservation of meaning with respect to CRM concepts. However, additional information that can be regarded as extending CRM concepts may be communicated and preserved in CRM compatible systems through the appropriate use of controlled terminology. The specification of the latter techniques does not fall under the scope of this standard. Communities of practice requiring extensions to the CRM are encouraged to declare their extensions as CRM-compatible standards.

CRM-Compatible Form

The CRM is a formal ontology which can be expressed in terms of logic or a suitable knowledge representation language. Its concepts can be instantiated as sets of statements that provide a model of reality. We call any encoding of such CRM instances in a formal language that preserves the relations between the CRM *classes*, *properties* and *inheritance rules* a "CRM-compatible form". Hence data expressed in any CRM-compatible form can be automatically transformed into any other CRM-compatible form without loss of meaning. Classes and properties of the CRM are identified by their initial codes, such as "E55" or "P12". The names of classes and properties of a CRM-compatible form *may be translated into any local language*, but the identifying codes must be preserved. A CRM-compatible form *should not implement the quantifiers* of CRM properties as cardinality constraints for the encoded instances. Quantifiers may be implemented in an informative way, or not at all. Statements that violate quantifiers should be treated as *alternative knowledge*.

Any encoding of CRM instances in a formal language that preserves the relations within a consistent *subset* of CRM *classes*, *properties* and *inheritance rules* is regarded a "reduced CRM-compatible form", if:

- all the conditions applicable to a *CRM compatible form* are respected;

the subset does not violate the rules of subsumption and inheritance;

- any instance of the reduced CRM-compatible form is also a valid instance of a (full) CRM compatible form
- the subset contains at least the following concepts:

E1 CRM Entity
E2 - Temporal Entity
E4 - - Period
E5 - - - Event
E7 - - - - Activity
E11 - - - - - Modification
E12 - - - - - - Production
E13 - - - - - Attribute Assignment
E65 - - - - - Creation
E63 - - - - Beginning of Existence
E12 - - - - - *Production*
E65 - - - - - Creation
E64 - - - - End of Existence
E77 - Persistent Item
E70 - - Thing
E72 - - - Legal Object
E18 - - - - Physical Thing
E24 - - - - - Physical Man-Made Thing
E90 - - - - Symbolic Object
E71 - - - Man-Made Thing
E24 - - - - *Physical Man-Made Thing*

E28 - - - - Conceptual Object
E89 - - - - - Propositional Object
E30 - - - - - - Right
E73 - - - - - - Information Object
E90 - - - - - *Symbolic Object*
E41 - - - - - - Appellation
E73 - - - - - - *Information Object*
E55 - - - - - Type
E39 - - Actor
E74 - - - Group
E52 - Time-Span
E53 - Place
E54 - Dimension
E59 Primitive Value
E61 - Time Primitive
E62 - String

Property id	Property Name	Entity – Domain	Entity - Range
P1	is identified by (identifies)	E1 CRM Entity	E41 Appellation
P2	has type (is type of)	E1 CRM Entity	E55 Type
P3	has note	E1 CRM Entity	E62 String
P4	has time-span (is time-span of)	E2 Temporal Entity	E52 Time-Span
P7	took place at (witnessed)	E4 Period	E53 Place
P10	falls within (contains)	E4 Period	E4 Period
P12	occurred in the presence of (was present at)	E5 Event	E77 Persistent Item
P11	- had participant (participated in)	E5 Event	E39 Actor
P14	- - carried out by (performed)	E7 Activity	E39 Actor
P16	- used specific object (was used for)	E7 Activity	E70 Thing
P31	- has modified (was modified by)	E11 Modification	E24 Physical Man-Made Thing
P108	- - has produced (was produced by)	E12 Production	E24 Physical Man-Made Thing
P92	- brought into existence (was brought into existence by)	E63 Beginning of Existence	E77 Persistent Item
P108	- - *has produced (was produced by)*	*E12 Production*	*E24 Physical Man-Made Thing*
P94	- - has created (was created by)	E65 Creation	E28 Conceptual Object
P93	- took out of existence (was taken out of existence by)	E64 End of Existence	E77 Persistent Item
P15	was influenced by (influenced)	E7 Activity	E1 CRM Entity
P16	- *used specific object (was used for)*	*E7 Activity*	*E70 Thing*
P20	had specific purpose (was purpose of)	E7 Activity	E7 Activity
P43	has dimension (is dimension of)	E70 Thing	E54 Dimension
P46	is composed of (forms part of)	E18 Physical Thing	E18 Physical Thing
P59	has section (is located on or within)	E18 Physical Thing	E53 Place
P67	refers to (is referred to by)	E89 Propositional Object	E1 CRM Entity
P75	possesses (is possessed by)	E39 Actor	E30 Right
P81	ongoing throughout	E52 Time-Span	E61 Time Primitive
P82	at some time within	E52 Time-Span	E61 Time Primitive
P89	falls within (contains)	E53 Place	E53 Place
P104	is subject to (applies to)	E72 Legal Object	E30 Right
P106	is composed of (forms part of)	E90 Symbolic Object	E90 Symbolic Object
P107	has current or former member (is current or former member of)	E74 Group	E39 Actor
P127	has broader term (has narrower term)	E55 Type	E55 Type
P128	carries (is carried by)	E24 Physical Man-Made Thing	E90 Symbolic Object
P130	shows features of (features are also found on)	E70 Thing	E70 Thing
P140	assigned attribute to (was attributed by)	E13 Attribute Assignment	E1 CRM Entity
P141	assigned (was assigned by)	E13 Attribute Assignement	E1 CRM Entity
P148	has component (is component of)	E89 Propositional Object	E89 Propositional Object

CRM Compatibility of Data Structure

A data structure is *export-compatible* with the CRM if it is possible to transform any data from this data structure into a CRM-compatible form *without loss of meaning*. Implicit concepts may be present in elements of the data structure that are not supported by the CRM. As long as these concepts can be encoded as instances of E55 Type (i.e. as terminology) and attached unambiguously to their respective data items with suitable properties, the data structure is *still regarded as* export compatible.

Note that not all CRM concepts may be represented by elements of an export-compatible data structure. All data from export-compatible data structures can be transported in a CRM-compatible form. In particular any CRM compatible form or *reduced CRM-compatible form* is export-compatible with the CRM.

A data structure is *import-compatible* with the CRM if it is possible to automatically transform any data from a CRM-compatible form into this data structure *without loss of meaning*, simply on the basis of knowledge about the data structure elements being used. This implies that a data record transformed into this data structure from a CRM-compatible form can be transformed back into the CRM-compatible form *without loss of meaning*. Note that the back-transformation into a CRM-compatible form may result in a data record that is semantically equivalent but not identical with the original.

Any CRM-compatible form is automatically import-compatible with the CRM. Note that an import-compatible data structure may be semantically richer than the CRM. It may contain elements that, through the use of a transformation algorithm, can be made to correspond to CRM concepts or specializations thereof or that contain elements with meanings that fall outside the scope of the CRM. However, it must not contain elements that overlap in meaning with CRM concepts and which cannot be subsumed via transformation by a CRM concept other than E1 CRM Entity and E77 Persistent Item.

Import-compatible data structures may be used to transport data for applications that require concepts that lie beyond the scope of the CRM, as well as data from any export-compatible data structure. Note that, in general, applications may *make use* of data from a CRM import-compatible data structure that has been exported into a CRM compatible form by semantic reduction to CRM concepts, i.e. by generalizing all subsumed concepts to the most specific CRM concept applicable, and by discarding elements that fall outside the scope of the CRM.

A data structure is ***partially import-compatible* with the CRM** if the above holds for a reduced CRM-compatible form.

CRM Compatibility of Information Systems

An information system is *export-compatible* with the CRM if it is possible to export all user data from this information system into an import-compatible data structure. This capability is the recommended kind of CRM-compatibility for *local information systems.*

An information system is *partially export compatible* if it is possible to export all user data from this information system into a partially import-compatible data structure. This is not the recommended kind of CRM-compatibility, but it may not be feasible for legacy systems to acquire a higher level of CRM compatibility without unreasonable effort. This reduced level of CRM compatibility is nonetheless highly useful.

Note that there is no minimum requirement for the classes and properties that must be present in the exported user data. Therefore it is possible that the data may pertain to instances of just a single property, such as E21 Person. *P131 is identified by*: E82 Actor Appellation.

An information system is *import-compatible* with the CRM if it is possible to import data encoded in a CRM-compatible form and to access the data in a manner equivalent to and homogeneous with all generic data of this system that fall under the same concepts. This capability is considered as the normal kind of CRM compatibility for *integrated access systems* that physically copy source data in a *data warehouse* style (materialized access systems).

An information system is *partially import-compatible* with the CRM if it is possible to import data encoded in a reduced CRM-compatible form and to access the data in a manner equivalent to and homogeneous with all generic data of this system that fall under the same concepts. Depending on the functional requirements, it makes sense for integrated access systems to offer access services of reduced complexity by being only partially import-compatible with the CRM.

Note that it makes sense for integrated access systems to import data from extended data structures by semantic reduction to CRM defined concepts.

Note that local information system providers may choose to make their systems import-compatible with the CRM to be import-compatible with the CRM in order to exchange data, for example in the case of museum object loans or for system migration purposes. Communities of practice may choose to agree on import compatibility for extended data structures.

Some local information systems are likely to focus on specialized subject areas, such as inscriptions. For these

specialized systems, the ability to import a specific data structure is recommended. This should be export-compatible with the CRM, and encompass the concepts that are required by the subject matter ("dedicated import compatibility").

An information system is *access-compatible* with the CRM if it is possible to access the user data in the information system by querying with CRM classes and properties so that the meaning of the answers to the queries corresponds to the query terms used. It is not regarded as a reduction of compatibility if access is limited to data deemed to be exchanged.

An information system is *partially access-compatible* with the CRM if it is possible to access the user data in the information system by querying with a consistent subset of CRM classes and properties, corresponding to a reduced CRM-compatible form, so that the meaning of the answers to the queries corresponds to the query terms used.

An access-compatible system may be *export-compatible* with respect to the query answers. Note that it may make sense for an access-compatible content management system to return only content items in response to queries rather than being export compatible.

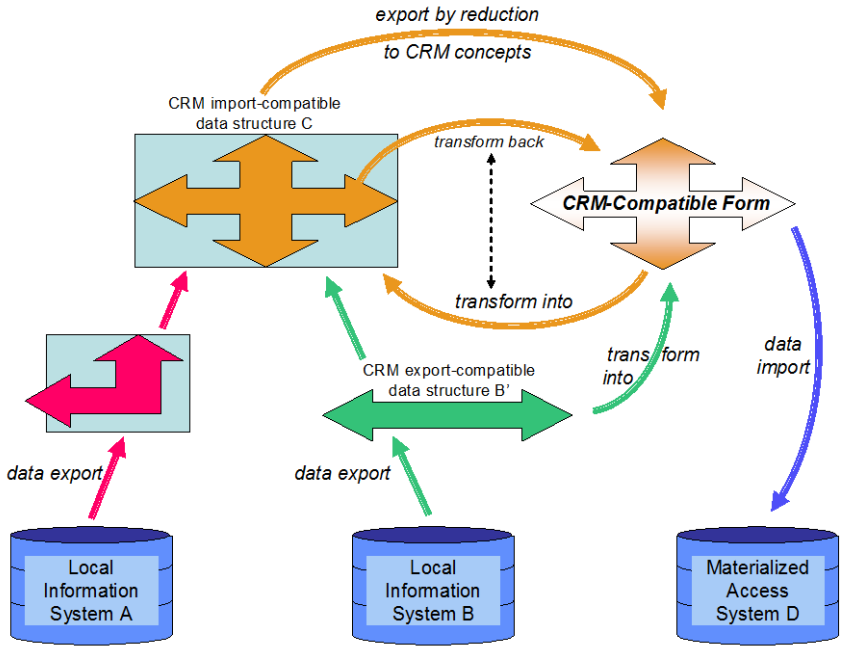


Figure XXX: Possible data flow between different kinds of CRM-compatible systems and data structures

Fig. XXX shows a symbolic representation of some of the data flow patterns defined above between different kinds of CRM-compatible systems and data structures. In this figure it is assumed that the Local System B exports data into a CRM export-compatible data structure, which implies that it can be exported into a CRM-compatible form or any other CRM import-compatible data structure. Therefore Local System B is export-compatible with the CRM. For Local System A, the figure symbolizes the case where the exported data contain elements that correspond to specializations of the CRM or fall out of its scope.

Compatibility claim declaration

A provider of a data structure or information system claiming compatibility with the CRM has to provide a declaration that describes the kind of compatibility and, depending on the kind, the following additional information:

- For export-compatible data structures:
  The subset of CRM concepts directly instantiated by any possible data in this data structure after transformation into a CRM-compatible form.

- For export-compatible systems:
  d. A declaration of configurable user data elements, if any, that are not semantically restricted to a CRM Concept (other than E1 CRM Entity or E77 Persistent Item).
  e. User data elements or units that are not exported.
  f. The subset of CRM concepts directly instantiated by any possible data exported from the system after transformation into a CRM-compatible form.
- For partially or dedicated import-compatible systems:
  The subset of CRM concepts under which data can be imported into the system.
- For access-compatible systems:
  d. The query language by which the system can be queried.
  e. The subset of CRM concepts directly instantiated by any possible query answers exported from the system after transformation into a CRM-compatible form.
  f. For partially access-compatible systems, the subset of CRM concepts by which the system can be queried.

The provider should be able to *demonstrate* the claim with suitable test data. A third party should be able to *verify* the claim with suitable test data.

About Types

The text about types was changed:

FROM:

Virtually all structured descriptions of museum objects begin with a unique object identifier and information about the "type" of the object, often in a set of fields with names like "Object Type," "Object Name," "Category," "Classification," etc. All these fields are used for terms that declare that the object is a member of a particular class or category of items, and are described by the CRM as instances of E55 Type. Since the instances of this class are themselves classes, E55 Type is in fact a metaclass.

The class E1 CRM Entity is the domain of the property *P2 has type (is type of)*, which has the range E55 Type. Consequently, every class in the CRM, with the exception of E59 Primitive Value, inherits the property *P2 has type (is type of)*. This provides a general mechanism for refining the classification of CRM instances to any level of detail, by linking to external vocabulary sources, thesauri, classification schema or ontologies that function as *extensions* to the CRM class and property hierarchies. The external vocabularies do not themselves fall within the scope of the CRM.

The class E55 Type also serves as the range of properties that relate to categorical knowledge commonly found in cultural documentation. For example, the property *P125 used object of type (was type of object used in)* enables the CRM to express statements such as "this casting was produced using a mould", meaning that there has been an unknown or unmentioned instance of "mould" that was actually used. This enables the specific instance of the casting to be associated with the entire type of manufacturing devices known as moulds. Further, the objects of type "mould" would be related via *P2 has type (is type of)* to this term. This indirect relationship may actually help in detecting the unknown object in an integrated environment. On the other side, some casting may refer directly to a known mould via *P16 used specific object (was used for)*. So a statistical question to how many objects in a certain collection are made with moulds could be answered correctly (following both paths through *P16 used specific object (was used for) - P2 has type (is type of)* and *P125 used object of type (was type of object used in*). This consistent treatment of categorical knowledge significantly enhances the CRM's ability to integrate cultural knowledge.

Some properties in the CRM are associated with an additional property. These are numbered in the CRM documentation with a ".1" extension. These do not appear in the property hierarchy list but are included as part of the property declarations and referred to in the class declarations. For example, *P62.1 mode of depiction: E55 Type* is associated with *E24 Physical Man-made Thing. P62 depicts (is depicted by): E1 CRM Entity*. The range of these properties of properties always falls within the type hierarchy E55 Type. Their purpose is to allow dynamic extensions to their parent property through the use of property subtypes declared as instances of E55 Type. This function is analogous to that of the *P2 has type (is type of)* property, which all CRM classes inherit from E1 CRM Entity. System implementations and schemas that do not support properties of properties may use dynamic subtyping of the parent properties instead.

Finally, types play a central role in the history of human understanding; they are intellectual products, and documentation about the history and justification by physical evidence of types (particularly in disciplines such as archaeology and natural history) falls squarely within the intended scope of the CRM. Therefore types are modelled as "conceptual objects," in parallel to their structural role as metaclasses. This approach elegantly addresses the dual nature of types in a manner consistent with material culture and natural history documentation.

TO:

Virtually all structured descriptions of museum objects begin with a unique object identifier and information about the "type" of the object, often in a set of fields with names like "Classification", "Category", "Object Type", "Object Name", etc. All these fields are used for terms that declare that the object belongs to a particular category of items. In the CRM the class E55 Type comprises such terms from thesauri and controlled vocabularies used to characterize and classify instances of CRM classes. Instances of E55 Type represent concepts (universals) in contrast to instances of E41 Appellation which are used to name instances of CRM classes.

E55 Type is the CRM's interface to domain specific ontologies and thesauri. These can be represented in the CRM as subclasses of E55 Type, forming hierarchies of terms, i.e. instances of E55 Type linked via P127 has broader term (has narrower term). Such hierarchies may be extended with additional properties.

For this purpose the CRM provides two basic properties that describe classification with terminology, corresponding to what is the current practice in the majority of information systems. The class E1 CRM Entity is the domain of the property P2 has type (is type of), which has the range E55 Type. Consequently, every class in the CRM, with the exception of E59 Primitive Value, inherits the property P2 has type (is type of). This provides a general mechanism for simulating a specialization of the classification of CRM instances to any level of detail, by linking to external vocabulary sources, thesauri, classification schema or ontologies.

Analogous to the function of the P2 has type (is type of) property, some properties in the CRM are associated with an additional property. These are numbered in the CRM documentation with a '.1' extension. The range of these properties of properties always falls under E55 Type. Their purpose is to simulate a specialization of their parent property through the use of property subtypes declared as instances of E55 Type. They do not appear in the property hierarchy list but are included as part of the property declarations and referred to in the class declarations. For example, P62.1 mode of depiction: E55 Type is associated with E24 Physical Man-made Thing. P62 depicts (is depicted by): E1 CRM Entity.

The class E55 Type also serves as the range of properties that relate to categorical knowledge commonly found in cultural documentation. For example, the property P125 used object of type (was type of object used in) enables the CRM to express statements such as "this casting was produced using a mould", meaning that there has been an unknown or unmentioned object, a mould, that was actually used. This enables the specific instance of the casting to be associated with the entire type of manufacturing devices known as moulds. Further, the objects of type "mould" would be related via P2 has type (is type of) to this term. This indirect relationship may actually help in detecting the unknown object in an integrated environment. On the other side, some casting may refer directly to a known mould via P16 used specific object (was used for). So a statistical question to how many objects in a certain collection are made with moulds could be answered correctly (following both paths through P16 used specific object (was used for) - P2 has type (is type of) and P125 used object of type (was type of object used in). This consistent treatment of categorical knowledge enhances the CRM's ability to integrate cultural knowledge.

In addition to being an interface to external thesauri and classification systems E55 Type is an ordinary class in the CRM and a subclass of E28 Conceptual Object. E55 Type and its subclasses inherit all properties from this superclass. Thus together with the CRM class E83 Type Creation the rigorous scholarly or scientific process that ensures a type is exhaustively described and appropriately named can be modelled inside the CRM. In some cases, particularly in archaeology and the life sciences, E83 Type Creation requires the identification of an exemplary specimen and the publication of the type definition in an appropriate scholarly forum. This is very central to research in the life sciences, where a type would be referred to as a "taxon," the type description as a "protologue," and the exemplary specimens as "original element" or "holotype".

Finally, types, that is, instances of E55 Type and its subclasses, are used to characterize the instances of a CRM class and hence refine the meaning of the class. A type 'artist' can be used to characterize persons through P2 has type (is type of). On the other hand, in an art history application of the CRM it can be adequate to extend the CRM class E21 Person with a subclass E21.xx Artist. What is the difference of the type 'artist' and the class Artist? From an everyday conceptual point of view there is no difference. Both denote the concept 'artist' and identify the same set of persons. Thus in this

setting a type could be seen as a class and the class of types may be seen as a metaclass. Since current systems do not provide an adequate control of user defined metaclasses, the CRM prefers to model instances of E55 Type as if they were particulars, with the relationships described in the previous paragraphs.

Users may decide to implement a concept either as a subclass extending the CRM class system or as an instance of E55 Type. A new subclass should only be created in case the concept is sufficiently stable and associated with additional explicitly modeled properties specific to it. Otherwise, an instance of E55 Type provides more flexibility of use. Users that may want to describe a discourse not only using a concept extending the CRM but also describing the history of this concept itself, may chose to model the same concept both as subclass and as an instance of E55 Type with the same name. Similarly it should be regarded as good practice to foresee for each term hierarchy refining a CRM class a term equivalent of this class as top term. For instance, a term hierarchy for instances of E21 Person may begin with "Person".

E55 Type

The scope note of E55 Type was changed:

FROM

> This class comprises arbitrary concepts (universals) and provides a mechanism for organising them into a hierarchy.
>
> This hierarchy is intended to duplicate the names of all the classes present in the model. This allows additional refinement, through subtyping, of those classes which do not require further analysis of their formal properties, but which nonetheless represent typological distinctions important to a given user group.
>
> It should be noted that the Model does not make the distinction between classes and types known from some knowledge representation systems and object-oriented programming languages. The class E55 Type can be regarded as a metaclass (a class whose instances are universals), used to denote a user-defined specialization of some class or property of the Model, without introducing any additional formal properties for this specialization.
>
> It reflects the characteristic use of the term "object type" for naming data fields in museum documentation and particularly the notion of typology in archaeology. It has however nothing to do with the term "type" in Natural History (cf. E83 Type Creation), but it includes the notion of a "taxon".
>
> Ideally, instances of the class E55 Type should be organised into thesauri, with scope notes, illustrations, etc. to clarify their meaning. In general, it is expected that different domains and cultural groups will develop different thesauri in parallel. Consistent reasoning on the expansion of subterms used in a thesaurus is possible insofar as it conforms to both the classes and the hierarchies of the model.
>
> E56 Language, E57 Material and E58 Measurement Unit have been defined explicitly as elements of the E55 Type hierarchy because they are used categorically in the model without reference to instances of them, i.e. the Model does not foresee the description of instances of instances of them, e.g., the property instance "*P45 consists of :* gold" does not refer to a particular instance of gold.

TO:

> This class comprises concepts denoted by terms from thesauri and controlled vocabularies used to characterize and classify instances of CRM classes. Instances of E55 Type represent concepts in contrast to instances of E41 Appellation which are used to name instances of CRM classes.
>
> E55 Type is the CRM's interface to domain specific ontologies and thesauri. These can be represented in the CRM as subclasses of E55 Type, forming hierarchies of terms, i.e. instances of E55 Type linked via P127 has broader term (has narrower term). Such hierarchies may be extended with additional properties.

E66 Formation

The scope note of E66 Formation was changed:

FROM:

This class comprises events that result in the formation of a formal or informal E74 Group of people, such as a club, society, association, corporation or nation.

E66 Formation does not include the arbitrary aggregation of people who do not act as a collective.

TO:

This class comprises events that result in the formation of a formal or informal E74 Group of people, such as a club, society, association, corporation or nation.

E66 Formation does not include the arbitrary aggregation of people who do not act as a collective.
The formation of an instance of E74 Group does not mean that the group is populated with members at the time of formation. In order to express the joining of members at the time of formation, the respective activity should be simultaneously an instance of both E66 Formation and E85 Joining.

P143 joined was joined by)

The scope note of P143 was changed:

FROM:

This property identifies the instance of E39 Actor that becomes member of a E74 Group in an E85 Joining

TO:

This property identifies the instance of E39 Actor that becomes member of a E74 Group in an E85 Joining.
Joining events allow for describing people becoming members of a group with a more detailed path from E74 Group through *P144 joined with (gained member by)*, E85 Joining, *P143 joined (was joined by)* to E39 Actor, compared to the shortcut offered by *P107 has current or former member (is current or former member of).*

P144 joined with (gained member by)

The scope note of P144 was changed

FROM:

This property identifies the instance of E74 Group of which an instance of E39 Actor becomes a member through an instance of E85 Joining.
Although a Joining activity normally concerns only one instance of E74 Group, it is possible to imagine circumstances under which becoming member of one Group implies becoming member of another Group as well.

TO:

This property identifies the instance of E74 Group of which an instance of E39 Actor becomes a member through an instance of E85 Joining.
Although a Joining activity normally concerns only one instance of E74 Group, it is possible to imagine circumstances under which becoming member of one Group implies becoming member of another Group as well.

Joining events allow for describing people becoming members of a group with a more detailed path from E74 Group through *P144 joined with (gained member by)*, E85 Joining, *P143 joined (was joined by)* to E39 Actor, compared to the shortcut offered by *P107 has current or former member (is current or former member of).*

P5 consists of

The example of P5 was changed

FROM:

- Ruination of the Tower of Babylon (E3) *consists of* wind-erosion phase (E3)

TO:

The Condition State of the ruined Parthenon (E3 Condition State) consists *of (P5)* a bombarded state (E3 Condition State) from the explosion of a Venetian shell in 1687

E78 Collection

An example is added:

FROM:

Examples:

- the John Clayton Herbarium
- the Wallace Collection

TO:

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

E87 Curation Activity

An example is added:

FROM:

Examples:

TO:

Examples:

- The curation of Mikael Heggelund Foslie's coralline red algae Herbarium 1876 – 1909 (when Foslie died), now at Museum of Natural History and Archaeology, Norway

P147 curated (was curated by)

An example is added:

FROM:

Examples:

- The activities (E87) by the Benaki Museum *curated* the acquisition of dolls and games of urban and folk manufacture dating from the 17th to the 20th century, from England, France and Germany for the "Toys, Games and Childhood Collection (E78) of the Museum.
- The activities (E87) of the Historical Museum of Crete, Heraklion, Crete, *curated* the development of the permanent Numismatic Collection (E78).

TO:

Examples:

- The activities (E87) by the Benaki Museum *curated* the acquisition of dolls and games of urban and folk manufacture dating from the 17th to the 20th century, from England, France and Germany for the "Toys, Games and Childhood Collection (E78) of the Museum.
- The activities (E87) of the Historical Museum of Crete, Heraklion, Crete, *curated* the development of the permanent Numismatic Collection (E78).
- The activities (E87) by Mikael Heggelund Foslie *curated* the Mikael Heggelund Foslie's coralline red algae Herbarium

P109 has current or former curator (is current or former curator of)

An example is added:

FROM:

Examples:

- the Robert Opie Collection (E78) *has current or former curator* Robert Opie (E39)

TO:

Examples:

- the Robert Opie Collection (E78) *has current or former curator* Robert Opie (E39)
- the Mikael Heggelund Foslie's coralline red algae Herbarium (E78) *has current or former curator* Mikael Heggelund Foslie

Amendments to version 5.0

Compatibility claim declaration

The last paragraph was changed. The phrase

"The provider should be able to demonstrate the claim with suitable test data. A third party should be able to verify the claim with suitable test data."

is replaced by:
""The provider should be able to demonstrate the claim with suitable test data. The provider should be able to demonstrate its claim according to certain procedures included in any applicable certificate practice related statement.

The provider should either make evidence of these procedures publicly available on the Internet on a site nominated by the ISO community of use, so that any third party is able to verify the claim with suitable test data, or acquire a certificate by a certification authority (CA).

A trusted third party recognised and authorised by a competent regulatory authority to act as a CA in this practice area, should be able to verify the credentials of the provider applying for such certificate and thus, of its claim with suitable test data, before issuing the certificate so that the users can trust the information in the CA certificates.

The CA will grant the provider of the certified system the right to use the "CRM compatible" logo."

E78 Collection

The first sentence in the scope note has been changed. The phrase "This class comprises aggregations of physical items that are assembled and maintained ..."
is replaced by
"This class comprises aggregations of instances of E18 Physical Thing that are assembled and maintained .."

P107 has current or former member (is current or former member of)

The property 'P107.1 *kind of member*: E55 Type' has been added and the scope note and the examples have been changed to:

Scope note: This property relates an E39 Actor to the E74 Group of which he or she is a member.

Groups, Legal Bodies and Persons, may all be members of Groups. A Group necessarily consists of more than one member.

This property is a shortcut of the more fully developed path from E74 Group through P144 joined with (gained member by), E85 Joining, P143 joined (was joined by) to E39 Actor
The property P107.1 *kind of member* can be used to specify the type of membership or the role the member has in the group.

Examples:

- Moholy Nagy (E21) *is current or former member of* Bauhaus (E74)

- National Museum of Science and Industry (E40) *has current or former member* The National Railway Museum (E40)
- The married couple Queen Elisabeth and Prince Phillip (E74) *has current or former member* Prince Phillip (E21) with P107.1 *kind of member* husband (E55 Type)

Properties: P107.1 *kind of member*: E55 Type

P144 joined with (gained member by)

The property P144.1 *kind of member*: E55 Type has been added and the scope note and the examples have been changed to:

Scope note: This property identifies the instance of E74 Group of which an instance of E39 Actor becomes a member through an instance of E85 Joining.

Although a Joining activity normally concerns only one instance of E74 Group, it is possible to imagine circumstances under which becoming member of one Group implies becoming member of another Group as well.

Joining events allow for describing people becoming members of a group with a more detailed path from E74 Group through P144 joined with (gained member by), E85 Joining, P143 joined (was joined by) to E39 Actor, compared to the shortcut offered by P107 has current or former member (is current or former member of).
The property P144.1 *kind of member* can be used to specify the type of membership or the role the member has in the group.

Examples:

- The election of Sir Isaac Newton as Member of Parliament to the Convention Parliament of 1689 *joined with* the Convention Parliament
- The inauguration of Mikhail Sergeyevich Gorbachev as Leader of the Union of Soviet Socialist Republics (USSR) in 1985 *joined with* the office of Leader of the Union of Soviet Socialist Republics (USSR) with *P144.1 kind of member* President
- The implementation of the membership treaty January 1. 1973 between EU and Denmark *joined with* EU (E40)

Properties: P144.1 *kind of member*: E55 Type

Formatted: Normal

Proofreading:

Page vii: Figure XXX became fig. 1
Page xiv: **Naming Conventions**, second paragraph became "…… *P126 employed (was employed in) "* instead of *P126 employed (was employed by")*
Page xviii: **Examples**: the first figure fig.1 reasoning about spatial information was updated and became fig2
Page xix: in the first paragraph the domain of P59 was corrected, from E19 Physical Object to E18 Physical Thing. The fig.2 in the same page became fig.3
Page xxiv: P33 was added to the table of CIDOC CRM Property Hierarchy
Page 14: The name of P68 was corrected. It was "P68 usually employs (is usually employed)" and it was changed to "P68 foresees use of (use foreseen by)"
Page 14: A correction was made to the superclasses of E30 Right. E30 is not a direct subclass of E28 Conceptual Object.
Page 29: A correction was made to the superclasses of E73 Information Object. E73 Information Object is not a direct subclass of E28 Conceptual Object
Page 40: A correction was made to the subclasses of 'P12 occurred in the presence of (was present at)'. It was added the subclass of 'E7 Activity.P33 used specific technique(was used by):E29 Design or Procedure'
Page 41: A correction was made to the subclasses of 'P15 was influenced by (influenced)'. It was added the subclass of 'E7 Activity.P33 used specific technique(was used by):E29 Design or Procedure'
Page 64: It was missing the domain of 'P52 has current owner (is current owner of)' of the subclass of 'P105 right held by (has right on)'. The 'E18 Physical Thing' was added.

Amendments to version 5.01

Proofreading:

Page xxv: CIDOC CRM Property Hierarchy is updated
Page 18: E41 Appellation: E28 Conceptual Object was removed from the subclass list
Page 28: E72 Legal Object: E73 Information Object was removed from the superclass list
Page 29: E73 Information Object: E72 Legal Object was removed from the subclass list
Page 33: The fist sentence of the scope note of E85 Joining read: This class comprises the activities that result in an instance of E49 Actor: it was corrected to: This class comprises the activities that result in an instance of E39 Actor
Page 40: P12 occurred in the presence of (was present at): P33 was removed from the superproperty list
Page 41: P15 was influenced by (influenced): P33 was removed from the superproperty list
Page 44: P24 transferred title of (changed ownership through): the scope note is updated
Page 46: P33 used specific technique (was used by): P12, P15 were removed from the subroperty list
Page 47: P37 assigned (was assigned by): The spelling error in the domain part is corrected
Page 50: P46 is composed of (forms part of): the "Hog's Back" (E24) *forms part of* the "Fosseway" (E24): The missing ')' was added to (E24)
Page 54**:** P62 depicts (is depicted by): italics were added to the name of the property at the examples
Page 67: P118 overlaps in time with (is overlapped in time by): the Iron Age (E52) *overlaps in time with* the Roman period (E52): it was corrected to: the Iron Age (E4) *overlaps in time with* the Roman period (E4)
Page 68: P119 meets in time with (is met in time by): Early Saxon Period (E52) *meets in time with* Middle Saxon Period (E52): it was corrected to: Early Saxon Period (E4) *meets in time with* Middle Saxon Period (E4)
Page 68: P120 occurs before (occurs after): Early Bronze Age (E52) occurs before Late Bronze age (E52): it was corrected to: Early Bronze Age (E4) occurs before Late Bronze age (E4)

Amendments to amendments
Page 101: E15: The first letter of the first word in the first example was capitalized.

BEFORE
replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens
AFTER
replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens:

It was corrected to
BEFORE
replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens
AFTER
Replacement of the inventory number TA959a by GE34604 for a 17th century lament cloth at the Museum Benaki, Athens

Page 112: P105 has been superpclass of P52: It was changed to:P105 has been superproperty of P52
Page 124: P143 Joining: it was corrected to: P143 joined (was joined by)

Amendments to version 5.02

E5 Event, E6 Destruction

The example "the destruction of Lisbon by earthquake in 1755" wasn't really an example for E6 Destruction since Lisbon continued to exist and be identified as Lisbon after the earthquake, so the example changed from

- the destruction of Lisbon by earthquake in 1755 (E6)

To

- the destruction of Herculaneum by volcanic eruption in 79 AD (E6)

Also, for the same reason the example "the shooting of the last wolf […] of E6 Destruction has been removed.

E12 Production

The second and the third example were reworded, because the term "edition" is ambiguous, it makes one think of E73 Information Object rather than E7 Activity. The text of the example was modified from:

- the recasting of the Little Mermaid at the harbour of Copenhagen
- the seventh edition of Rembrandt's etching "Woman sitting half dressed beside a stove", 1658, Bartsch Number 197

To:

- the first casting of the Little Mermaid from the harbour of Copenhagen
- Rembrandt's creating of the seventh state of his etching "Woman sitting half dressed beside a stove", 1658, identified by Bartsch Number 197 (E12,E65,E81)

E29 Design or Procedure

The fourth example of E29 Design or Procedure was modified in order to be more accurate from:

- folio 860 of the Codex Atlanticus from Leonardo da Vinci, 1486-1490, kept in the Biblioteca Ambrosiana in Milan

to:

- The drawing on the folio 860 of the Codex Atlanticus from Leonardo da Vinci, 1486-1490, kept in the Biblioteca Ambrosiana in Milan

E35 Title

The text in the parenthesis in the scope note was changed from :

(the latter are common nouns and are modelled in the CRM as instances of E55 Type)

To:

(the latter are common nouns that stand for instances of E55 Type)

E70 Thing

The following examples were modified for better understanding from:

- the pint of milk in my refrigerator
- the plan of the Stassburger Muenster
- the thing on the top of Otto Hahn's desk
- the design of the no-smoking sign (E29)

to:

- the bottle of milk in my refrigerator (E22)
- the plan of the Strassburger Muenster (E29)
- the thing on the top of Otto Hahn's desk (E19)
- the form of the no-smoking sign (E36)

E75 Conceptual Object Appellation

The scope note of E75 Conceptual Object Appellation was modified for not confusing with the class E42 Identifier. So the text of the scope note is changed from:

This class comprises all specific identifiers of intellectual products or standardized patterns

To:

This class comprises all appellations specific to intellectual products or standardized patterns

Also in the second example the letter in the parenthesis at the end was changed to (F) for not confusing with the label of a CRM entity. So the example was changed from:

- ISO 2788-1986 (E)

To:

- ISO 2788-1986 (F)

E81 Transformation – issue 165

The scope note and the example of E81 Transformation were changed from:

This class comprises the events that result in the simultaneous destruction of one E77 Persistent Item and the creation of another E77 Persistent Item that preserves recognizable substance from the first but has a fundamentally different nature and identity.

Although the two instances of E77 Persistent Item are treated as discrete entities having separate, unique identities, they are causally connected through the E81 Transformation; the destruction of the first E77 Persistent Item directly causes the creation of the second using or preserving some relevant substance. Instances of E81 Transformation are therefore distinct from re-classifications (documented using E17 Type Assignment) or modifications (documented using E11 Modification) of objects that do not fundamentally change their nature or identity. Characteristic cases are reconstructions and repurposing of historical buildings or ruins, fires leaving buildings in ruins, taxidermy of specimen in natural history and the reorganization of a corporate body into a new one.

Examples:

- the death and mummification of Tut Ankh Amun (transformation of Tut Ankh Amun from a living person to a mummy)

To:

This class comprises the events that result in the simultaneous destruction of one or more than one E77 Persistent Item and the creation of one or more than one E77 Persistent Item that preserves recognizable substance from the first one(s) but has fundamentally different nature and identity.

Although the old and the new instances of E77 Persistent Item are treated as discrete entities having separate, unique identities, they are causally connected through the E81 Transformation; the destruction of the old E77 Persistent Item(s) directly causes the creation of the new one(s) using or preserving some relevant substance. Instances of E81 Transformation are therefore distinct from re-classifications (documented using E17 Type Assignment) or modifications (documented using E11 Modification) of objects that do not fundamentally change their nature or identity. Characteristic cases are reconstructions and repurposing of historical buildings or ruins, fires leaving buildings in ruins, taxidermy of specimen in natural history and the reorganization of a corporate body into a new one.

Examples:

- the death and mummification of Tut Ankh Amun (transformation of Tut Ankh Amun from a living person to a mummy) (E69,E81,E7)

P4 has time-span (is time-span of)

The example was reworded for better understanding. The example changed from:

- the Yalta Conference (E7) *has time-span* Yalta Conference time-span (E52), *ongoing throughout* 11 February 1945 (E61)

To:

- the Yalta Conference (E7) *has time-span* Yalta Conference time-span (E52)

P5 consists of (forms part of)

The example has been reworded to follow the usual pattern for property examples. So the example changed form:

The Condition State of the ruined Parthenon (E3 Condition State) consists of (P5) a bombarded state (E3 Condition State) from the explosion of a Venetian shell in 1687

To:

The Condition State of the ruined Parthenon (E3) *consists of* the bombarded state after the explosion of a Venetian shell in 1687 (E3)

P14 carried out by (performed) – issue 170

In P14, the example was corrected, the word ‘was’ was deleted from the example.

P44 has condition (is condition of) – issue 144

The name of the property P44 changed from ‘P44 has condition (condition of)’ to ‘P44 has condition (is condition of).

P62 depicts (is depicted by)

The first example was changed for better understanding. It was changed from:

- “Impression Sunrise” by Monet (E84) *depicts* sun rising over Le Havre (E5) *mode of depiction* Impressionistic (E55)

To:

- The painting “La Liberté guidant le peuple” by Eugene Delacroix (E84) *depicts* the French “July Revolution” 1830 (E7)

P65 shows visual item (is shown by) – issue 169

The example has been changed from:

- “Impression Sunrise” by Monet (E84) *shows visual item* Impression_Sunrise.jpg (E38)

To

- My T-Shirt (E22) *shows visual item* Mona Lisa (E38)

P107 has current or former member (is current or former member of)

In the scope note of this property the phrase “he or she” was reworded for not equating E39 Actor with E21 Person. So the first paragraph of the scope note changed

From

This property relates an E39 Actor to the E74 Group of which he or she is a member.

To

This property relates an E39 Actor to the E74 Group of which that E39 Actor is a member.

P148 has component (is component of)

The example was reworded for better understanding and it is changed from:

The Italian text of Dante’s textual work entitled “Divina Commedia” (E33) P148 has component The Italian text of Dante’s textual work entitled “Inferno” (E33)

To:

Dante’s “Divine Comedy” (E89) *has component* Dante’s “Hell” (E89)

Proofreading:

Page 2: it was corrected the declaration of property ‘P3.1 has type: E55 Type’ of the property ‘P3 has note’ of E1 CRM Entity
Page 11: the “P” removed from the second example of E20:“Tut-Ankh-AmunP”
Page14: the “,” at the end of the first example of E28 has been deleted.
Page 18: it was corrected the declaration of property ‘P139.1 has type: E55 Type’ of the property P139 has alternative form of E41 Appellation.
Page 23: The reference to the
Page 26: the terms “postquem” and “antequem” in the scope note of E63 Beginning of Existence were corrected.
Page 27: The singulars and plurals in the first sentence in the scope note of E67 Birth are corrected
Page 30: It was corrected the declaration of property ‘P107.1 *kind of member*: E55 Type’ of the property P107 has current or former member (is current or former member of) of E74 Group

Page 33: one of the two closing brackets in property P136 in the definition of E83 Type Creation was dropped
Page 34: In E87, in the example, in the phrase "Michael. Foslie", the period was removed.
Page 40: P11 had participant (participated in), the OR between two examples has been deleted
Page 41: the name of the property P14 was corrected in the example
Page 42: P16 used specific object (was used for), in the second example the phrase 'mode of use' is turned on italics
Page 45: P30 transferred custody of (custody transferred through), the phrase "transferred custody of*"* in the example, changed to italics.
Page 47: a closing bracket was added after "P35 has identified (was identified by".
Pages 6,32,44,45,66,69: E9,E81,P26,P27,P112,P113,P123,P124, the different spellings of Tut Ankh Amun / Tutankhamun /.. are changed to Tut-Ankh-Amun
Page 48, 58,59: In P43,P83,P84, the codes (P90 and P91) of the properties are added to the examples.
Page 49: The name of the P35B in the scope note of P44 was corrected.
Page 54: In P62, in the scope note and examples, all occurrences of property names were turned to italics.
Page 54: the two examples for P62 depicts (is depicted by) were corrected: "Eugene Delacroix" was replaced with "Eugène Delacroix", "the "July Revolution" 1830" was replaced with "the "July Revolution" of 1830", "a 20 pence coin" was replaced with "the 20 pence coin held by the Department of Coins and Medals of the British Museum under registration number 2006,1101.126".
Page 55: In P67, the domain of P129 is about (is subject of) was corrected to E89 Propositional Object
Page 58: inside the parenthesis in the scope notes of the P81 and P82, "it's" was changed to "its"
Page 58: outside and inside the parenthesis in the scope notes of the P83 and P84, "it's" was changed to "its"
Page 64: In P105, in the definition, the range of the subproperty P52 was added.
Page 64: In P106, the label of the property P106 is composed of (forms part of), in the examples were corrected.
Page 65: In P109, in the second example, in the phrase "Mikael.Foslie", the period between "Mikael" and "Foslie"" was removed.
Page 70: In P128 carries (is carried by) and P129 is about (is subject of), in the examples for both properties, the label of the property (i.e., "carries", "is about") was converted to italics.
Page 74: In P142, in the examples the reference to the property names and codes was formalized to be the same as in the rest document.
Page 74,75: In p143, P144, P145, P146, in the examples, the class codes are added to follow the usual pattern of property example.
Page 76: In P147, in the third example, in the phrase "Mikael. Foslie", the period was removed.
Page 70,71,72: In P130,P134,P136,P137,P138, the missing "of" next to the superproperty or subproperty definition is added.
Page. 31, 34, 65, 76: "Mikael Foslie" was replaced with "Mikael Heggelund Foslie".

General Notice 1: All the appellations in the examples of the entities and properties are displayed in double quotes. Changes took place at the following pages / entity code / property code.

Page no.	*Entity / Property code*
16	E35
19	E44
20	E46, E47,E48
21	E50, E51
30	E75
32	E82
35	E90
37	P2
42	P16
47	P37, P38
53	P58
57	P76, P78
59	P87
71	P131

Amendments to version 5.0.3

E11 Modification

The forth paragraph of the scope note of E11 Modification has been changed

From: "If the instance of the E29 Design or Procedure utilised for the modification prescribes the use of specific materials, they should be documented using properties of the design or procedure, rather than via *P126 employed (was employed in): E57 Material*."

To: "If the instance of the E29 Design or Procedure utilized for the modification prescribes the use of specific materials, they should be documented using property *P68 foresees use of (use foreseen by)*: *E57 Material* of E29 Design or Procedure, rather than via *P126 employed (was employed in): E57 Material*."

This is related to ***ISSUE 188***

E51 Contact Point

The scope note of E51 has been changed

from: "This class comprises identifiers employed, or understood, by communication services to direct communications to an instance of E39 Actor. These include E-mail addresses, telephone numbers, post office boxes, Fax numbers, etc. Most postal addresses can be considered both as instances of E44 Place Appellation and E51 Contact Point. In such cases the subclass E45 Address should be used"

to: "This class comprises identifiers employed, or understood, by communication services to direct communications to an instance of E39 Actor. These include E-mail addresses, telephone numbers, post office boxes, Fax numbers, URLs etc. Most postal addresses can be considered both as instances of E44 Place Appellation and E51 Contact Point. In such cases the subclass E45 Address should be used.

URLs are addresses used by machines to access another machine through an http request. Since the accessed machine acts on behalf of the E39 Actor providing the machine, URLs are considered as instances of E51 Contact Point to that E39 Actor."

This is related to the **ISSUE 180**

E89 Propositional Object

The first paragraph of the scope note has been changed

from: 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 mental things and that are documented as single units or serve as topic of discourse.

to: 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 topics of discourse.

This is related to the **ISSUE 181**

P2 has type (is type of)

The example has been changed

from: "www.cidoc.icom.org" (E51) *has type* URL (E55)

to: "enquiries@cidoc-crm.org" (E51) *has type* e-mail address (E55)

This is related to the **ISSUE 180**

P33 used specific technique (was used by)

The scope note of this property has been changed

from: This property identifies a specific E29 Design or Procedure used in an E11 Modification.

Modification may be carried out in order to ensure the preservation of an object and not just as part of the creative process.

The property differs from *P32 used general technique (was technique of)* in that the E29 Design or Procedure referred to is specific and documented rather than simply being a term in the E55 Type hierarchy. Typical examples would include intervention plans for conservation.

to: This property identifies a specific instance of E29 Design or Procedure in order to carry out an instance of E7 Activity or parts of it.

The property differs from P32 used general technique (was technique of) in that P33 refers to an instance of E29 Design or Procedure, which is a concrete information object in its own right rather than simply being a term or a method known by tradition.

Typical examples would include intervention plans for conservation or the construction plans of a building
This is related to ***ISSUE 188***

P68 foresees use of (use foreseen by)

P68 is subproperty of *P67 refers to(is referred to by).* This is related to the **ISSUE 189.** The appropriate changes were made to the pages:

- xxvi(table)
- 55(P67)
- 55(P68)

P69 is associated with

The third paragraph of the scope note has been changed

from: The nature of the association may be whole-part, sequence, prerequisite etc. The property is assumed to be entirely reciprocal.

to: The *P69.1 has type* property of *P69 is associated with* allows the nature of the association to be specified; examples of types of association between instances of E29 Design or Procedure include: whole-part, sequence, prerequisite, etc

This is related to the **ISSUE 184**

P71 lists (is listed in)

The range of this property has been changed from E55 Type to E1 CRM Entity. This is related to **ISSUE 182.**
The appropriate changes have been made to pages:

- xxvi(table)
- 15 (E32)
- 55(P67)
- 56(P71)

P101 had as general use (was use of)

The first sentence of the second paragraph of the scope note has been changed.

from: It allows the generic link between things, both physical and immaterial, to methods and techniques of use.

to: It allows the relationship between particular things, both physical and immaterial, and general methods and techniques of use to be documented.

This is related to the **ISSUE 190**

P111 added (was added by)

P111 is subproperty of *P12 occurred in the presence of(was present at)*. This is related to the **ISSUE 189.** The appropriate changeswere made to the pages:

- xxv(table)
- 40(P12)
- 66(P111)

P113 removed (was removed by)

P113 is subproperty of *P12 occurred in the presence of(was present at).* This is related to the **ISSUE 189.**
The appropriate changes were made to the pages:

- xxv(table)
- 40(P12)
- 66(P113)

P128 carries (is carried by)

The range of this property has been changed from E73 Information Object to E90 Symbolic Object. This is related to **ISSUE 167.** Also *P128 carries (is carried by)* has been declared as subproperty of *P130 shows features of (features are also found on).* The latter change is related to **ISSUE 178.**
The appropriate changes have been made to pages:

- v(table),
- xxvi(table),
- 12(E24 Physical Man-Made Thing),
- 54(P65 shows visual item (is shown by)),

- 70 (P128, P130)

P149 is identified by (identifies)

It is decided to create a subproperty of P1 to connect E28 with E75 as follows

P149 is identified by: E75

Domain: E28 Conceptual Object
Range: E75 Conceptual Object Appellation
Subproperty of: E1 CRM Entity. P1 is identified by (identifies): E41 Appellation
Quantification: many to many (0,n:0,n)

Scope note: This property identifies an instance of E28 Conceptual Object using an instance of E75 Conceptual Object Appellation.

Examples: The German edition of the CIDOC CRM (E73) *is identified by* ISBN 978-3-00-030907-6 (E75)

This is related to the **ISSUE 183.** The appropriate changes have been made to pages:

- xxv(table)
- 14(E28)
- 37 (P1)

Proofreading:

Page xi: The last paragraph of the terminology of Subproperty has been changed

from: In Some object-oriented languages, such as C++, have no equivalent to the specialization of properties
to: Some object-oriented programming languages, such as C++, do not contain constructs that allow for the expression of the specialization of properties as sub-properties
This is related to **ISSUE 174**.

Page xii: The last sentence of the terminology of shortcut has been changed

from: The CRM allows shortcuts as cases of less detailed knowledge, while preserving in its schema the relationship to the full information.
to: The CRM declares shortcuts explicitly as single properties in order to allow the user to describe cases in which he has less detailed knowledge than the full data path would need to be described. For each shortcut, the CRM contains in its schema the properties of the full data path explaining the shortcut
This is related to **ISSUE 174**.

Page xiii: In the paragraph of property quantifiers, the first sentence have been changed

from: "We use the term property quantifiers for the declaration of the allowed number of **instances** of a certain **property** that an instance of its **range** or **domain** may have."
to: "We use the term "property quantifiers" for the declaration of the allowed number of **instances** of a certain **property** that can refer to a particular instance of the **range** class or the **domain** class of that property"
This is related to ***ISSUE 179***.

Page xiv: The first sentences of the last paragraph of this page have been changed

from: The CRM defines some properties as being necessary for their domain or as being dependent from their range" seems to be wrong.
to: The CRM defines some dependencies between properties and the classes that are their domains or ranges. These can be one or both of the following:
A) the property is necessary for the domain
B) the property is necessary for the range, or, in other words, the range is dependent on the property.
The possible kinds of dependencies are defined in the table above. Note that if a dependent property is not specified for an instance of the respective domain or range, it means that the property exists, but the value on one side of the property is unknown.
This is related to ***ISSUE 175***.

Page xix: The first paragraph in the examples under the figure has been changed

from: "The diagram above shows a partial view of the CRM, representing reasoning about spatial information. Five of the main hierarchy branches are included in this view: E39 Actor, E51 Contact Point, E41 Appellation, E53 Place, and E70 Thing. The relationships between these main classes and their subclasses are shown as arrows. Properties between classes are shown as green rectangles. A 'shortcut' property is included in this view: *P59 has section (is located on or within)* between E53 Place and E18 Physical Thing is a shortcut of the path

through E46 Section Definition. In some cases the order of priority for property names has been modified in order to facilitate reading the diagram from left to right."

to: "The diagram above shows a partial view of the CRM, representing reasoning about spatial information. Five of the main hierarchy branches are included in this view: E39 Actor, E51 Contact Point, E41 Appellation, E53 Place and E70 Thing. All classes are shown as blue-white rectangles. Properties are shown as single arrows. In some cases the order of priority for property names has been reversed in order to facilitate reading the diagram from left to right. Double arrows indicate IsA relations between classes and their subclasses or between properties and their subproperties. 'Shortcuts' are indicated with light grey rectangles and their names are written in italics, such as the P59 has section (is located on or within) between E53 Place and E18 Physical Thing, which is a shortcut of the path through E46 Section Definition."

This is related to ***ISSUE 168***

Page xix: The last sentence in the second paragraph has been changed:

from: An instance of E53 Place may *consist of* or *form part of* another instance of E53 Place, thereby allowing a hierarchy of physical 'containers' to be constructed"

to: An instance of E53 Place may *consist of* or *form part of* another instance of E53 Place, thereby allowing a hierarchy of geometric 'containers' to be constructed

This is related to ***ISSUE 186***

Page xx: The third paragraph inside the parenthesis the text has been changed

from: "The E2 Temporal Entity class is an abstract class (i.e. it has no instances) that serves to group together all classes with a temporal component, such as instances of E4 Period, E5 Event and E3 Condition State."

to: "The E2 Temporal Entity class is an abstract class (i.e. it has no direct instances) that serves to group together all classes with a temporal component, such as instances of E4 Period, E5 Event and E3 Condition State."

This is related to ***ISSUE 187***

Page 43:In the example of P20 the word "alter" changed to "altar"

Amendments to version 5.0.4

Change the text in objectives of the CIDOC CRM

The third paragraph in the chapter entitled "Objectives of the CIDOC CRM" in page i has been changed

From:
"It intends to provide an optimal analysis of the intellectual structure of cultural documentation in logical terms. As such, it is not optimised to implementation-specific storage and processing aspects. Rather, it provides the means to understand the effects of such optimisations to the semantic accessibility of the respective contents".
To:

It intends to provide a model of the intellectual structure of cultural documentation in logical terms. As such, it is not optimised for implementation-specific storage and processing aspects. Implementations may lead to solutions where elements and links between relevant elements of our conceptualizations are no longer explicit in a database or other structured storage system. For instance the birth event that connects elements such as father, mother, birth date, birth place may not appear in the database, in order to save storage space or response time of the system. The CRM allows us to explain how such apparently disparate entities are intellectually interconnected, and how the ability of the database to answer certain intellectual questions is affected by the omission of such elements and links.

This is related to the **ISSUE 176**

P109 is subproperty of P49

Resolving the **ISSUE 193**, the CRM-SIG decided that the property P109 has current or former curator (is current or former curator of) is a Subproperty of P49 has former or current keeper (is former or current keeper of). This decision produced the following changes in the document:

Page xxvi: The CIDOC CRM Property Hierarchy has been updated
Page 50: the Superproperty section of P49 has been updated
Page 65: the Subproperty section of P109 has been updated

P111 is subproperty of P16

Resolving the **ISSUE 194**, the CRM-SIG decided that P111 added (was added by) isA P16 used specific object. This decision produced the following changes in the document:

Page xxv: The CIDOC CRM Property Hierarchy has been updated
Page 41: the Superproperty section of P16 has been updated
Page 66: the Subproperty section of P111 has been updated

Proofreading:

Page v: The range of P20 is corrected to E5 Event
Page 2: The notation of P137.1 has been added to the properties of E1 CRM Entity
Page 14: The notation of P69.1 has been added to the properties of E29 Design or Procedure
Page 33: The notation of P144.1 has been added to the properties of E85 Joining
Page 56: The E55 type in the scope note of P71 became E1 CRM Entity

Amendments to draft version 5.1 (November 2012)

Change the authors list in the first page of CIDOC-CRM

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, it is decided to made the following changes to the authors list on the first page of the CIDOC-CRM text:

From:

Editors: Nick Crofts, Martin Doerr, Tony Gill, Stephen Stead, Matthew Stiff.

To:

Current Main Editors: Patrick Le Boeuf, Martin Doerr, Christian Emil Ore, Stephen Stead
Contributors: Trond Aalberg, Detlev Balzer, Chryssoula Bekiari, Lina Boudouri, Nick Crofts, Gordon Dunsire, Øyvind Eide, Tony Gill, Günther Goerz, Monika Hagedorn-Saupe, Gerald Hiebel, Jon Holmen, Juha Inkari, Dolores Iorizzo, Juha Kotipelto, Siegfried Krause, Karl Heinz Lampe, Carlos Lamsfus, Jutta Lindenthal, Mika Nyman, Pat Riva, Lene Rold, Richard Smiraglia, Regine Stein, Matthew Stiff, Maja Žumer.

This decision is related to the item#49 in the minutes of this meeting

Change in the scope note of E41

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, resolving the ISSUE 200 and 206 the following changes made to the scope note of E41 Appellation.

From:

Scope note: This class comprises all sequences of signs of any nature, either meaningful or not, that are used or can be used to refer to and identify a specific instance of some class within a certain context.

Instances of E41 Appellation do not identify things by their meaning, even if they happen to have one, but 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.

Specific subclasses of E41 Appellation should be used when instances of E41 Appellation of a characteristic form are used for particular objects. Instances of E49 Time Appellation, for example, which take the form of instances of E50 Date, can be easily recognised.

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

Examples:

- "Martin"
- "the Forth Bridge"
- "the Merchant of Venice" (E35)
- "*Spigelia marilandica* (L.) L." [not the species, just the *name*]
- "information science" [not the science itself, but the name through which we refer to it in an English-speaking context]

To:

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.

Specific subclasses of E41 Appellation should be used when instances of E41 Appellation of a characteristic form are used for particular objects. Instances of E49 Time Appellation, for example, which take the form of instances of E50 Date, can be easily recognised.

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

Examples:

- "Martin"
- "the Forth Bridge"
- "the Merchant of Venice" (E35)
- "*Spigelia marilandica* (L.) L." [not the species, just the *name*]
- "information science" [not the science itself, but the name through which we refer to it in an English-speaking context]
- “安” [Chinese “an”, meaning “peace”]

New property P151 has been added

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, resolving the ISSUE 210. The CRM-SIG decided to add a new property to E66 Formation the following:

P151 was formed from (participated in)

Domain: E66 Formation
Range: E74 Group
Subproperty of: P11 had participant (participated in)
Quantification: (0,n:0:n)

Scope note: This property associates an instance of E66 Formation with an instance of E74 Group from which the new group was formed preserving a sense of continuity such as in mission, membership or tradition.

Examples:

- The formation of the House of Bourbon-Conti in 1581 (E66) *was formed from* House of Condé (E74)

Also appropriate changes were made to (1) the property section to E66 Formation (2) to the superproperty section of P11 had participant (participated in) (3) CIDOC CRM Property Hierarchy table in page xxv

Changes in the scope note of E90 Symbolic Object

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, resolving the ISSUE 207 , made the following changes in the scope note of E90 Symbolic Object and on the fifth example.

From:

Scope note:

This class comprises identifiable symbols and any aggregation of symbols, such as characters, identifiers, traffic signs, emblems, texts, data sets, images, musical scores, multimedia objects, computer program code or mathematical formulae that have an objectively recognizable structure and that are documented as single units.

It includes sets of signs of any nature, which may serve to designate something, or to communicate some propositional content.

An instance of E90 Symbolic Object does not depend on a specific physical carrier, which can include human memory, and it can exist on one or more carriers simultaneously. An instance of E90 Symbolic Object may or may not have a specific meaning, for example an arbitrary character string.

Examples:

- 'ecognizabl'
- The "no-smoking" sign (E36)
- "BM000038850.JPG" (E75)
- image BM000038850.JPG from the Clayton Herbarium in London (E38)
- The distribution of form, tone and colour found on Leonardo da Vinci's painting named "Mona Lisa" (E38)

To:

Scope note:

This class comprises identifiable symbols and any aggregation of symbols, such as characters, identifiers, traffic signs, emblems, texts, data sets, images, musical scores, multimedia objects, computer program code or mathematical formulae that have an objectively recognizable structure and that are documented as single units.

It includes sets of signs of any nature, which may serve to designate something, or to communicate some propositional content.

An instance of E90 Symbolic Object does not depend on a specific physical carrier, which can include human memory, and it can exist on one or more carriers simultaneously. An instance of E90 Symbolic Object may or may not have a specific meaning, for example an arbitrary character string.

In some cases, the content of an instance of E90 Symbolic Object may completely be represented by a serialized content model, such.. as the property P3 has note allows for describing this content model…P3.1 has type: E55 Type to specify the encoding..

Examples:

- 'ecognizabl'
- The "no-smoking" sign (E36)
- "BM000038850.JPG" (E75)
- image BM000038850.JPG from the Clayton Herbarium in London (E38)
- The distribution of form, tone and colour found on Leonardo da Vinci's painting named "Mona Lisa" in daylight (E38)

Changes in the scope note of P50, P52, P55, P54

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, resolving the ISSUE 204, made changes to the following properties:

P50 has current keeper (is current keeper of) (first paragraph of the scope note)

From:

This property identifies the E39 Actor or Actors who had custody of an instance of E18 Physical Thing at the time this property was recorded.

To:

This property identifies the E39 Actor or Actors who had custody of an instance of E18 Physical Thing at the time of validity of the record or database containing the statement that uses this property.

P52 has current owner (is current owner of) (first paragraph of the scope note)

From:

This property identifies the E21 Person, E74 Group or E40 Legal Body that was the owner of an instance of E18 Physical Thing at the time this property was recorded.

To:

This property identifies the E21 Person, E74 Group or E40 Legal Body that was the owner of an instance of E18 Physical Thing at the time of validity of the record or database containing the statement that uses this property.

P54 has current permanent location (is current permanent location of) (first paragraph of the scope note)

From:

This property records the foreseen permanent location of an instance of E19 Physical Object at the time this property was recorded.

To:
This property records the foreseen permanent location of an instance of E19 Physical Object at the time of validity of the record or database containing the statement that uses this property.

P55 has current location (currently holds) (first paragraph of the scope note)

From:
This property records the location of an E19 Physical Object at the time the property was recorded.
To:
This property records the location of an E19 Physical Object at the time of validity of the record or database containing the statement that uses this property.

P88 consists of (forms part of) has been deleted

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, resolving the ISSUE 201, decided to delete E53 Place. P88 consists of (form part of):E53 Place and to post an new issue about E18 Physical Thing occupies place. Appropriate updates were made to the text of CIDOC CRM:

1. CIDOC CRM Property Hierarchy, page xxvi
2. Property Section of E53 Place, page 22
3. CIDOC CRM Property declarations, page 59

The range of P142 used constituent (was used in) is changed

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, the CRM-SIG resolving the ISSUE 209, made the following changes in the definition of P142 in page 74.

from:

P142 used constituent (was used in)
Domain: E15 Identifier Assignment
Range: E41 Appellation
Subproperty of: E7 Activity. P16 used specific object (was used for): E70 Thing

Quantification: (0:n,0:n)

Scope note: This property associates the event of assigning an instance of E42 Identifier to an entity, with the instances of E41 Appellation that were used as elements of the identifier.

Examples:

- On June 1, 2001 assigning the personal name heading “Guillaume, de Machaut, ca. 1300-1377” (E15) *used constituent* “Guillaume, de Machaut” (E82)
- On June 1, 2001 assigning the personal name heading “Guillaume, de Machaut, ca. 1300-1377” (E15) *used constituent* “ca. 1300-1377” (E49)

to:

P142 used constituent (was used in)
Domain: E15 Identifier Assignment
Range: E90 Symbolic Object
Subproperty of: E7 Activity. P16 used specific object (was used for): E70 Thing

Quantification: (0:n,0:n)

Scope note: This property associates the event of assigning an instance of E42 Identifier with the instances of E90 Symbolic Object that were used as constituents of the identifier.

Examples:

- On June 1, 2001 assigning the personal name identifier “Guillaume, de Machaut, ca. 1300-1377” (E15) *used constituent* “ca. 1300-1377” (E49)
- Assigning a uniform title to the anonymous textual work known as ‘The Adoration of the Shepherds’(E15) *used constituent* ‘Coventry’ (E48)
- Assigning a uniform title to Pina Bausch’s choreographic work entitled ‘Rite of spring’ (E15)

used constituent '(Choreographic Work: Bausch)'(E90)

- Assigning a uniform title to the motion picture directed in 1933 by Merian C. Cooper and Ernest B. Schoedsack and entitled 'King Kong' (E15) *used constituent* '1933' (E50)
- Assigning the corporate name identifier 'Univerza v Ljubljani. Oddelek za bibliotekarstvo' to The Department for library science of the University of Ljubljana (E15) *used constituent* 'Univerza v Ljubljani' (E42)

The range of P142 has been changed in the following:

Page xxv: CIDOC Property Hierarchy
Page 9: Property section of E15
Page 41: Superproperty section of P16

New property P150 has been added

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, resolving the ISSUE 208. The CRM-SIG decided to add a new property P150 (*the name will be decided to the next meeting*) to E55 Type the following:

P150 defines typical parts of (defines typical wholes for)
Domain: E55 Type
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: The property "broaderPartitive" associates an instance of E55 Type "A" with an instance of E55 Type "B", when items of type "A" typically form part of items of type "B", such as "car motors" and "cars".

It allows Types to be organised into hierarchies. This is the sense of "broader term partitive (BTP)" as defined in ISO 2788 and "broaderPartitive" in SKOS.

Examples:

- Car motors (E55) has broader term cars (E55)

Also appropriate changes were made to (1) the property section to E55 Type (2) CIDOC CRM Property Hierarchy table in page xxvii

New property P152 has been added

In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, resolving the ISSUE 199. The CRM-SIG decided to add a new property P152 has parent(is parent of) the following:

P152 has parent (is parent of)
Domain: E21 Person
Range: E21 Person
Subproperty of:
Quantification: (2,n:0:n)

Scope note: It appears that there is a notion of events justifying parenthood relationships in a biological or legal sense. There is a notion of legal parenthood being equal to or equivalent to biological parenthood. The fact that the legal system may not acknowledge biological parenthood is not a contradiction to a more general concept comprising both biological and legal sense. In particular, such a notion should imply as default children being heirs, if the society supports such concept.

The superproperty of this property is in abeyance until the next meeting. It should be paths for was born – gave birth, was born, by father..

Also appropriate changes were made to (1) the property section to E21 Person (2) CIDOC CRM Property Hierarchy table in page xxvii

Proofreading:

Page xvi: In the 25th CIDOC SIG meeting and the 18th FRBR-CIDOC CRM Harmonization meeting, at April 30th – May 3rd, 2012, at ICS – FORTH, the CRM-SIG, it is decided to made the following changes for clarification reasons to Disjointness

from

"Classes are disjoint if they share no common instances in any possible world. There are many examples of disjoint classes in the CRM."

To

Classes are disjoint if they share no common instances in any possible world. That implies that it is not possible to instantiate an item using a combination of classes that are mutually disjoint or with subclasses of them (see "multiple instantiation" in section "Terminology"). There are many examples of disjoint classes in the CRM.

Page 62: In the first sentence of the scope note of P98 brought into life (was born), the phrase *E67Birth* became E67 Birth

Page 65: In P109 has current or former curator (is current or former curator of), the hyperlink of code P49 has former or current keeper (is former or current keeper of) to the subproperty section has been added.

Page 70: In the scope note of *P128 carries(is carried by)*, in the first sentence the E73 Information Object became E90 Symbolic Object.

Page 119:The range of *P128 carries(is carried by)*, in the table of the section CRM-Compatible Form, set to E90 Symbolic Object.

Page 76: the first paragraph of P147 has been changed

from

This property associates an instance of E78 Collection or collections with subject of a curation activity following some implicit or explicit curation plan.

To

This property associates an instance of E87 Curation Activity with the instance of E78 Collection that is subject of that curation activity.

Page 136:in P111 added(was added by), P113 removed(was removed by) the form of the tense has been corrected.

Page 170:in P88 foresees use of (use forseen by), the form of the tense has been corrected.

Amendments to draft version 5.1.1

Addition to the monotonicity text in page xvi

In 27th CIDOC SIG meeting and the 20th FRBR-CIDOC CRM Harmonization meeting, at 19 November – 22 November, 2012, at Amersfoort, Netherlands, the CRM-SIG, resolving the ISSUE 204, decided to add the following text in the monotonicity section in page xvi.

The following text is added:

Properties, such as having a part, an owner or a location, may change many times for a single item during its existence. Stating instances of such properties for an item in terms of the CRM only means that these properties existed during some particular time-span. Therefore, one item may have multiple instances of the same property reflecting an aggregation of these instances over the time-span of its existence. If more temporal details are required, the CRM recommends explicitly describing the events of acquiring or losing such property instances, such as by E9 Move etc. By virtue of this principle, the CRM achieves monotonicity with respect to an increase of knowledge about the states of an item at different times, regardless of their temporal order.

However, for some of these properties many collection databases describe the "current" state, such as "current location" or "current owner". Using such a "current" state means, that the database manager is able to verify the respective reality at the latest date of validity of the database. Obviously, this information is non-monotonic, i.e., it requires deletion when the state changes. In order to preserve a reduced monotonicity, these properties have time-neutral superproperties by which respective instances can be reclassified if the validity becomes unknown or no longer holds. Therefore the use of such properties in the CRM is only recommended if they can be maintained consistently. Otherwise, they should be reclassified by their time-neutral superproperties. This holds in particular if data is exported to another repository.

The range of P8 took place on or within (witnessed)

In 27th CIDOC SIG meeting and the 20th FRBR-CIDOC CRM Harmonization meeting, at 19 November – 22 November, 2012, at Amersfoort, Netherlands, the CRM-SIG, resolving the ISSUE 211, decided to change the range of E4 Period.P8 took place on or within (witnessed) to E18 Physical Thing from E19 Physical Object.The following changes took place:

Page xvv: on the property hierarchy table

Page 4: Properties section of E4 Period
Page 39: Properties definition section on Range field.

The name of the property P69 is associated with

In 27th CIDOC SIG meeting and the 20th FRBR-CIDOC CRM Harmonization meeting, at 19 November – 22 November, 2012, at Amersfoort, Netherlands, the CRM-SIG, discussing the **ISSUE 214**
Decided to change the name of the property *P69 is associated with* to *P69 has association with (is associated with).* The following changes took place:

Page xxvi: on the property hierarchy table
Page 14: On the scope note and properties of E29 Design or Procedure
Page 55,56: Name, scope note and examples of P69

The following example has been added to the P69

- The set of instructions for performing Macbeth in Max Reinhardt's production in 1916 in Berlin at Deutsches Theater (E29) has association with the scene design drawing by Ernst Stern reproduced at http://www.glopad.org/pi/fr/record/digdoc/1003814 (E29) has type set design (E55)

Examples in E28 Conceptual Object

In 27th CIDOC SIG meeting and the 20th FRBR-CIDOC CRM Harmonization meeting, at 19 November – 22 November, 2012, at Amersfoort, Netherlands, the CRM-SIG, decided the example of Maxwell equations in F50 Controlled Access Point to be added to E28 Conceptual Object

The scope note of E90 Symbolic Object

In 27th CIDOC SIG meeting and the 20th FRBR-CIDOC CRM Harmonization meeting, at 19 November – 22 November, 2012, at Amersfoort, Netherlands, the CRM-SIG, decided to finalize the text of the issue 207.

From

In some cases, the content of an instance of E90 Symbolic Object may completely be represented by a serialized content model, such.. as the property P3 has note allows for describing this content model… P3.1 has type: E55 Type to specify the encoding..

To

In some cases, the content of an instance of E90 Symbolic Object may completely be represented by a serialized digital content model, such as a sequence of ASCII-encoded characters, an XML or HTML document, or a TIFF image. The property P3 has note allows for the description of this content model. In order to disambiguate which symbolic level is the carrier of the meaning, the property P3.1 has type can be used to specify the encoding (e.g. "bit", "Latin character", RGB pixel)

New property for E55 Type about narrower term partitive

In 27th CIDOC SIG meeting and the 20th FRBR-CIDOC CRM Harmonization meeting, at 19 November – 22 November, 2012, at Amersfoort, Netherlands, the CRM-SIG, decided to close the issue 208. The definition of the property, the scope notes and the example are accepted as they are.

P150 defines typical parts of (defines typical wholes for)
Domain: E55 Type
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: The property "broaderPartitive" associates an instance of E55 Type "A" with an instance of E55 Type "B", when items of type "A" typically form part of items of type "B", such as "car motors" and "cars".

It allows Types to be organised into hierarchies. This is the sense of "broader term partitive (BTP)" as defined in ISO 2788 and "broaderPartitive" in SKOS.

Examples:
car motors (E55) has broader term cars (E55)

The range of P142 used constituent (was used in)

In 27th CIDOC SIG meeting and the 20th FRBR-CIDOC CRM Harmonization meeting, at 19 November – 22 November, 2012, at Amersfoort, Netherlands, the CRM-SIG resolving the issue 209 decided to change . the range of E15 Identifier Assignment.P142 used constituent (was used in):E41 Appellation to E90 Symbolic Object and the examples from R47 used constituent (was used in), of FRBRv2.0 draft to be transferred to P142 used constituent (was used in).

FROM

P142 used constituent (was used in)
Domain: E15 Identifier Assignment
Range: E41 Appellation
Subproperty of: E7 Activity. P16 used specific object (was used for): E70 Thing

Quantification: (0:n,0:n)

Scope note: This property associates the event of assigning an instance of E42 Identifier to an entity, with the instances of E41 Appellation that were used as elements of the identifier.

Examples:

- On June 1, 2001 assigning the personal name heading "Guillaume, de Machaut, ca. 1300-1377" (E15) *used constituent* "Guillaume, de Machaut" (E82)
- On June 1, 2001 assigning the personal name heading "Guillaume, de Machaut, ca. 1300-1377" (E15) *used constituent* "ca. 1300-1377" (E49)

TO

P142 used constituent (was used in)
Domain: E15 Identifier Assignment
Range: E90 Symbolic Object
Subproperty of: E7 Activity. P16 used specific object (was used for): E70 Thing

Quantification: (0:n,0:n)

Scope note: This property associates the event of assigning an instance of E42 Identifier with the instances of E90 Symbolic Object that were used as constituents of the identifier.

Examples:

- On June 1, 2001 assigning the personal name identifier "Guillaume, de Machaut, ca. 1300-1377" (E15) *used constituent* "ca. 1300-1377" (E49)
- Assigning a uniform title to the anonymous textual work known as 'The Adoration of the Shepherds'(E15) *used constituent* 'Coventry' (E48)
- Assigning a uniform title to Pina Bausch's choreographic work entitled 'Rite of spring' (E15) *used constituent* '(Choreographic Work: Bausch)'(E90)
- Assigning a uniform title to the motion picture directed in 1933 by Merian C. Cooper and Ernest B. Schoedsack and entitled 'King Kong' (E15) *used constituent* '1933' (E50)
- Assigning the corporate name identifier 'Univerza v Ljubljani. Oddelek za bibliotekarstvo' to The Department for library science of the University of Ljubljana (E15) *used constituent* 'Univerza v Ljubljani' (E42)

Examples have been added to E7 Activity

In 27th CIDOC SIG meeting and the 20th FRBR-CIDOC CRM Harmonization meeting, at 19 November – 22 November, 2012, at Amersfoort, Netherlands, the CRM-SIG resolving the **issue 216** decided that the scope note of E7 Activity covers the notion of continuity and added two examples to denote the continuity.
These are:

- Kira Weber working in glass art from 1984 to 1993
- Kira Weber working in oil and pastel painting from 1993

Proofreading:

Page xxv: The range of the property P8 has been corrected

Amendments 5.1.2

The scope note of E74 is changed

28th CIDOC SIG meeting and the 21st FRBR-CIDOC CRM Harmonization meeting 6 – 8 June, 2013, the CRM-SIG resolving the **issue 215** decided to accept the changes to the scope note of E74 Group.

The scope note of E74 has been changed:
FROM

This class comprises any gatherings or organizations of two or more people that act collectively or in a similar way due to any form of unifying relationship. In the wider sense this class also comprises official positions which used to be regarded in certain contexts as one actor, independent of the current holder of the office, such as the president of a country.

A gathering of people becomes an E74 Group when it exhibits organizational characteristics usually typified by a set of ideas or beliefs held in common, or actions performed together. These might be communication, creating some common artifact, a common purpose such as study, worship, business, sports, etc. Nationality can be modeled as membership in an E74 Group (cf. HumanML markup). Married couples and other concepts of family are regarded as particular examples of E74 Group.

Examples

- the impressionists
- the Navajo
- the Greeks
- the peace protestors in New York City on February 15 2003
- Exxon-Mobil
- King Solomon and his wives
- The President of the Swiss Confederation

TO

This class comprises any gatherings or organizations of two or more people that act collectively or in a similar way due to any form of unifying relationship. In the wider sense this class also comprises official positions which used to be regarded in certain contexts as one actor, independent of the current holder of the office, such as the president of a country. A joint pseudonym (i.e., a name that seems indicative of an individual but that is actually used as a persona by two or more people) is a particular case of E74 Group.

A gathering of people becomes an E74 Group when it exhibits organizational characteristics usually typified by a set of ideas or beliefs held in common, or actions performed together. These might be communication, creating some common artifact, a common purpose such as study, worship, business, sports, etc. Nationality can be modeled as membership in an E74 Group (cf. HumanML markup). Married couples and other concepts of family are regarded as particular examples of E74 Group.

Examples:

- the impressionists
- the Navajo
- the Greeks
- the peace protestors in New York City on February 15 2003
- Exxon-Mobil
- King Solomon and his wives
- The President of the Swiss Confederation
- Nicolas Bourbaki
- Betty Crocker
- Ellery Queen

Multiple Instantiation

In 29th CIDOC SIG and the 22nd FRBR-CIDOC CRM Harmonization meeting, October 21st, Crete, resolving the **issue 202,** a text about "multiple instantiation has been added to terminology section, page x. The text follows:

"*Instantiation is the term that describes the case that an instance of class A is also regarded as an instance of one or more other classes B1...n at the same time. When multiple instantiation is used, it has the effect that the properties of all these classes become available to describe this instance. For instance, some particular cases of destruction may also be activities(e.g.,Herostratos' deed), but not all destructions are activities (e.g., destruction of Herculaneum). In comparison, multiple inheritance describes the case that all instances of a class A are implicitly instances of all superclasses of A, by virtue of the definition of the class A, whereas the combination of classes used for multiple instantiation is a characteristic of particular instances only. It is important to note that multiple instantiation is not allowed using combinations of disjoint classes*."

P138 represents (has representation)

In 29th CIDOC SIG and the 22nd FRBR-CIDOC CRM Harmonization meeting, October 21st, Crete, resolving the **issue 205,** the scope note of property P138 has been changed

FROM

This property establishes the relationship between an E36 Visual Item and the entity that it visually represents.
Any entity may be represented visually. This property is part of the fully developed path from E24 Physical Man-Made Thing through *P65 shows visual item (is shown by)*, E36 Visual Item, *P138 represents (has representation)* to E1 CRM Entity, which is shortcut by *P62depicts (is depicted by)*.
P138.1 mode of representation allows the nature of the representation to be refined .

Examples:

- the design on the reverse of a Swiss coin (E36) *represents* Helvetia (E28) *mode of representation* Profile (E55)

TO:

This property establishes the relationship between an E36 Visual Item and the entity that it visually represents.

Any entity may be represented visually. This property is part of the fully developed path from E24 Physical Man-Made Thing through *P65 shows visual item (is shown by)*, E36 Visual Item, *P138 represents (has representation)* to E1 CRM Entity, which is shortcut by *P62depicts (is depicted by)*.
P138.1 mode of representation allows the nature of the representation to be refined.

This property is also used for the relationship between an original and a digitisation of the original by the use of techniques such as digital photography, flatbed or infrared scanning. Digitisation is here seen as a process with a mechanical, causal component rendering the spatial distribution of structural and optical properties of the original and does not necessarily include any visual similarity identifiable by human observation."

Also the following examples has been added:

- "the digital file found at http://www.emunch.no/N/full/No-MM_N0001-01.jpg (E73) represents page 1 of Edward Munch's manuscript MM N 1, Munch-museet (E73) mode of representation Digitisation (E55)"

P69 has association with (is associated with)

In 29th CIDOC SIG and the 22nd FRBR-CIDOC CRM Harmonization meeting, October 21st, Crete, resolving the **issue 214** we revised the scope note of P69 and the examples and one example is added. The text and the examples are changed

FROM:

P69 has association with (is associated with)

Scope note: This symmetric property describes the association of an E29 Design or Procedure with other Designs or Procedures.

Any instance of E29 Design or Procedure may be associated with other designs or procedures.

The *P69.1 has type* property of *P69 has association with* allows the nature of the association to be specified; examples of types of association between instances of E29 Design or Procedure include: whole-part, sequence, prerequisite, etc

Properties: P69.1 has type: E55 Type

Examples:

- procedure for glass blowing (E29) *has association with* procedure for glass heating (E29)
- The set of instructions for performing Macbeth in Max Reinhardt's production in 1916 in Berlin at Deutsches Theater (E29) *has association with* the scene design drawing by Ernst Stern reproduced at http://www.glopad.org/pi/fr/record/digdoc/1003814 (E29) *has type* set design (E55)

TO

P69 has association with (is associated with)

Scope note: This property generalises relationships like whole-part, sequence, prerequisite or inspired by between instances of E29 Design or Procedure. Any instance of E29 Design or Procedure may be associated with other designs or procedures. The property is considered to be symmetrical unless otherwise indicated by P69.1 has type.
The *P69.1 has type* property of *P69 has association with* allows the nature of the association to be specified reading from domain to range; examples of types of association between instances of E29 Design or Procedure include: has part, follows, requires, etc.
The property can typically be used to model the decomposition of the description of a complete workflow into a series of separate procedures.

Examples:

- Procedure for glass blowing (E29) has association with procedure for glass heating (E29)
- The set of instructions for performing Macbeth in Max Reinhardt's production in 1916 in Berlin at Deutsches Theater (E29) has association with the scene design drawing by Ernst Stern reproduced at http://www.glopad.org/pi/fr/record/digdoc/1003814 (E29) has type has part (E55)
- Preparation of parchment (E29) *has association with* soaking and unhairing of skin (E29) *has type* 'has part' (E55). Preparation of parchment (E29) *has association with* stretching of skin (E29) *has type* 'has part' (E55). Stretching of skin (E29) *has association with* soaking and unhairing of skin (E29) *has type* 'follows' (E55).

Properties: P69.1 has type: E55 Type

P56 bears feature (is found on)

In 29th CIDOC SIG and the 22nd FRBR-CIDOC CRM Harmonization meeting, October 21st, Crete, resolving the **issue 225,** the scope of P56 has been changed

FROM

This property describes a E26 Physical Feature found on a E19 Physical Object It does not specify the location of the feature on the object.

P56 bears feature (is found on) is a shortcut. A more detailed representation can make use of the fully developed (i.e. indirect) path from E19 Physical Object through *P59 has section (is located on or within)*, E53 Place, *P53 has former or current location (is former or current location of)* to E26 Physical Feature.
A Physical Feature can only exist on one object. One object may bear more than one Physical Feature. An E27 Site should be considered as an E26 Physical Feature on the surface of the Earth.

TO

This property links an instance of E19 Physical Object to an instance of E26 Physical Feature that it bears.
An E26 Physical Feature can only exist on one object. One object may bear more than one E26 Physical Feature. An E27 Site should be considered as an E26 Physical Feature on the surface of the Earth.

An instance B of E26 Physical Feature being a detail of the structure of another instance A of E26 Physical Feature can be linked to B by use of the property P46 is composed of (forms part of). This implies that the subfeature B is P56i found on the same E19 Physical Object as A.
P56 bears feature (is found on) is a shortcut. A more detailed representation can make use of the fully developed (i.e. indirect) path from E19 Physical Object through P59 has section (is located on or within), E53 Place, P53 has former or current location (is former or current location of) to E26 Physical

Feature.

Co reference statement

In 29th CIDOC SIG and the 22nd FRBR-CIDOC CRM Harmonization meeting, October 21st, Crete, resolving the **issue 230,** the following entities and properties have been added to the CRM

E91 Co-Reference Assignment
Subclass of: E13 Attribute Assignment

Scope note: This class comprises actions of making the assertion whether two or more particular instances of E89 Propositional Object refer to the same instance of E1 CRM Entity. The assertion is based on the assumption that this was an implicit fact being made explicit by this assignment. Use of this class allows for the full description of the context of this assignment.(MD will write an extension about the levels of belief)

Examples:

- the assertion that the author name "Hans Jæger" on the title page of the novel "Fra Christiania-Bohêmen" refers to the same historical person as the motive of the painting "Forfatteren Hans Jæger" by Edvard Munch.
- the assertion that the author name "Hans Jæger" on the title page of the novel "Fra Christiania-Bohêmen" does not refer to the same historical person as the author of the collection of drawings "Til Julebordet : ti Pennetegninger / af H.J." incorrectly attributed to Hans Jæger in the Bibsys database.
-

Properties:

P153 assigned co-reference to (was regarded to co-refer by): E89 Propositional Object
P154 assigned non co-reference to (was regarded not to co-refer by): E89 Propositional Object
P155 has co-reference target (is co-reference target of): E1 CRM Entity

P153 assigned co-reference to (was regarded to co-refer by)
Domain: E91 Co-Reference Assignment
Range: E89 Propositional Object
Subproperty of: P140 assigned attribute to
Quantification: ()

Scope note: This property connects an E91 Co-Reference Assignment to one of the propositional objects co-referring to the co-reference target

P154 assigned non co-reference to (was regarded not to co-refer by)
Domain: E91 Co-Reference Assignment
Range: E89 Propositional Object
Subproperty of: P140 assigned attribute to
Quantification: ()

Scope note: This property connects an E91 Co-Reference Assignment to one of the propositional objects not co-referring to the co-reference target

P155 has co-reference target (is co-reference target of)
Domain: E91 Co-Reference Assignment
Range: E1 CRM Entity
Subproperty of: P141 assigned (was assigned by)
Quantification: ()

Scope note: This property connects an E91 Co-Reference Assignment to the target of the references that are regarded as co-referring.

Scope note of P32 used general technique (was technique of)

In 29th CIDOC SIG and the 22nd FRBR-CIDOC CRM Harmonization meeting, October 21st, Crete, resolving the **issue 232,** the scope note of P32 has been changed

FROM
These techniques should be drawn from an external E55 Type hierarchy of consistent terminology of general techniques such as embroidery, oil-painting, etc. Specific techniques may be further described as instances of E29 Design or Procedure.
TO

This property identifies the technique or method that was employed in an activity.
These techniques should be drawn from an external E55 Type hierarchy of consistent terminology of general techniques or methods such as embroidery, oil-painting, carbon dating, etc. Specific documented techniques should be described as instances of E29 Design or Procedure. This property identifies the technique that was employed in an act of modification.

Spatiotemporal Entities and Properties

In 29th CIDOC SIG and the 22nd FRBR-CIDOC CRM Harmonization meeting, October 21st, Crete, resolving the **issue 234,** the following entities and properties have been added for reviewing

E92 Spacetime Volume

Subclass of: E1 CRM Entity

Scope note: This class comprises 4 dimensional point sets (volumes) in physical spacetime regardless its true geometric form. They may derive their identity from being the extent of a material phenomenon or from being the interpretation of an expression defining an extent in spacetime. Intersections of instances of E92 Spacetime Volume, Place and Timespan are also regarded as instances of E92 Spacetime Volume. An instance of E92 Spacetime Volume is either contiguous or composed of a finite number of contiguous subsets. Its boundaries may be fuzzy due to the properties of the phenomena it derives from or due to the limited precision up to which defining expression can be identified with a real extent in spacetime. The duration of existence of an instance of a spacetime volume is trivially its projection on time .

Examples:

- the spacetime Volume of the Event of Ceasars murder
- the spacetime Volume where and when the carbon 14 dating of the "Schoeninger Speer II" in 1996 took place
- the spatio-temporal trajectory of the H.M.S. Victory from its building to its actual location
- the spacetime volume defined by a polygon approximating the Danube river flood in Austria between 6th and 9th of August 2002

Properties:

P160 has temporal projection: E52 Time-Span
P161 has spatial projection: E53 Place

E93 Spacetime Snapshot

Subclass of: E92 Spacetime Volume

Scope note: This class comprises instances of E92 Spacetime Volume that result from intersections of instances of E92 Spacetime Volume, E53 Place or E52 Time-Span. The identity of an instance of this class is determined by the identities of its constituting items. Those are one or more of the following:
1) two or more instances of E92 Spacetime Volume
2) one or more instances of E92 Spacetime Volume AND one or more instances of E53 Place.
3) one or more instances of E92 Spacetime Volume AND one or more instances of E52 Time-Span
4) one or more instances of E53 Place AND one or more instances of E52 Time-Span

This class can be used to define temporal snapshots at a particular time-span, such as the extent of the Roman Empire at 33 B.C., or the extent occupied by a museum object at rest in an exhibit. It can also be used to define a spatial snapshot, such as cutting the E92 Spacetime Volume occupied by the Iron Age by the current spatial extent of Austria. It can also be used to define intersections of two or

more real spatiotemporal components, such as the E92 Spacetime Volume occupied by the E4 Period of Impressionism with the E92 Spacetime Volume occupied by the life of Van Gogh, or the E92 Spacetime Volume occupied by Imperial China with that claimed by Imperial Vietnam.
In particular, it can be used to define partial spatial or temporal projections of spacetime volumes, such as the time-spans of foreign occupation of a country, or the spatial extent of a flood at some particular hour.

Properties:

P162 is restricted by: E92 Spacetime Volume
P163 is restricted by: E53 Place
P164 is restricted by: E52 Time Span

P156 occupies

Domain: E18 Physical Thing
Range: E53 Place
Quantification: one to one (0,1:1,1)

Scope note: This property describes the maximal real volume in space that an instance of E18 Physical Thing has occupied during its lifetime with respect to a reference space relative to which the thing is at rest. In other words, it is the volume that contains all the points which the thing has covered at some time during its existence. In the case of an E26 Physical Feature the default reference space is the one in which the object that bears the feature or at least the surrounding matter of the feature is at rest. In this case there is a 1:1 relation of E26 Feature and E53 Place. For simplicity of implementation multiple inheritance (E26 Feature IsA E53 Place) may be a practical approach.

For instances of E19 Physical Objects the default reference space is the one which is at rest to the object itself, i.e. which moves together with the object. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

This property is a shortcut of the fully developed path from '*E18 Physical Thing' through 'P157 occupied', 'E92 Spacetime Volume', 'P159 has spatial projection' to 'E53 Place'*. For some instances of E18 Physical Object the relative stability of form may not be sufficient to define a useful local reference space, for instance for an amoeba. In such cases the fully developed path to an external reference space and using a temporal validity component may be adequate to determine the place they have occupied.

In contrast to P156 occupies, the property P53 has former or current location identifies an instance of E53 Place at which a thing is or has been for some unspecified time span. Further it does not constrain this reference space of the referred instance of P53 Place.

P157 is at rest relative to (occupied)

Domain: P53 Place

Range: E18 Physical Thing

Superproperty of: Inverse of (E53 Place. P59i is located on or within: E18 Physical Thing)

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

Scope note: This property associates an instance of P53 Place with the instance of E18 Physical Thing that determines a reference space for this instance of P53 Place by being at rest with respect to this reference space. The relative stability of form of an E18 Physical Thing defines its default reference

space. The reference space is not spatially limited to the referred thing. For example, a ship determines a reference space in terms of which other ships in its neighbourhood may be described. Larger constellations of matter, such as continental plates, may comprise many physical features that are at rest with them and define the same reference space.

P158 occupied

Domain: E4 Period
Range: E92 Spacetime Volume
Quantification: many to one, necessary (1,1:0,n)
Scope note: This property associates an instance of E4 Period with the real (phenomenal) 4 dimensional point set (volume) in spacetime that it has occupied. The associated instance of E92 Spacetime Volume includes the trajectories of the participating physical things during their participation in the instance of E4 Period, the open spaces via which they 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, such as the air in a meeting room transferring the voices. Another example are the areas controlled by some military power. In general, instances of E4 Period have fuzzy boundaries in spacetime.

P159 occupied

Domain: E18 Physical Thing
Range: E92 Spacetime Volume
Quantification: many to one, necessary (1,1:0,n)

Scope note: This property describes the real (phenomenal) 4 dimensional point sets (volumes) in spacetime that the trajectory of an instance of E18 Physical Thing occupies in spacetime in the course of its existence. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

P160 has temporal projection

Domain: E92 Spacetime Volume
Range: E52 Time-Span
Quantification: one to one (1,1:1,1)

Scope note: This property describes the temporal projection of an instance of an E92 Spacetime Volume. The property P4 has time-span is a shortcut of the more fully developed path from E4 Period through P158 occupied, E92 Spacetime Volume P160 has temporal projection to E52 Time Span.

P161 has spatial projection

Domain: E92 Spacetime Volume
Range: E53 Place
Quantification: one to many, necessary, dependent (1,n:1,1)

Scope note: This property associates an instance of a E92 Spacetime Volume with an instance of E53 Place that is the result of the spatial projection of the instance of a E92 Spacetime Volume on a reference space. In general there can be more than one useful reference space to describe the spatial projection of a spacetime volume, such as that of a battle ship versus that of the seafloor. Therefore the projection is not unique.
The property P7 took place at is a shortcut of the more fully developed path from *E4 Period through P158 occupied, E92 Spacetime Volume P161 has spatial projection to E53 Place.*

P162 is restricted by

Domain: E93 Spacetime Snapshot

Range: E92 Spacetime Volume

Quantification: two to many, necessary (2,n:0,n)

Scope note: This property relates an E93 Spacetime Snapshot with an arbitrary E92 Spacetime Volume that restricts the extent of the former to a volume equal to or within the latter.

P163 is restricted by

Domain: E93 Spacetime Snapshot

Range: E53 Place

Quantification: two to many, necessary (2,n:0,n)

Scope note: This property relates an E93 Spacetime Snapshot with an arbitrary instance of E53 Place that restricts the extent of the former to a volume within the back-projection of the instance of E53 Place to all times. If the instance of E53 Place is defined in two dimensions only, such as the footprint of a building, the place needs also to be back-projected into the third dimension.

P164 is restricted by

Domain: E93 Spacetime Snapshot

Range: E52 Time-Span

Quantification: two to many, necessary (2,n:0,n)

Scope note: This property relates an E93 Spacetime Snapshot with an arbitrary E52 Time-Span that restricts the extent of the former to a volume within these time limits.

Proofreading

Page 9: The range of the property the P39 measured (was measured by) in the declaration of properties on E16 has been corrected to E1 CRM Entity
Page 139: The version number corrected. It changed from "Amendments to draft version 5.1 (May 2013)" to "Amendments to draft version 5.1.1"

Amendments 6.0

Inverse of a property

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig resolving the ISSUES 199 and 219, decided to add an explanation about "superproperty of inverse". Thus the following insertions has been made to:
(1) Terminology section inverse of a property,

" The inverse of a property is the reinterpretation of a **property** from **range** to **domain** without more general or more specific meaning, similar to the choice between active and passive voice in some languages. In contrast to some knowledge representation languages, such as RDF and OWL, we regard that the inverse of a property is not a property in its own right that needs an explicit declaration of being inverse of another, but an interpretation implicitly existing for any property. The inverse of the inverse of a property is identical to the property itself, i.e. its primary sense of direction.

For example:
"CRM Entity *is depicted by* Physical Man-Made Thing" is the inverse of "Physical Man-Made Thing *depicts* CRM Entity" "
(2) In the subproperty definition in the Terminology section the following text has been added:

"Alternatively, a property may be subproperty of the **inverse of** another property, i.e. reading the property from range to domain. In that case,

6. all instances of the subproperty are also instances of the inverse of the other property,
7. the intension of the subproperty extends the intension of the inverse of the other property, i.e. its traits are more restrictive than that of the inverse of the other property,
8. the domain of the subproperty is the same as the range of the other property or a subclass of that range,
9. the range of the subproperty is the same as the domain of the other property or a subclass of that domain,
10. the subproperty inherits the definition of all of the properties declared for the other property without exceptions (strict inheritance), in addition to having none, one or more properties of its own. The definitions of inherited properties have to be interpreted in the inverse sense of direction of the subproperty, i.e., from range to domain."

(3) In the superproperty section in the Terminology section the following sentence has been added to the end of the paragraph.
"A superproperty may be a generalization of the **inverse of** another property"
(4) In the chapter entitled "naming conventions" the third paragraph is changed to:

- "Property names should be read in their non-parenthetical form for the domain-to-range direction, and in parenthetical form for the range-to-domain direction. Reading a property in range-to-domain direction is equivalent to the inverse of that property. Following a current notational practice in OWL knowledge representation language, we represent inverse properties in this text by adding a letter "i" following the identification number and the parenthetical form of the full property name, such as *P59i is located on or within*, which is the inverse of *P59 has section (is located on or within)*."

E2 Temporal Entity

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 234, we added the following text to the end of the first paragraph of E2 Temporal Entity.

"This extent in time must be contiguous, i.e., without gaps. In case the defining kinds of phenomena for an instance of E2 Temporal Entity cease to happen, and occur later again at another time, we regard that the former E2 Temporal Entity has ended and a new instance has come into existence. In more intuitive terms, the same event cannot happen twice."

E4 Period

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 234, we modified the third paragraph of scope note of E4.

Old:

> Typically this class is used to describe prehistoric or historic periods such as the "Neolithic Period", the "Ming Dynasty" or the "McCarthy Era". There are however 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.

New:

> Typically 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. Geopolitical units may be distributed over disconnected areas, such as islands or colonies. In such cases, the spatiotemporal extent is composed of more than one spacetime volume. One may 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. Nevertheless, an instance of E4 Period must be contiguous in time. I.e., if it has ended in all areas, it has ended as a whole, but it may involve one area after another, such as the Polynesian migration, as long as it is ongoing at least in one area.
> 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.

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the

ISSUE 234, we made changes in the scope note of E4.

FROM

This class comprises sets of coherent phenomena or cultural manifestations bounded in time and space.

It is the social or physical coherence of these phenomena that identify an E4 Period and not the associated spatiotemporal bounds. These bounds are a mere approximation of the actual process of growth, spread and retreat. Consequently, different periods can overlap and coexist in time and space, such as when a nomadic culture exists in the same area as a sedentary culture.

Typically 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. Geopolitical units may be distributed over disconnected areas, such as islands or colonies. In such cases, the spatiotemporal extent is composed of more than one spacetime volume. One may 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. Nevertheless, an instance of E4 Period must be contiguous in time. I.e., if it has ended in all areas, it has ended as a whole, but it may involve one area after another, such as the Polynesian migration, as long as it is ongoing at least in one area.

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.

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 E4 Period, and the second defines morphological object types that fall under E55 Type.

Another specific case of an E4 Period is the set of activities and phenomena associated with a settlement, such as the populated period of Nineveh.

TO:

This class comprises sets of coherent phenomena or cultural manifestations bounded in time and space.

It is the social or physical coherence of these phenomena that identify an E4 Period and not the associated spatiotemporal bounds. These bounds are a mere approximation of the actual process of growth, spread and retreat. Consequently, different periods can overlap and coexist in time and space, such as when a nomadic culture exists in the same area as a sedentary culture.
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, the open spaces via which they 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, such as the air in a meeting room transferring the voices. 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. In these cases, the trajectories necessary for participants to travel between these areas are not regarded as part of the spatiotemporal extent. Consequently, instances of E4 Period may occupy each a limited number of disjoint spacetime volumes, however there must not be a discontinuity in the total timespan covered by these spacetime volumes.

Typically 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. Geopolitical units may be distributed over disconnected areas, such as islands or colonies. In such cases, the spatiotemporal extent is composed of more than one spacetime volume. One may 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. Nevertheless, an instance of E4 Period must be contiguous in time. I.e., if it has ended in all areas, it has ended as a whole, but it may involve one area after another, such as the Polynesian migration, as long as it is ongoing at least in one area.

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.

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 E4 Period, and the second defines morphological object types that fall under E55 Type.

Another specific case of an E4 Period is the set of activities and phenomena associated with a settlement, such as the populated period of Nineveh.

E39 Actor

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 195, we modified the first paragragh of the scope note of E39 Actor.

Old:
This class comprises people, either individually or in groups, who have the potential to perform intentional actions for which they can be held responsible.

New:

This class comprises people, either individually or in groups, who have the potential to perform intentional actions of kinds for which someone may be held responsible.

E74 Group

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 195, we modified the first paragragh of the scope note of E74 Group.

Old:

This class comprises any gatherings or organizations of two or more people that act collectively or in a similar way due to any form of unifying relationship. In the wider sense this class also comprises official positions which used to be regarded in certain contexts as one actor, independent of the current holder of the office, such as the president of a country. A joint pseudonym (i.e., a name that seems indicative of an individual but that is actually used as a persona by two or more people) is a particular case of E74 Group.

TO:

This class comprises any gatherings or organizations of E39 Actors that act collectively or in a similar way due to any form of unifying relationship. In the wider sense this class also comprises official positions which used to be regarded in certain contexts as one actor, independent of the current holder of the office, such as the president of a country. In such cases, it may happen that the Group never had more than one member. A joint pseudonym (i.e., a name that seems indicative of an individual but that is actually used as a persona by two or more people)

is a particular case of E74 Group.

P134 continued (was continued by)

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 195, we modified the scope note of P134 continued (was continued by).

Old:

This property allows two activities to be related where the domain is considered as an intentional continuation of the range.

Used multiple times, this allows a chain of related activities to be created which follow each other in sequence.

New:

This property associates two instances of E7 Activity, where the domain is considered as an intentional continuation of the range. A continuation of an activity may happen when the continued activity is still ongoing or after the continued activity has completely ended. The continuing activity may have started already before it decided to continue the other one. Continuation implies a coherence of intentions and outcomes of the involved activities.

P69 has association with (is associated with)

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 214, we added an example showing the continuation of activities. The example is the following

"The plan for reassembling the temples at Abu Simbel (E29) has association with the plan for storing and transporting the blocks (E29) has type 'follows' (E55)'."

E75 Conceptual Object Appellation

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 233, we modified the scope note of E75 :

Old:

This class comprises all appellations specific to intellectual products or standardized patterns.

New:

This class comprises appellations that are by their form or syntax specific to identifying instances of E28 Conceptual Object, such as intellectual products, standardized patterns etc.

and we added the following example:

"DOI=10.1109/MIS.2007.103"

P138 represents (has representation)

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 205, an example has been added. The following :

"The 3D model VAM_A.200-1946_trace_1M.ply (E73) represents Victoria & Albert Museum's Madonna and child sculpture (visual work) A.200-1946 (E22) mode of representation 3D surface (E55)"

P152 has parent (is parent of)

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 199**, the scope note of P152 has been updated

FROM:

Scope note: (It appears that there is a notion of events justifying parenthood relationships in a biological or legal sense. There is a notion of legal parenthood being equal to or equivalent to biological parenthood. The fact that the legal system may not acknowledge biological parenthood is not a contradiction to a more general concept comprising both biological and legal sense. In particular, such a notion should imply as default children being heirs, if the society supports such concept.)

Superproperty of paths for was born – gave birth, was born, by father..

TO:

Scope note: This property associates an instance of E21 Person with another instance of E21 Person who plays the role of the first instance's parent, regardless of whether the relationship is biological parenthood, assumed or pretended biological parenthood or an equivalent legal status of rights and obligations obtained by a social or legal act. This property is, among others, a shortcut of the fully developed paths from '*E21Person' through 'P98i was born', 'E67 Birth', 'P96 by mother' to 'E21 Person',* and from '*E21Person' through 'P98i was born', 'E67 Birth', 'P97 from father' to 'E21 Person'*.

P165 incorporates (is incorporated in)

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 227**, we introduce the property of incorporation

Domain: F22 Self-Contained 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 instance of F22 Self-Contained Expression 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.

E91 Co-Reference Assignment

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 230**, we made the following changes in the scope note of E91 in order to clarify `epistemological positions with respect URI use:`

old

Scope note: This class comprises actions of making the assertion whether two or more particular instances of E89 Propositional Object refer to the same instance of E1 CRM Entity. The assertion is based on the assumption that this was an implicit fact being made explicit by this assignment. Use of this class allows for the full description of the context of this assignment.(MD will write an extension about the levels of belief)

New Scope note:

Scope note: This class comprises actions of making the assertion whether two or more particular instances of E89 Propositional Object refer to the same instance of E1 CRM Entity. The assertion is based on the assumption that this was an implicit fact being made explicit by this assignment. Use of this class allows for the full description of the context of this assignment. The Actor making the assertion may have different kinds of confidence in the truth of the asserted fact of co-reference, because it may imply an interpretation of the (past) knowledge behind the propositional objects assumed to be co-referring. This kind of confidence can be described by using the property *P2 has type (is type of)*. In case different propositional attitudes should be expressed per asserted propositional object, the assertion has accordingly to be divided into one instance of E91 Co-Reference Assignment for each kind of confidence.

This class aims at the problem of interpreting within a particular passage of an historical text, to which real-world entity a particular name, pronoun or equivalent expression was intended to refer by the texts author. In other words, it expresses the uncertainty of the creator of the assertion about the meaning of the information provided by another person.
Each such interpretation can only be documented with respect to another reference – either found in another text by the same or a different author, and/or by referring to the world known to the creator of the co-reference assertion. To do the latter, the property P155 *has co-reference target (is co-reference target of)* allows for referring to an instance of CRM Entity of the creator's world. In a sense, the respective instance of E91 Co-Reference Assignment using the property P155 *has co-reference target (is co-reference target of)* in a knowledge base forms propositional object referring to the creator's target entity, since a knowledge base as a whole can be seen as a propositional object. Consequently, if in a Semantic Web implementation the target entity is instantiated by a URI, the meaning of this identifier must be unambiguous to the creator of the co-reference assignment. Similarly, a URI of another authority, such as an author catalogue of a library, can be interpreted as a referring proposition of this catalogue, and be referred to by the property *P153 assigned co-reference to (was regarded to co-refer by)* or *P154 assigned non co-reference to (was regarded not to co-refer by): E89 Propositional Object* in order to express that it does not immediately represent the creator's known world. In this case, the authority that knows the meaning of this URI must be unambiguous by the form of the URI itself.

In contrast, the meaning of the property 'owl:same_as' of the OWL knowledge representation language cannot specify who's knowledge it represents and cannot express kind of confidence. Therefore it is not adequate to model the progress of scholarly co-reference research .

E93 Spacetime Snapshot

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 234, we deleted the properties P162 and P163 and we made changes to the first paragraph of the scope notes:

Old:

This class comprises instances of E92 Spacetime Volume that result from intersections of instances of E92 Spacetime Volume, E53 Place or E52 Time-Span. The identity of an instance of this class is determined by the identities of its constituting items. Those are one or more of the following:

New:

This class comprises instances of E92 Spacetime Volume that result from intersections between instances of E92 Spacetime Volume, instances of E53 Place, or instances of E52 Time-Span. The identity of an instance of this class is determined by the identities of its constituting items. Those are one or more of the following:

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 234**, we made the following changes in the scope note of E93

old

This class comprises instances of E92 Spacetime Volume that result from intersections between instances of E92 Spacetime Volume, instances of E53 Place, or instances of E52 Time-Span. The identity of an instance of this class is determined by the identities of its constituting items. Those are one or more of the following:

1) two or more instances of E92 Spacetime Volume
2) one or more instances of E92 Spacetime Volume AND one or more instances of E53 Place.
3) one or more instances of E92 Spacetime Volume AND one or more instances of E52 Time-Span
4) one or more instances of E53 Place AND one or more instances of E52 Time-Span

This class can be used to define temporal snapshots at a particular time-span, such as the extent of the Roman Empire at 33 B.C., or the extent occupied by a museum object at rest in an exhibit. It can also be used to define a spatial snapshot, such as cutting the E92 Spacetime Volume occupied by the Iron Age by the current spatial extent of Austria. It can also be used to define intersections of two or more real spatiotemporal components, such as the E92 Spacetime Volume occupied by the E4 Period of Impressionism with the E92 Spacetime Volume occupied by the life of Van Gogh, or the E92 Spacetime Volume occupied by Imperial China with that claimed by Imperial Vietnam.
In particular, it can be used to define partial spatial or temporal projections of spacetime volumes, such as the time-spans of foreign occupation of a country, or the spatial extent of a flood at some particular hour.

Properties:

P164 is restricted by: E52 Time Span

To:

Scope note: This class comprises instances of E92 Spacetime Volume that result from intersections between instances of E92 Spacetime Volume, instances of E53 Place, or instances of E52 Time-Span. The identity of an instance of this class is determined by the identities of its constituting items. Those are one or more of the following:

This class can be used to define temporal snapshots at a particular time-span, such as the extent of the Roman Empire at 33 B.C., or the extent occupied by a museum object at rest in an exhibit. In particular, it can be used to define the spatial projection of a spacetime volume during a particular time-span, such as the maximal spatial extent of a flood at some particular hour, or all areas covered by the Poland within the 20th century AD

This class comprises instances of E92 Spacetime Volume that result from intersection of instances of E92 Spacetime Volume with an instance of E52 Time-Span. The identity of an instance of this class is determined by the identities of the constituting space time volume and the time-span.

This class can be used to define temporal snapshots at a particular time-span, such as the extent of the Roman Empire at 33 B.C., or the extent occupied by a museum object at rest in an exhibit. In particular, it can be used to define the spatial projection of a space time volume during a particular time-span, such as the maximal spatial extent of a flood at some particular hour, or all areas covered by the Poland within the 20th century AD

Properties:

P164 is restricted by: E52 Time Span

P157 is at rest relative to (occupied)

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 234**, we made changes in the name and examples have been added

FROM P157 is at rest relative to (occupied) **TO** P157 is at rest relative to (provides reference space for)

The following examples have been added

Examples:

- The spatial extent of the municipality of Athens in 2014 (E53) *is at rest relative to* The Royal Observatory in Greenwich (E25)
- The place where Lord Nelson died on H.M.S. Victory (E53) *is at rest relative to* H.M.S. Victory (E22)

P158 occupied

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 234, we modified the scope note of the properties P158.

Old:

This property associates an instance of E4 Period with the real (phenomenal) 4 dimensional point set (volume) in spacetime that it has occupied. The associated instance of E92 Spacetime Volume includes the trajectories of the participating physical things during their participation in the instance of E4 Period, the open spaces via which they 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, such as the air in a meeting room transferring the voices. Another example are the areas controlled by some military power. In general, instances of E4 Period have fuzzy boundaries in spacetime.

New:

This property associates an instance of E4 Period with the real, that is, phenomenal, 4 dimensional point set or volume in spacetime that it has occupied. The associated instance of E92 Spacetime Volume includes the trajectories of the participating physical things during their participation in the instance of E4 Period. This consists of the open spaces via which they have interacted and the spaces by which they had the potential to interact during that period or event. Such interactions took place in the way defined by the type of the respective period or event, such as the air in a meeting room transferring the voices. Another example are the areas controlled by some military power. In general, instances of E4 Period have fuzzy boundaries in spacetime.

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 234**, we made changes in cardinalities and scope note of P158

Cardinalities: FROM many to one, necessary (1,1:0,n) TO: many to one, necessary (1,n:0,n)

Scope note :

FROM:

This property associates an instance of E4 Period with the real, that is, phenomenal, 4 dimensional point set or volume in spacetime that it has occupied. The associated instance of E92 Spacetime Volume includes the trajectories of the participating physical things during their participation in the instance of E4 Period. This consists of the open spaces via which they have interacted and the spaces by which they had the potential to interact during that period or event. Such interactions took place in the way defined by the type of the respective period or event, such as the air in a meeting room transferring the voices. Another example are the areas controlled by some military power. In general, instances of E4 Period have fuzzy boundaries in spacetime.

TO:

This property associates an instance of E4 Period with the real that is phenomenal,, 4 dimensional point set or volume in spacetime that it has occupied. The associated instance of E92 Spacetime Volume includes the trajectories of the participating physical things during their participation in the instance of E4 Period. This consists of the open spaces via which they have interacted and the spaces by which they had the potential to interact during that period or event. Such interactions took place in the way defined by the type of the respective period or event, such as the air in a meeting room transferring the voices. Another example are the areas controlled by some military power. In case of phenomena spreading out over islands or other separated areas, the trajectories necessary for participants to travel between these areas are not regarded as part of the occupied spacetime volumes. Such instances of E4 Period occupy each a limited number of contiguous spacetime volumes, however there must not be a discontinuity in the total timespan covered by these spacetime volumes. The real spacetime volumes occupied by an instance of E4 Period must not be confused with declarations of spacetime approximating the real extent. In general, instances of E4 Period have fuzzy boundaries in spacetime.

Therefore it cannot be verified, if two different instances of E4 Period occupy exactly the same spacetime volume. We therefore determine that a spacetime volume may only be occupied by one instance of E4 Period.

P159 occupied

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 234, we modified the scope note of the properties P158.
Old:

This property describes the real (phenomenal) 4 dimensional point sets (volumes) in spacetime that the trajectory of an instance of E18 Physical Thing occupies in spacetime in the course of its existence. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

New:
This property describes the real, that is, phenomenal, 4 dimensional point sets or volumes in spacetime that the trajectory of an instance of E18 Physical Thing occupies in the course of its existence. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 234**, we made changes in cardinalities and scope note of P159

Cardinalities: FROM many to one, necessary (1,1:0,n) TO many to one, necessary (1,n:0,n)

Scope note :

FROM:

This property describes the real (phenomenal) 4 dimensional point sets (volumes) in spacetime that the trajectory of an instance of E18 Physical Thing occupies in spacetime in the course of its existence. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

TO:

This property describes the real that is phenomenal, 4 dimensional point sets or volumes in spacetime that the trajectory of an instance of E18 Physical Thing occupies in the course of its existence. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.
Physical things consisting of aggregations of physically unconnected objects, such as a set of chessmen, occupy a number of individually contiguous spacetime volumes equal to the number of unconnected objects that constitute them.

P161 has spatial projection

In 30th CIDOC SIG and the 23rd FRBR-CIDOC CRM Harmonization meeting, the crm-sig discussing the ISSUE 234, we modified the scope note of the properties P161

Old:

This property associates an instance of a E92 Spacetime Volume with an instance of E53 Place that is the result of the spatial projection of the instance of a E92 Spacetime Volume on a reference space. In general there can be more than one useful reference space to describe the spatial projection of a spacetime volume, such as that of a battle ship versus that of the seafloor. Therefore the projection is not unique.
The property P7 took place at is a shortcut of the more fully developed path from *E4 Period through P158 occupied, E92 Spacetime Volume P161 has spatial projection to E53 Place*.

New:

This property associates an instance of a E92 Spacetime Volume with an instance of E53Place that is the result of the spatial projection on a reference space. There can be more than one useful reference space to describe the spatial projection of a spacetime volume, such as that of a battle ship and that of the seafloor, so the projection is not unique.

The property P7 took place at is a shortcut of the more fully developed path from E4 Period through P158 *occupied*, E92 Spacetime Volume P161 *has spatial projection* to E53 Place.

P9 consists of (forms part of)

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 235**, we made changes in the P9

Old:

Domain: E4 Period
Range: E4 Period
Quantification: one to many, (0,n:0,1)

Scope note: This property describes the decomposition of an instance of E4 Period into discrete, subsidiary periods.

The sub-periods into which the period is decomposed form a logical whole - although the entire picture may not be completely known - and the sub-periods are constitutive of the general period.

Examples:

- Cretan Bronze Age (E4) *consists of* Middle Minoan (E4)

New:

Domain: E4 Period

Range: E4 Period
Subproperty of: E4 Period. P10i contains: E4 Period

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

Scope note: This property associates an instance of E4 Period with another instance of E4 Period that falls within the spacetime volumes occupied by the former and which is defined by phenomena that form part of or are refinements of the phenomena that define the former.

P89 falls within (contains)

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the **ISSUE 238 , the scope note of P89 has been changed**

OLD**:** ,

Scope note: This property identifies the instances of E53 Places that fall within the area covered by another Place.

It addresses spatial containment only, and no 'whole-part' relationship between the two places is implied.

New:

Scope note: This property identifies an instance of E53 Place that falls wholly within the extent of another E53 Place.

It addresses spatial containment only, and does not imply any relationship between things or phenomena occupying these places.

E31 Document

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the ISSUE 246, we changed the second example.

Old:

- the photo of the Allied Leaders at Yalta published by UPI, 1945

New

- The image content of the photo of the Allied Leaders at Yalta published by UPI, 1945 (E38)

E73 Information Object

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the issue 252 the following example has been added . to it.

" The Getty AAT as published as Linked Open Data, accessed 1/10/2014"

E70 Thing

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the issue 253, the crm-sig changed the scope note of E70 Thing

Old:

This general class comprises usable discrete, identifiable, instances of E77 Persistent Item that are documented as single units.

They can be either intellectual products or physical things, and are characterized by relative stability. They may for instance either have a solid physical form, an electronic encoding, or they may be logical concept or structure.

New:

This general class comprises discrete, identifiable, instances of E77 Persistent Item that are documented as single units, that either consist of matter or depend on being carried by matter and are characterized by relative stability.

They may be intellectual products or physical things. They may for instance have a solid physical form, an electronic encoding, or they may be a logical concept or structure.

Inverse Subproperties of P130

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the issue 219, we revised the subproperty of P130

Old
Superproperty of: E33 Linguistic Object. P73 has translation (is translation of): E33 Linguistic Object

New:

Superproperty of: E33 Linguistic Object. P73i has translation (is translation of): E33 Linguistic Object

E84 Information Carrier

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the issue 259, the crm-sig revised the scope note of E84

Old:
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.

This allows a relationship to be asserted between an E19 Physical Object and its immaterial information contents. 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.

New:

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.

P128 carries (is carried by)

In 31st joined meeting of the CIDOC CRM SIG, ISO/TC46/SC4/WG9 and the 24th FRBR - CIDOC CRM, resolving the issue 259, the crm-sig revised the scope note of P128 and the domain.

Domain: E24 Physical Man-Made Thing
…
Scope note: This property identifies an E90 Symbolic Object carried by an instance of E24 Physical Man-Made

Thing.

In general this would be an E84 Information Carrier *P65 shows visual item (is shown by)* is a specialisation of *P128 carries (is carried by)* which should be used for carrying visual items.

Examples:

- Matthew's paperback copy of Reach for the Sky (E84) *carries* the text of Reach for the Sky (E73)

New
Domain: E18 Physical Thing
…

Scope note: This property identifies an E90 Symbolic Object carried by an instance of E18 Physical Thing.

Proofreading:

Page 113: the code of the properties appeared in the shortcut description in the scop enote of ' P156 occupied' have been corrected
Page 72: It has been added the domain, range , subproperty and quantification part of P151.
Page 112: Editorial changes in the format in the description of P153, P154, P155
Page 80: The following reference has been added to the References section:
Doerr M., Hiebel G., Eide Ø, CRMgeo: Linking the CIDOC CRM to GeoSPARQL through a Spatiotemporal Refinement, TECHNICAL REPORT: ICS-FORTH/TR-435, April 2013

Amendments 6.1

In First Order Logic representation

In 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig decided the In First Order Logic representation of Entities and Properties as proposed by Carlo Meghini to be added to the official text of CIDOC - CRM after the examples.

E73 Information Object

In 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig reviewing the ISSUE 252 . to include name graphs changed the scope note of E73 from

Scope note: This class comprises identifiable immaterial items, such as a 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.

To

Scope note: This class comprises identifiable immaterial items, such as a 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. The encoding structure known as a "named graph" also falls under this class, so that each "named graph" is an instance of an E73 Information Object.

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.

P150 defines typical parts of (defines typical wholes for)

In 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig reviewing the ISSUE 242 . corrected the example of this property

from

Car motors (E55) has broader term cars (E55)

To

Car motors (E55) *defines typical parts of* cars (E55)

E59 Primitive Value

In 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig reviewing the ISSUE 254, changed the scope not of E59 Primitive Value

FROM

Scope Note: This class comprises primitive values used as documentation elements, which are not further elaborated upon within the model.

As such they are not considered as elements within our universe of discourse. No specific implementation recommendations are made. It is recommended that the primitive value system from the implementation platform be used to substitute for this class and its subclasses.

TO:

Scope Note: This class comprises values of primitive data types of programming languages or database management systems and data types composed of such values used as documentation elements, as well as their mathematical abstractions.

They are not considered as elements of the universe of discourse this model aims at defining and analysing. Rather, they play the role of a symbolic interface between the scope of this model and the world of mathematical and computational manipulations and the symbolic objects they define and handle.

In particular they comprise lexical forms encoded as "strings" or series of characters and symbols based on encoding schemes (characterised by being a limited subset of the respective mathematical abstractions) such as UNICODE and values of datatypes that can be encoded in a lexical form, including quantitative specifications of time-spans and geometry. They have in common that instances of E59 Primitive Value define themselves by virtue of their encoded value, regardless the nature of their mathematical abstractions.

Therefore they must not be represented in an implementation by a universal identifier associated with a content model of different identity. In a concrete application, it is recommended that the primitive value system from a chosen implementation platform and/or data definition language be used to substitute for this class and its subclasses.

E91 Co-Reference Assignment

In 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig reviewing the ISSUE 230, the sig decided to withdraw the Entity E91 from the version 6.1 of CIDOC-CRM as well as its properties

P153 assigned co-reference to (was regarded to co-refer by)
P154 assigned non co-reference to (was regarded not to co-refer by)
P155 has co-reference target (is co-reference target of)

P158 occupied, P159 occupied

In 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig reviewing the ISSUE 230, the sig decided to withdraw the properties P158, P159 from the version 6.1 of CIDOC-CRM. This was an outcome of the ISSUE 234

P152 has parent

In 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig reviewing the ISSUE 199 added the following examples .

- Gaius Octavius (E29) *has parent* Julius Caesar (E29)
- Steve Jobs (E29) *has parent* Joanne Simpson (biological mother)(E29)
- Steve Jobs (E29) *has parent* Clara Jobs (adoption mother) (E29)

P165 incorporates (is incorporated in)

In the 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig reviewing the scope note of P165 and we added the following examples.

FROM

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.

TO

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.
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)

P72 has language (is language of)

In the 32nd CIDOC SIG and the 25th FRBR-CIDOC CRM Harmonization meeting, the crm-sig resolving the issue 258, the quantification changed

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

To:

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

Amendments 6.2

E4 Period

In 33rd CRM-SIG meeting the group discussed the issue 234, 235 and 263 and changed the subclass, the scope note, the representation in First Order Logic and the properties of E4

From:

Subclass of: E2 Temporal Entity
Superclass of: E5 Event

This class comprises sets of coherent phenomena or cultural manifestations bounded in time and space.

It is the social or physical coherence of these phenomena that identify an E4 Period and not the associated spatiotemporal bounds. These bounds are a mere approximation of the actual process of growth, spread and retreat. Consequently, different periods can overlap and coexist in time and space, such as when a nomadic culture exists in the same area as a sedentary culture.
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, the open spaces via which they 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, such as the air in a meeting room transferring the voices. 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. In these cases, the trajectories necessary for participants to travel between these areas are not regarded as part of the spatiotemporal extent. Consequently, instances of E4 Period may occupy each a limited number of disjoint spacetime volumes, however there must not be a discontinuity in the total timespan covered by these spacetime volumes.

Typically 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. Geopolitical units may be distributed over disconnected areas, such as islands or colonies. In such cases, the spatiotemporal extent is composed of more than one spacetime volume. One may 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. Nevertheless, an instance of E4 Period must be contiguous in time. I.e., if it has ended in all areas, it has ended as a whole, but it may involve one area after another, such as the Polynesian migration, as long as it is ongoing at least in one area.

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.

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 E4 Period, and the second defines morphological object types that fall under E55 Type.

Another specific case of an E4 Period is the set of activities and phenomena associated with a settlement, such as the populated period of Nineveh.

In First Order Logic: $E4(x) \supset E2(x)$

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
P10 falls within (contains): E4 Period
P132 overlaps with: E4 Period
P133 is separated from: E4 Period

To:

Subclass of: E2 Temporal Entity
Subclass of E92 Spacetime volume
Superclass of: E5 Event

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 space-time 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.

Another specific case of an E4 Period is the set of activities and phenomena associated with a settlement, such as the populated period of Nineveh..

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

E18 Physical Thing

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed the subclasses, the scope note, the representation in First Order Logic and the properties.

From:

Subclass of: E72 Legal Object
Superclass of: E19 Physical Object
E24 Physical Man-Made Thing
E26 Physical Feature

Scope Note: This class comprises all persistent physical items with a relatively stable form, man-made or natural.

Depending on the existence of natural boundaries of such things, the CRM distinguishes the instances of E19 Physical Object from instances of E26 Physical Feature, such as holes, rivers, pieces of land etc. Most instances of E19 Physical Object can be moved (if not too heavy), whereas features are integral to the surrounding matter.

The CRM is generally not concerned with amounts of matter in fluid or gaseous states.

Examples:

- the Cullinan Diamond (E19)
- the cave "Ideon Andron" in Crete (E26)
- the Mona Lisa (E22)

In First Order Logic: $E18(x) \supset E72(x)$
Properties:
P44 has condition (is condition of): E3 Condition State
P45 consists of (is incorporated in): E57 Material
P46 is composed of (forms part of): E18 Physical Thing
P49 has former or current keeper (is former or current keeper of): E39 Actor
P50 has current keeper (is current keeper of): E39 Actor
P51 has former or current owner (is former or current owner of): E39 Actor
P52 has current owner (is current owner of): E39 Actor
P53 has former or current location (is former or current location of): E53 Place
P58 has section definition (defines section): E46 Section Definition

P59 has section (is located on or within): E53 Place
P128 carries (is carried by): E90 Symbolic Object
P156 occupies: E53 Place
~~P159 occupied: E92 Spacetime Volume~~

To:

Subclass of: E72 Legal Object
E92 Spacetime Volume

Superclass of: E19 Physical Object
E24 Physical Man-Made Thing
E26 Physical Feature

Scope Note: This class comprises all persistent physical items with a relatively stable form, man-made or natural.

Depending on the existence of natural boundaries of such things, the CRM distinguishes the instances of E19 Physical Object from instances of E26 Physical Feature, such as holes, rivers, pieces of land etc. Most instances of E19 Physical Object can be moved (if not too heavy), whereas features are integral to the surrounding matter.

An instance of E18 Physical Thing occupies not only a particular geometric space, but in the course of its existence it also forms a trajectory through spacetime, which occupies a real, that is phenomenal, volume in spacetime. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces, such as the interior of a box. Physical things consisting of aggregations of physically unconnected objects, such as a set of chessmen, occupy a number of individually contiguous spacetime volumes equal to the number of unconnected objects that constitute the set.

We model E18 Physical Thing to be a subclass of E72 Legal Object 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 E18 Physical Thing 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 E18 Physical Thing is matter while a spacetime volume is an aggregation of points in spacetime. However, the real spatiotemporal extent of an instance of E18 Physical Thing 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 E18 Physical Thing. Therefore this multiple inheritance is unambiguous and effective and furthermore corresponds to the intuitions of natural language.

The CIDOC CRM is generally not concerned with amounts of matter in fluid or gaseous states.

Examples:

- the Cullinan Diamond (E19)
- the cave “Ideon Andron” in Crete (E26)
- the Mona Lisa (E22)

In First Order Logic: $E18(x) \supset E72(x)$
$E18(x) \supset E92(x)$

Properties:

P44 has condition (is condition of): E3 Condition State
P45 consists of (is incorporated in): E57 Material
P46 is composed of (forms part of): E18 Physical Thing
P49 has former or current keeper (is former or current keeper of): E39 Actor
P50 has current keeper (is current keeper of): E39 Actor
P51 has former or current owner (is former or current owner of): E39 Actor
P52 has current owner (is current owner of): E39 Actor
P53 has former or current location (is former or current location of): E53 Place
P58 has section definition (defines section): E46 Section Definition
P59 has section (is located on or within): E53 Place
P128 carries (is carried by): E90 Symbolic Object

P156 occupies (is occupied by): E53 Place

E53 Place

In 33rd CRM-SIG meeting the group the crm-sig, resolving the issue 275, added a new property about space primitive to the class E53 Place, the property P168 place is defined by (defines place). The properties of E53 Place changed

From:

Properties:

P87 is identified by (identifies): E44 Place Appellation
P89 falls within (contains): E53 Place
P121 overlaps with: E53 Place
P122 borders with: E53 Place
P157 is at rest relative to (provides reference space for): E18 Physical Thing

To:

Properties:

P87 is identified by (identifies): E44 Place Appellation
P89 falls within (contains): E53 Place
P121 overlaps with: E53 Place
P122 borders with: E53 Place
P157 is at rest relative to (provides reference space for): E18 Physical Thing
P168 place is defined by (defines place) : E94 Space Primitive

E66 Formation

In 33rd CRM-SIG meeting the group discussed about shortcut of P107 and changed the scope note of E66

From:

…..
The formation of an instance of E74 Group does not mean that the group is populated with members at the time of formation.

To:

….
The formation of an instance of E74 Group does not require that the group is populated with members at the time of formation. In order to express the joining of members at the time of formation, the respective activity should be simultaneously an instance of both E66 Formation and E85 Joining.
.

E85 Joining, E86 Leaving

In 33rd CRM-SIG meeting the group, resolving the issue 276 about Formalization of shortcuts, added at the end of the first paragraph of the scope note of the above classes the following sentence:

"It may be the initiative of a third party."

E92 Spacetime Volume

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263, and updated the subclasses of E92 and changed the properties.

From:

Superclass of:

Properties:

P160 has temporal projection: E52 Time-Span

P161 has spatial projection: E53 Place

To:

Superclass of: E93 Presence
E4 Period
E18 Physical Thing

Properties:

P10 falls within (contains): E92 Spacetime Volume
P132 overlaps with: E92 Spacetime Volume
P133 is separated from: E92 Spacetime Volume
P160 has temporal projection: E52 Time-Span
P161 has spatial projection: E53 Place

E93 Spacetime Snapshot

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed the name and properties.

From:

E93 Spacetime Snapshot
Subclass of: E92 Spacetime Volume

Scope note: This class comprises instances of E92 Spacetime Volume that result from intersection of instances of E92 Spacetime Volume with an instance of E52 Time-Span. The identity of an instance of this class is determined by the identities of the constituing spacetime volume and the time-span.

This class can be used to define temporal snapshots at a particular time-span, such as the extent of the Roman Empire at 33 B.C., or the extent occupied by a museum object at rest in an exhibit. In particular, it can be used to define the spatial projection of a spacetime volume during a particular time-span, such as the maximal spatial extent of a flood at some particular hour, or all areas covered by the Poland within the 20th century AD

In First Order Logic: E93(x) ⊃ E92(x)

Properties:

P164 is restricted by: E52 Time Span

To:

E93 Presence

Subclass of: E92 Spacetime Volume

Scope note: This class comprises instances of E92 Spacetime Volume that result from intersection of instances of E92 Spacetime Volume with an instance of E52 Time-Span. The identity of an instance of this class is determined by the identities of the constituing spacetime volume and the time-span.

This class can be used to define temporal snapshots at a particular time-span, such as the extent of the Roman Empire at 33 B.C., or the extent occupied by a museum object at rest in an exhibit. In particular, it can be used to define the spatial projection of a spacetime volume during a particular time-span, such as the maximal spatial extent of a flood at some particular hour, or all areas covered by the Poland within the 20th century AD

In First Order Logic: E93(x) ⊃ E92(x)

Properties:

P164 during (was time-span of): E52 Time Span
P166 was a presence of (had presence): E92 Space Time Volume
P167 was at (was place of): E53 Place

E94 Space Primitive

In 33rd CRM-SIG meeting the group the crm-sig, resolving the issue 275, added a new class about space primitive

Subclass of: E59 Primitive Value

Scope Note: This class comprises instances of E59 Primitive Value for space that should be implemented with appropriate validation, precision and references to spatial coordinate systems to express geometries on or relative to earth, or any other stable constellations of matter, relevant to cultural and scientific documentation.
An E94 Space Primitive defines an E53 Place in the sense of a declarative place as elaborated in CRMgeo (Doerr and Hiebel 2013), which means that the identity of the place is derived from its geometric definition. This declarative place allows for the application of all place properties to relate phenomenal places to their approximations expressed with geometries.
Instances of E94 Space Primitive provide the ability to link CRM encoded data to the kinds of geometries used in maps or Geoinformation systems. They may be used for visualisation of the instances of E53 Place they define, in their geographic context and for computing topological relations between places based on these geometries.
E94 Space Primitive is not further elaborated upon within this model. Statement of compatibility with OPENGIS

Examples:

- Coordinate Information in GML like <gml:Point gml:id="p21" srsName="http://www.opengis.net/def/crs/EPSG/0/4326"> <gml:coordinates>45.67, 88.56</gml:coordinates> </gml:Point>
- Coordinate Information in lat, long 48,2 13,3
- Well Known Text like `POLYGON ((30 10, 40 40, 20 40, 10 20, 30 10))`

In First Order Logic: E94(x) ⊃ E59(x)

P7 took place at (witnessed)

In 33rd CRM-SIG meeting the group discussed the issue 234, 235 and 263 and changed the superproperties, the scope note of P7.

From:

Domain: E4 Period
Range: E53 Place
Superproperty of: E9 Move. P26 moved to (was destination of): E53 Place
E9 Move. P27 moved from (was origin of): E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property describes the spatial location of an instance of E4 Period.

The related E53 Place should be seen as an approximation of the geographical area within which the phenomena that characterise the period in question occurred. *P7took place at (witnessed)* does not convey any meaning other than spatial positioning (generally on the surface of the earth). For example, the period "Révolution française" can be said to have taken place in "France", the "Victorian" period, may be said to have taken place in "Britain" and its colonies, as well as other parts of Europe and north America.
A period can take place at multiple locations.

Examples:

- the period "Révolution française" (E4) *took place at* France (E53)

In First Order Logic: P7(x,y) ⊃ E4(x)
P7(x,y) ⊃ E53(y)

To:

Domain: E4 Period
Range: E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property describes the spatial location of an instance of E4 Period.

The related E53 Place should be seen as an approximation of the geographical area within which the phenomena that characterise the period in question occurred. *P7took place at (witnessed)* does not convey any meaning other than spatial positioning (generally on the surface of the earth). For example, the period "Révolution française" can be said to have taken place in "France", the "Victorian" period, may be said to have taken place in "Britain" and its colonies, as well as other parts of Europe and north America.
A period can take place at multiple locations.
It is a shortcut of the more fully developed path from E4 Period through *P161 has spatial projection*, E53 Place, *P89 falls within (contains)* to E53 Place. Describe in words.

Examples:

- the period "Révolution française" (E4) *took place at* France (E53)

In First Order Logic: P7(x,y) ⊃ E4(x)
P7(x,y) ⊃ E53(y)

P8 took place on or within (witnessed)

In 33rd CRM-SIG meeting the group discussed about shortcut formalization in first order logic(issue 276), and changed the scope note

From:

This property describes the location of an instance of E4 Period with respect to an E19 Physical Object.
P8 took place on or within (witnessed) is a short-cut of a path defining a E53 Place with respect to the geometry of an object. cf. E46 Section Definition.

This property is in effect a special case of P7 took place at. It describes a period that can be located with respect to the space defined by an E19 Physical Object such as a ship or a building. The precise geographical location of the object during the period in question may be unknown or unimportant.
For example, the French and German armistice of 22 June 1940 was signed in the same railway carriage as the armistice of 11 November 1918.

To:

This property describes the location of an instance of E4 Period with respect to an E19 Physical Object.
P8 took place on or within (witnessed) is a shortcut of the more fully developed path from E4 Period through P7 took place at, E53 Place, P156 occupies (is occupied by) to E18 Physical Thing.

It describes a period that can be located with respect to the space defined by an E19 Physical Object such as a ship or a building. The precise geographical location of the object during the period in question may be unknown or unimportant.
For example, the French and German armistice of 22 June 1940 was signed in the same railway carriage as the armistice of 11 November 1918.

P9 consists of (forms part of)

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed the scope note and updated the subproperty notation

From

Domain: E4 Period
Range: E4 Period

Subproperty of: E4 Period. P10i contains: E4 Period

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

Scope note: This property associates an instance of E4 Period with another instance of E4 Period that falls within the spacetime volumes occupied by the former and which is defined by phenomena that form part of or are refinements of the phenomena that define the former.

Examples:

- Cretan Bronze Age (E4) *consists of* Middle Minoan (E4)

In First Order Logic: P9(x,y) ⊃ E4(x)
P9(x,y) ⊃ E4(y)
P9(x,y) ⊃ P10(y,x)

To

Domain: E4 Period
Range: E4 Period
Subproperty of: E92 Spacetime Volume. P10i contains: E92 Spacetime Volume

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

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.

P10 falls within (contains)

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed the domain, range, scope note and In First Order Logic representation.

From:

Domain: E4 Period
Range: E4 Period
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 falls within the spacetime volumes occupied by the latter.

The difference with *P9 consists of (forms part of)* is subtle. Unlike *P9 consists of (forms part of)*, *P10 falls within (contains)* does not imply any logical connection between the two periods and it may refer to a period of a completely different nature.

Examples:

- the Great Plague (E4) *falls within* The Gothic period (E4)

In First Order Logic: P10(x,y) ⊃ E4(x)
P10(x,y) ⊃ E4(y)

To:

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume

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

Scope note: This property associates an instance of E92 Spacetime Volume with another instance of E92 Spacetime Volume that falls within the latter. In other words, all points in the former are also points in the latter.

Examples:

- the Great Plague (E4) *falls within* The Gothic period (E4)

In First Order Logic: P10(x,y) ⊃ E92(x)
P10(x,y) ⊃ E92(y)

P25 moved (moved by)

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed the scope note.

From:

Scope note: This property identifies the E19 Physical Object that is moved during a move event.

The property implies the object's passive participation. For example, Monet's painting "Impression sunrise" was moved for the first Impressionist exhibition in 1874.
In reality, a move must concern at least one object.

To:

Scope note: This property identifies an instance of E19 Physical Object that was moved by a move event. A move must concern at least one object.

The property implies the object's passive participation. For example, Monet's painting "Impression sunrise" was moved for the first Impressionist exhibition in 1874.

P26 moved to (was destination of)

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed subproperty, scope note and the representation in First Order Logic

From:

Domain: E9 Move
Range: E53 Place
Subproperty of: E4 Period. P7 took place at (witnessed): E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the destination of a E9 Move.

A move will be linked to a destination, such as the move of an artefact from storage to display. A move may be linked to many terminal instances of E53 Places. In this case the move describes a distribution of a set of objects. The area of the move includes the origin, route and destination.

Examples:

- the movement of the Tut-Ankh-Amun Exhibition (E9) *moved to* The British Museum (E53)

In First Order Logic: P26(x,y) ⊃ E9(x)
P26(x,y) ⊃ E53(y)
P26(x,y) ⊃ P7(x,y)

To:

Domain: E9 Move
Range: E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies a destination of a E9 Move.

A move will be linked to a destination, such as the move of an artefact from storage to display. A move may be linked to many terminal instances of E53 Place by multiple instances of this property. In this case the move describes a distribution of a set of objects. The area of the move includes the origin(s), route and destination(s).

Therefore the described destination is an instance of E53 Place which *P89 falls within (contains)* the instance of E53 Place the move *P7 took place at.*

Examples:

- the movement of the Tut-Ankh-Amun Exhibition (E9) *moved to* The British Museum (E53)

In First Order Logic:

P26(x,y) ⊃ E9(x)
P26(x,y) ⊃ E53(y)
P26(x,y) ⊃ (∃z)[E53(z) ∧ P7(x,z) ∧ P89(y,z)]

P27 moved from (was origin of)

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed, the subproperty, scope note and the representation in First Order Logic

From:

Domain: E9 Move
Range: E53 Place
Subproperty of: E4 Period. P7 took place at (witnessed): E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies the starting E53 Place of an E9 Move.

A move will be linked to an origin, such as the move of an artefact from storage to display. A move may be linked to many origins. In this case the move describes the picking up of a set of objects. The area of the move includes the origin, route and destination.

-

In First Order Logic: P27(x,y) ⊃ E9(x)
P27(x,y) ⊃ E53(y)
P27(x,y) ⊃ P7(x,y)

To:

Domain: E9 Move
Range: E53 Place
Quantification: many to many, necessary (1,n:0,n)

Scope note: This property identifies a starting E53 Place of an E9 Move.

A move will be linked to an origin, such as the move of an artefact from storage to display. A move may be linked to many starting instances of E53 Place by multiple instances of this property. In this case the move describes the picking up of a set of objects. The area of the move includes the origin(s), route and destination(s).
Therefore the described origin is an instance of E53 Place which *P89 falls within (contains)* the instance of E53 Place the move *P7 took place at.*

In First Order Logic:

P27(x,y) ⊃ E9(x)
P27(x,y) ⊃ E53(y)
P27(x,y) ⊃ (∃z)[E53(z) ∧ P7(x,z) ∧ P89(y,z)]

P46 is composed of (forms part of)

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and made changes to subproperty section, to the scope note and to the representation in First Order Logic.

From:

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 allows instances of E18 Physical Thing to be analysed into component elements.

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 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 Materials of which an item of E18 Physical Thing is composed should be documented using *P45 consists of (is incorporated in)*.

In First Order Logic: $P46(x,y) \supset E18(x)$
$P46(x,y) \supset E18(y)$

To:

Domain: E18 Physical Thing
Range: E18 Physical Thing
Subproperty of: E92 Spacetime Volume. P132 overlaps with: E92 Spacetime Volume
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 allows instances of E18 Physical Thing to be analysed into component elements.

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 item of E18 Physical Thing is composed should be documented using *P45 consists of (is incorporated in)*.

In First Order Logic: $P46(x,y) \supset E18(x)$
$P46(x,y) \supset E18(y)$
$P46(x,y) \supset P132(x,y)$
$P46(x,y) \supset (\exists uzw)[E93(u) \wedge P166(x,u) \wedge E52(z) \wedge P164(u,z) \wedge E93(w) \wedge P166(y,w) \wedge P164(w,z) \wedge P10(w,u)]$

P62 depicts (is depicted by)

In 33rd CRM-SIG meeting the group discussed about Issue 276, shortcut formalization in first order logic and changed the scope note

From:

Scope note: This property identifies something that is depicted by an instance of E24 Physical Man-Made Thing.

This property is a shortcut of the more fully developed path from E24 Physical Man-Made Thing through *P65 shows visual item (is shown by)*, E36 Visual Item, *P138 represents (has representation)* to E1CRM Entity. P62.1 mode of depiction allows the nature of the depiction to be refined.

To:

Scope note: This property identifies something that is depicted by an instance of E24 Physical Man-Made Thing. Depicting is meant in the sense that the surface of the E24 Physical Man-Made Thing shows, through its passive optical qualities or form, a representation of the entity depicted. It does not pertain to inscriptions or any other information encoding.

This property is a shortcut of the more fully developed path from E24 Physical Man-Made Thing through *P65 shows visual item (is shown by)*, E36 Visual Item, *P138 represents (has representation)* to E1 CRM Entity. P62.1 mode of depiction allows the nature of the depiction to be refined.

P109 has current or former curator (is current or former curator of)

In 33rd CRM-SIG meeting the group discussed about shortcut formalization in first order logic(issue 276), and changed the scope note.

From:

This property identifies the E39 Actor or Actors who assume or have assumed overall curatorial responsibility for an E78 Collection.
This property is effectively a short-cut. It does not allow a history of curation to be recorded. This would require use of an Event assigning responsibility for a Collection to a curator.

To:

This property identifies the E39 Actor or Actors who assume or have assumed overall curatorial responsibility for an E78 Collection.

It does not allow a history of curation to be recorded. This would require use of an Event initiating a curator being responsible for a Collection.

P132 overlaps with

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263, and updated the domain, range and the representation in First Order Logic of this property

From:

Domain: E4 Period
Range: E4 Period

In First Order Logic: P132(x,y) ⊃ E4(x)
P132(x,y) ⊃ E4(y)
P132(x,y) ⊃ P132(y,x)

To:

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Superproperty of: E18 Physical Thing. P46 is composed of (forms part of):E18 Physical Thing

In First Order Logic:
P132(x,y) ⊃ E92(x)
P132(x,y) ⊃ E92(y)
P132(x,y) ⊃ P132(y,x)

P133 is separated from

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263, and updated the domain, range and the representation in First Order Logic of this property

From:

Domain: E4 Period
Range: E4 Period

In First Order Logic: P133(x,y) ⊃ E4(x)
P133(x,y) ⊃ E4(y)
P133(x,y) ⊃ P133(y,x)

To:

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume

In First Order Logic:
P133(x,y) ⊃ E92(x)
P133(x,y) ⊃ E92(y)
P133(x,y) ⊃ P133(y,x)

P156 occupies

In 33rd CRM-SIG meeting the group discussed the issue 234, 235 and 263 and changed the name, the subproperty, the scope note, and the representation in First Order Logic of P156

From:

P156 occupies

Domain: E18 Physical Thing
Range: E53 Place
Quantification: one to one (0,1:1,1)

Scope note: This property describes the maximal real volume in space that an instance of E18 Physical Thing has occupied during its lifetime with respect to a reference space relative to which the thing is at rest. In other words, it is the volume that contains all the points which the thing has covered at some time during its existence. In the case of an E26 Physical Feature the default reference space is the one in which the object that bears the feature or at least the surrounding matter of the feature is at rest. In this case there is a 1:1 relation of E26 Feature and E53 Place. For simplicity of implementation multiple inheritance (E26 Feature IsA E53 Place) may be a practical approach.

For instances of E19 Physical Objects the default reference space is the one which is at rest to the object itself, i.e. which moves together with the object. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

This property is a shortcut of the fully developed path from '*E18 Physical Thing' through '~~P159 occupied~~', 'E92 Spacetime Volume', 'P161 has spatial projection' to 'E53 Place'.* For some instances of E18 Physical Object the relative stability of form may not be sufficient to define a useful local

reference space, for instance for an amoeba. In such cases the fully developed path to an external reference space and using a temporal validity component may be adequate to determine the place they have occupied.

In contrast to P156 occupies, the property P53 has former or current location identifies an instance of E53 Place at which a thing is or has been for some unspecified time span. Further it does not constrain this reference space of the referred instance of P53 Place.

In First Order Logic: P156 (x,y) ⊃ E18(x)
P156 (x,y)⊃ E53(y)

To:

P156 occupies (is occupied by)

Domain: E18 Physical Thing
Range: E53 Place
Subproperty of: E92 Spacetime Volume. P161 has spatial projection: E53 Place

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

Scope note: This property describes the largest volume in space that an instance of E18 Physical Thing has occupied at any time during its existence, with respect to the reference space relative to itself. This allows you to describe the thing itself as a place that may contain other things, such as a box that may contain coins. In other words, it is the volume that contains all the points which the thing has covered at some time during its existence. In the case of an E26 Physical Feature the default reference space is the one in which the object that bears the feature or at least the surrounding matter of the feature is at rest. In this case there is a 1:1 relation of E26 Feature and E53 Place. For simplicity of implementation multiple inheritance (E26 Feature IsA E53 Place) may be a practical approach.

For instances of E19 Physical Objects the default reference space is the one which is at rest to the object itself, i.e. which moves together with the object. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

This property is a subproperty of P161 has spatial projection because it refers to its own domain as reference space for its range, whereas P161 has spatial projection may refer to a place in terms of any reference space. For some instances of E18 Physical Object the relative stability of form may not be sufficient to define a useful local reference space, for instance for an amoeba. In such cases the fully developed path to an external reference space and using a temporal validity component may be adequate to determine the place they have occupied.

In contrast to P156 occupies, the property P53 has former or current location identifies an instance of E53 Place at which a thing is or has been for some unspecified time span. Further it does not constrain the reference space of the referred instance of P53 Place.

In First Order Logic: P156 (x,y) = [E18(x) ∧ E53(y) ∧ P161(x,y) ∧ P157(y,x)]

P160 has temporal projection

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed the name and the scope note

P160 has temporal projection

From:

Scope note: This property describes the temporal projection of an instance of an E92 Spacetime Volume. The property P4 has time-span is a shortcut of the more fully developed path from E4 Period through ~~P158~~

~~occupied~~, E92 Spacetime Volume P160 has temporal projection to E52 Time Span.

To:

P160 has temporal projection(is temporal projection of)

Scope note: This property describes the temporal projection of an instance of an E92 Spacetime Volume. The property P4 has time-span is the same as P160 has temporal projection if it is used to document an instance of E4 Period or any subclass of it.

P161 has spatial projection

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed the name , the subproperty and the scope note

From:

P161 has spatial projection

Superpoperty of:

Scope note: This property associates an instance of a E92 Spacetime Volume with an instance of E53 Place that is the result of the spatial projection of the instance of a E92 Spacetime Volume on a reference space. In general there can be more than one useful reference space to describe the spatial projection of a spacetime volume, such as that of a battle ship versus that of the seafloor. Therefore the projection is not unique.
The property P7 took place at is a shortcut of the more fully developed path from *E4 Period through ~~P158 occupied~~, E92 Spacetime Volume P161 has spatial projection to E53 Place*.

In First Order Logic: P161(x,y) ⊃ E92(x)
P161(x,y) ⊃ E53(y)

To:

P161 has spatial projection(is spatial projection of)

Superproperty of: E18 Physical Thing. P156 occupies (is occupied by): E53 Place

Scope note: This property associates an instance of a E92 Spacetime Volume with an instance of E53 Place that is the result of the spatial projection of the instance of a E92 Spacetime Volume on a reference space. In general there can be more than one useful reference space to describe the spatial projection of a spacetime volume, such as that of a battle ship versus that of the seafloor. Therefore the projection is not unique.
This is part of the fully developed path that is shortcut by *P7took place at (witnessed)*.The more fully developed path from E4 Period through *P161 has spatial projection*, E53 Place, *P89 falls within (contains)* to E53 Place.

P164 is restricted by

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and changed the name, the scope note and the properties.

From:

P164 is restricted by

Domain: E93 Spacetime Snapshot
Range: E52 Time-Span
Quantification: two to many, necessary (2,n:0,n)

Scope note: This property relates an E93 Spacetime Snapshot with an arbitrary E52 Time-Span that restricts the extent of the former to a volume within these time limits.

In First Order Logic: P164 (x,y) ⊃ E93(x)
P164 (x,y) ⊃ E52(y)

To:

P164 during (was time-span of)
Domain: E93 Presence
Range: E52 Time-Span
Quantification:
Scope note: This property relates an E93 Presence with an arbitrary E52 Time-Span that defines the section of the spacetime volume that this instance of E93 Presence is related to by *P166 was a presence of (had presence).* that is concerned by this instance of E93 Presence.
Examples:

In First Order Logic: P164 (x,y) ⊃ E93(x)
P164 (x,y) ⊃ E52(y)

P166 was a presence of (had presence)

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and added this new property

Domain: E93 Presence
Range: E92 Space Time Volume
Quantification:
Scope note: This property relates an E93 Presence with the STV it is part of…

P167 was at (was place of)

In 33rd CRM-SIG meeting the group the crm-sig discussed about the issues 234, 235,263 and added this new property

Domain: E93 Presence
Range: E53 Place
Quantification:
Scope note: This property points to a wider area in which my thing /event was…

P168 place is defined by (defines place)

In 33rd CRM-SIG meeting the group the crm-sig, resolving the issue 275, added a new property about space primitive to the class E53 Place

Domain: E53 Place
Range: E94 Space Primitive
Quantification: (0,n:1,1)

Scope note: This property associates an instance of E53 Place with an instance of E94 Space Primitive that defines it. Syntactic variants or use of different scripts may result in multiple instances of E94 Space Primitive defining exactly the same place. Transformations between different reference systems in general result in new definitions of places approximating each other and not in alternative definitions. Note that it is possible for a place to be defined by phenomena causal to it or other forms of identification rather than by an instance of E94 Space Primitive. In this case, this property must not be used for approximating the respective instance of E53 Place with an instance of E94 Space Primitive.

Proofreading:

The In First Order Logic statements are corrected in E1, E59, P101,P103,P104, P123,P124
The expression "In First Order Logic" is substituted by " In First Order Logic"
The notation of quantification of P43 has been corrected from (0,n:1.1) to (0,n:1,1)
The notation of quantification of P156 occupies(is occupied by) has been corrected
From: Quantification: one to one (0,1:1,1)
To: Quantification: one to one (1,1:1,1)
In the scope note of P130 the word "shortcut" is substituted by "short-cut"
The CIDOC CRM Class Hierarchy on page xxi is updated
CIDOC CRM Property Hierarchy on page xxv is updated

Amendments 6.2.1

The scope note of P49

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 276** the scope note of P49 has been changed.

FROM

This property identifies the E39 Actor or Actors who have or have had custody of an instance of E18 Physical Thing at some time.

The distinction with *P50 has current keeper (is current keeper of)* is that *P49 has former or current keeper (is former or current keeper of)* leaves open the question as to whether the specified keepers are current.

P49 has former or current keeper (is former or current keeper of) is a shortcut for the more detailed path from E18 Physical Thing through *P30 transferred custody of (custody transferred through)*, E10 Transfer of Custody, *P28 custody surrendered by (surrendered custody through)* or *P29 custody received by (received custody through)* to E39 Actor.

TO

This property identifies the E39 Actor or Actors who have or have had custody of an instance of E18 Physical Thing at some time. This property leaves open the question if parts of this physical thing have been added or removed during the time-spans it has been under the custody of this actor, but it is required that at least a part which can unambiguously be identified as representing the whole has been under this custody for its whole time. The way, in which a representative part is defined, should ensure that it is unambiguous who keeps a part and who the whole and should be consistent with the identity criteria of the kept instance of E18 Physical Thing.

The distinction with *P50 has current keeper (is current keeper of)* is that *P49 has former or current keeper (is former or current keeper of)* leaves open the question as to whether the specified keepers are current.

P49 has former or current keeper (is former or current keeper of) is a shortcut for the more detailed path from E18 Physical Thing through *P30 transferred custody of (custody transferred through)*, E10 Transfer of Custody, *P28 custody surrendered by (surrendered custody through)* or *P29 custody received by (received custody through)* to E39 Actor.

The scope note of E10

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 276** the scope note of E10 has been changed.

FROM

Scope note: This class comprises transfers of physical custody of objects between instances of E39 Actor.

The recording of the donor and/or recipient is optional. It is possible that in an instance of E10 Transfer of Custody there is either no donor or no recipient. Depending on the circumstances it may describe:

6. the beginning of custody
7. the end of custody
8. the transfer of custody
9. the receipt of custody from an unknown source
10. the declared loss of an object

The distinction between the legal responsibility for custody and the actual physical possession of the object should be expressed using the property *P2 has type (is type of)*. A specific case of transfer of custody is theft.

The interpretation of the museum notion of "accession" differs between institutions. The CRM therefore models legal ownership and physical custody separately. Institutions will then model their specific notions of accession and deaccession as combinations of these.

TO:

Scope note: This class comprises transfers of physical custody of objects between instances of E39 Actor.

The recording of the donor and/or recipient is optional. It is possible that in an instance of E10 Transfer of Custody there is either no donor or no recipient. Depending on the circumstances it may describe:

11. the beginning of custody
12. the end of custody
13. the transfer of custody
14. the receipt of custody from an unknown source
15. the declared loss of an object

The distinction between the legal responsibility for custody and the actual physical possession of the object should be expressed using the property *P2 has type (is type of)*. A specific case of transfer of custody is theft. The sense of physical possession requires that the object of custody is in the hands of the keeper at least with a part representative for the whole. The way, in which a representative part is defined, should ensure that it is unambiguous who keeps a part and who the whole and should be consistent with the identity criteria of the kept instance of E18 Physical Thing. For instance, in the case of a set of cutlery we may require the majority of pieces having been in the hands of the actor regardless which individual pieces are kept over time.

The interpretation of the museum notion of "accession" differs between institutions. The CRM therefore models legal ownership and physical custody separately. Institutions will then model their specific notions of accession and deaccession as combinations of these.

P130 shows features of (features are also found on)

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 276.** The scope note revised

FROM

Domain: E70 Thing
Range: E70 Thing
Superproperty of: E33 Linguistic Object. P73i has translation (is translation of): E33 Linguistic Object
E18 Physical Thing. P128 carries (is carried by): E90 Symbolic Object
Quantification: many to many (0,n:0,n)

Scope note: This property generalises the notions of "copy of" and "similar to" into a dynamic, asymmetric relationship, where the domain expresses the derivative, if such a direction can be established.

Otherwise, the relationship is symmetric. It is a shortcut of *P15 was influenced by (influenced)* in a creation or production, if such a reason for the similarity can be verified. Moreover it expresses similarity in cases that can be stated between two objects only, without historical knowledge about its reasons.

Examples:

- the Parthenon Frieze on the Acropolis in Athens (E22) *shows features of* the Original Parthenon Frieze in the British museum (E22). *Kind of similarity*: Copy (E55)

In First Order Logic:

P130 (x,y) ⊃ E70(x)
P130 (x,y) ⊃ E70(y)
P130(x,y,z) ⊃ [P130(x,y) ∧ E55(z)]
P130(x,y) ⊃ P130(y,x)

Properties: P130.1 kind of similarity: E55 Type

TO

Domain: E70 Thing
Range: E70 Thing
Superproperty of: E33 Linguistic Object. P73i has translation (is translation of): E33 Linguistic Object inverse subproperty!
E18 Physical Thing. P128 carries (is carried by): E90 Symbolic Object
Quantification: many to many (0,n:0,n)

Scope note: This property generalises the notions of "copy of" and "similar to" into a directed relationship, where the domain expresses the derivative, if such a direction can be established.
Otherwise, the relationship is symmetric. If the reason for similarity is a sort of derivation process, i.e., that the creator has used or had in mind the form of a particular thing during the creation or production, this process should be explicitly modelled. Moreover it expresses similarity in cases that can be stated between two objects only, without historical knowledge about its reasons.

Examples:

- the Parthenon Frieze on the Acropolis in Athens (E22) *shows features of* the Original Parthenon Frieze in the British museum (E22). *Kind of similarity*: Copy (E55)

In First Order Logic:

P130 (x,y) ⊃ E70(x)
P130 (x,y) ⊃ E70(y)
P130(x,y,z) ⊃ [P130(x,y) ∧ E55(z)]
P130(x,y) ⊃ P130(y,x)

Transitive properties

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 281** the following sentence has been added to the end of the scope note all explicit transitive properties which are P5,P9,P10,P69,P73, P86,P89,P106, P114,P115,P116,P117,P120,P127, P148
"This property is transitive"
In implicit transitive property P165, at the end of the scope note has been added the sentence : "This property in an implicit transitive property"
(For all transitive, we should state that the property is transitive. For the exception (P165) should state "when this property is restricted to domain and range of information object THEN it IS transtive."

Comment [GB7]: To add to scope note – FORTH (recommendation CEO)

P132 overlaps with

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 234,** the scope note of P132 has been revised:

FROM:

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Superproperty of: E18 Physical Thing. P46 is composed of (forms part of):E18 Physical Thing

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

Scope note: This symmetric property allows instances of E4 Period that overlap both temporally and spatially to be related, i,e. they share some spatio-temporal extent.

This property does not imply any ordering or sequence between the two periods, either spatial or temporal.

Examples:

- the "Urnfield" period (E4*) overlaps with* the "Hallstatt" period (E4)

TO:

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Superproperty of: E18 Physical Thing. P46 is composed of (forms part of): E18 Physical Thing

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

Scope note: This symmetric property associates two instances of E92 Spacetime Volume that have some of their extent in common.

Examples:

- the "Urnfield" period (E4*) overlaps with* the "Hallstatt" period (E4)

P150 defines typical parts of (defines typical wholes for)

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 242,** the scope note of P150 has been revised:
FROM
Domain: E55 Type
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: The property "broaderPartitive" associates an instance of E55 Type "A" with an instance of E55 Type "B", when items of type "A" typically form part of items of type "B", such as "car motors" and "cars".

It allows Types to be organised into hierarchies. This is the sense of "broader term partitive (BTP)" as defined in ISO 2788 and "broaderPartitive" in SKOS.

TO:
Domain: E55 Type
Range: E55 Type
Quantification: many to many (0,n:0,n)

Scope note: This property associates an instance of E55 Type "A" with an instance of E55 Type "B", when items of type "A" typically form part of items of type "B", such as "car motors" and "cars".

It allows types to be organised into hierarchies based on one type describing a typical part of another. This property is equivalent to "broader term partitive (BTP)" as defined in ISO 2788 and "broaderPartitive" in SKOS.

Examples:

- Car motors (E55) *defines typical parts of* cars (E55)

P133 is separated from

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 234,** the scope note of P133 has been revised:

FROM

Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Quantification: many to many (0,n:0,n)

Scope note: This symmetric property allows instances of E4 Period that do not overlap both temporally and spatially, to be related i,e. they do not share any spatio-temporal extent.

This property does not imply any ordering or sequence between the two periods either spatial or temporal.

Examples:

- the "Hallstatt" period (E4) *is separated from* the "La Tène" era (E4)

TO:
Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Quantification: many to many (0,n:0,n)

Scope note: This symmetric property associates two instances of E92 Spacetime Volume that have no extent in common.

Examples:

- the "Hallstatt" period (E4) *is separated from* the "La Tène" era (E4)

P164 during (was time-span of)

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 234,** the scope note of P164 and the subproperty part has been revised:

FROM:
Domain: E93 Presence
Range: E52 Time-Span
Quantification:
Scope note: This property relates an E93 Presence with an arbitrary E52 Time-Span that defines the section of the spacetime volume that this instance of E93 Presence is related to by *P166 was a presence of (had presence).* that is concerned by this instance of E93 Presence.

TO:

Domain: E93 Presence
Range: E52 Time-Span
Subproperty of: E92 Spacetime Volume.P160 has temporal projection : E52 Time-Span
Quantification: (1,1 :0,n)
Scope note: This property relates an instance of E93 Presence with an arbitrary instance of E52 Time-Span that defines the section of the spacetime volume that this instance of E93 Presence is related to by the property *P166 was a presence of (had presence)*.

P166 was a presence of (had presence)

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 234,** the quantifications of P164 has been revised:

FROM:

Domain: E93 Presence
Range: E92 Space Time Volume
Quantification:

TO:
Domain: E93 Presence
Range: E92 Spacetime Volume
Quantification: (1,1 : 0,n)

P167 was at (was place of)

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 234,** the label of the property P176 has been changed:

FROM:
P167 was at (was place of)
TO:
P167 at (was place of)

Knowledge Creation Process

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 276,** an entry about knowledge creation process has been added to Terminology

Knowledge Creation Process	All knowledge in an information system is introduced into that system by some human agent either directly or indirectly. Despite this fact, many, if not most, statements within such a system will lack specific attribution of authority. In the domain of cultural heritage, however, there are clear systems of responsibility for collection documentation and management, ideally specified in institutional policy and protocol documents. Thus, it is reasonable to hold that such not explicitly attributed statements represent the official view of the administrating institution of that system. This is to not say that an information system represents at any particular moment a completed phase of knowledge that the institution promotes. Rather, it is to say that is represents a managed set of data that, at any state of elaboration, adheres to and strives to some explicit code of standards. So long as the information is under active management it remains continuously open to revision and improvement as further research reveals further understanding surrounding the objects of concern. A distinct exception to this rule is represented by information in the data set that carries with it an explicit statement of responsibility. In CRM such statements of responsibility are expressed though knowledge creation events such as E13 Attribute Assignment with subclasses. Any information in a CRM model that is based on an explicit creation event for that piece of information is attributed to be the responsibility of the actor identified as causal in that event (provided the creator's identity has been made explicit for that event). For any information connected to knowledge creation events that do not explicitly reference their creator, as well as any information not connected to creation events, the responsibility falls back to the institution responsible for the database/knowledge graph. That means that for information only expressed through shortcuts such as 'P2 has type', where no knowledge creation event has been explicitly specified, the originating creation event cannot be deduced and the responsibility for the information can never be any other body than the institution responsible for the whole information system. In the case of an institution taking over stewardship of a database transferred into their custody, two relations of responsibility for the knowledge therein can be envisioned. If the institution accepts the dataset and undertakes to maintain and update it, then they take on

responsibility for that information and become the default authority behind its statements as described above. If the institution accepts the data set and stores it without change as a closed resource, then it can considered that the default authority remains the original steward.

Proofreading:

Page 78: The statement in First Order Logic is corrected.
Page 92: the class number in the example of *P138 represents (has representation)* is corrected.

Amendments 6.2.2

34th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 27th FRBR - CIDOC CRM Harmonization meeting

E10 Transfer of Custody

In 34th CRM-SIG and 27th FRBR-CIDOC CRM group meeting, resolving the **issue 276** the scope note of E10 has been changed. This change was left out of the amendments of the affected the version 6.2.1. while the scope note of E10 has been changed in the text of version 6.2.1.

35th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 28th FRBR - CIDOC CRM Harmonization meeting

E78 Collection

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the **issue 270** the name and the scope note of the class E78 has been changed

FROM

E78 Collection

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.

Items may be added or removed from an E78 Collection in pursuit of this plan. This class should not be confused with the E39 Actor maintaining the E78 Collection often referred to with the name of the E78 Collection (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 Collection. This is because they form wholes either because they are physically bound together or because they are kept together for their functionality.

TO:

E78 Curated Holding

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.

E93 Presence

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the issue 234,the scope note has been changed .

FROM

Subclass of: E92 Spacetime Volume

Scope note: This class comprises instances of E92 Spacetime Volume that result from the intersection of instances of E92 Spacetime Volume with an instance of E52 Time-Span. The identity of an instance of this class is determined by the identities of the constituent spacetime volume and the time-span.

This class can be used to define temporal snapshots at a particular time-span, such as the extent of the Roman Empire at 33 B.C., or the extent occupied by a museum object at rest in an exhibit. In particular, it can be used to define the spatial projection of a spacetime volume during a particular time-span, such as the maximal spatial extent of a flood at some particular hour, or all areas covered by Poland within the 20th century AD.

TO

This class comprises instances of E92 Spacetime Volume, whose arbitrary temporal extent has been chosen in order to determine the spatial extent of a phenomenon over the chosen time-span. Respective phenomena may, for instance, be historical events or periods, but can also be physical things seen in their diachronic existence and extent. In other words, instances of this class fix a slice of a Spacetime Volume in time.

The temporal extent typically is predetermined by the researcher so as to focus the investigation particularly on finding the spatial extent of the phenomenon by testing for its characteristic features. There are at least two basic directions such investigations might take. The investigation may wish to determine where something was during some time or it may wish to reconstruct the total passage of a phenomenon's Spacetime Volume through an examination of discrete presences. Observation and measurement of features indicating the presence or absence of a phenomenon in some space allows for the progressive approximation of spatial extents through argumentation typically based on inclusion, exclusion and various overlaps.

E94 Space Primitive

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 275*** the scope note of E94 has been changed.

FROM

Scope Note: This class comprises instances of E59 Primitive Value for space that should be implemented with appropriate validation, precision and references to spatial coordinate systems to express geometries on or relative to earth, or any other stable constellations of matter, relevant to cultural and scientific

documentation.
An E94 Space Primitive defines an E53 Place in the sense of a declarative place as elaborated in CRMgeo (Doerr and Hiebel 2013), which means that the identity of the place is derived from its geometric definition. This declarative place allows for the application of all place properties to relate phenomenal places to their approximations expressed with geometries.
Instances of E94 Space Primitive provide the ability to link CRM encoded data to the kinds of geometries used in maps or Geoinformation systems. They may be used for visualisation of the instances of E53 Place they define, in their geographic context and for computing topological relations between places based on these geometries.
E94 Space Primitive is not further elaborated upon within this model. Statement of compatibility with OPENGIS

Examples:

- Coordinate Information in GML like <gml:Point gml:id="p21" srsName="http://www.opengis.net/def/crs/EPSG/0/4326"> <gml:coordinates>45.67, 88.56</gml:coordinates> </gml:Point>
- Coordinate Information in lat, long 48,2 13,3
- Well Known Text like `POLYGON ((30 10, 40 40, 20 40, 10 20, 30 10))`

To:

Scope Note: This class comprises instances of E59 Primitive Value for space that should be implemented with appropriate validation, precision and references to spatial coordinate systems to express geometries on or relative to earth, or any other stable constellations of matter, relevant to cultural and scientific documentation.
An E94 Space Primitive defines an E53 Place in the sense of a declarative place as elaborated in CRMgeo (Doerr and Hiebel 2013), which means that the identity of the place is derived from its geometric definition. This declarative place allows for the application of all place properties to relate phenomenal places to their approximations expressed with geometries.
Definitions of instances of E53 Place using different spatial reference systems always result in definitions of different instances of E53 place approximating each other.

Instances of E94 Space Primitive provide the ability to link CRM encoded data to the kinds of geometries used in maps or Geoinformation systems. They may be used for visualisation of the instances of E53 Place they define, in their geographic context and for computing topological relations between places based on these geometries.
Note that it is possible for a place to be defined by phenomena causal to it or other forms of identification rather than by an instance of E94 Space Primitive. In this case, this property must not be used for approximating the respective instance of E53 Place with an instance of E94 Space Primitive.
E94 Space Primitive is not further elaborated upon within this model. Compatibility with OGC standards are recommended.Examples:

- Coordinate Information in GML like <gml:Point gml:id="p21" srsName="http://www.opengis.net/def/crs/EPSG/0/4326"> <gml:coordinates>45.67, 88.56</gml:coordinates> </gml:Point>
- Coordinate Information in lat, long 48,2 13,3
- Well Known Text like `POLYGON ((30 10, 40 40, 20 40, 10 20, 30 10))`

E95 Spacetime Primitive

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 275 Space primitive*** new class have been added. The following:

E95 Spacetime Primitive

Subclass of: E59 Primitive Value

Scope Note: This class comprises instances of E59 Primitive Value for spacetime volumes that should be

implemented with appropriate validation, precision, interval logic and reference systems to express date ranges and geometries relevant to cultural documentation. A Spacetime Primitive may consist of one expression including temporal and spatial information like in GML or a different form of expressing spacetime in an integrated way like a formula containing all 4 dimensions.
An E95 Spacetime Primitive defines an E92 Spacetime Volume in the sense of a declarative spacetime volume as defined in CRMgeo (Doerr & Hiebel 2013), which means that the identity of the spacetime volume is derived from its geometric and temporal definition. This declarative spacetime volume allows for the application of all E92 Spacetime Volume properties to relate phenomenal spacetime volumes of periods and physical things to propositions about their spatial and temporal extents.
Definitions of spacetime volumes using different spacetime reference systems always result in definitions of different spacetime volumes approximating each other.

Note that it is possible for a spacetime volume to be defined by phenomena causal to it or other forms of identification rather than by an instance of E95 Spacetime Primitive. In this case, this property must not be used for approximating the respective instance of E92 Spacetime volume with an instance of E95 Spacetime Primitive.
E95 Spacetime Primitive is not further elaborated upon within this model. Compatibility with OGC standards are recommended.

Examples:

- Spatial and temporal information in KML for the maximum extent of the Byzantine Empire

```
<Placemark>
    <name> Byzantine Empire </name>
    <styleUrl>#style_1</styleUrl>
    <TimeSpan>
        <begin>330</begin>
        <end>1453</end>
    </TimeSpan>
<Polygon><altitudeMode>clampToGround</altitudeMode><outerBoundaryIs><LinearRing>
<coordinates>18.452787460,40.85553626,0 17.2223187,40.589098,.....0 17.2223,39.783
</coordinates>
</Polygon>
</Placemark>
```

Properties:
P169 defines spacetime volume (spacetime volume is defined by): E92 Spacetime Volume

E96 Purchase

In the **35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM** Harmonization meeting, resolving the issue 273, the crm-sig added the class: E96 Purchase with the following definition.

Subclass of: E8 Acquisition

Superclass of:

Scope note: This class comprises transfers of legal ownership from one or more instances of E39 Actor to one or more other instances of E39 Actor, which are completely compensated by payment of a monetary amount. In more detail, a purchase agreement establishes a fixed monetary obligation at its initialization on the receiving party to the giving party. An instance of E96 Purchase begins with the contract or equivalent agreement and ends with the fulfilment of the monetary

obligation in whatever form. In the case that the activity is abandoned before both parties have fulfilled their contractual obligations, the activity is not regarded as an instance of E96 Purchase.

This class is a very specific case of much more complex social business practices of exchange of good and the creation and satisfaction of related social obligations. Purchase activities which define individual sales prices per object can be modelled by instantiating E96 Purchase for each object individually and as part of an overall transaction.

Properties:

P179 had sales price (was sales price of)): E97 Monetary Amount

E97 Monetary Amount

In the **35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM** Harmonization meeting, resolving the issue 273, the crm-sig added the class: E97 Monetary Amount with the following definition

Subclass of: E54 Dimension

Scope note: This class comprises quantities of monetary possessions or obligations in terms of their nominal value with respect to a particular currency. These quantities may be abstract accounting units, the nominal value of a heap of coins or bank notes at the time of validity of the respective currency, the nominal value of a bill of exchange or other documents expressing monetary claims or obligations.

Properties:

P180 has currency (was_currency_of): E98 Currency

P181 has amount : E60 Number

E98 Currency

In the **35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM** Harmonization meeting, resolving the issue 273, the crm-sig added the class: E99 Currency with the following definition

Subclass of: E55 Type

Scope note: This class comprises the units in which a monetary system supported by an administrational authority or other community quantifies and compares all monetary amounts declared in this unit arithmetically. The unit of a monetary system must describe a nominal value which is kept constant by its authority and an associated banking system, and not by market value. For instance, one may pay with grams of gold, but the respective monetary amount may be agreed on as the gold price in US dollars the day of the payment. Under this definition, British pounds, U.S. dollars, and European euros are examples of currency, but "grams of gold" are not. One monetary system has only one currency. Instances of this class

must not be confused with coin denominations, such as “Dime” or “Sestertius”. Non-monetary exchange of values in terms of quantities of a particular type of goods, such as cows, do not constitute a currency.

Examples: “As” (Roman mid republic), “Euro”, “US Dollar”

P1 is identified by (identifies)/ P48 has preferred identifier (is preferred identifier of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 276***, the following paragraph is added to the end of scope note of P1, this paragraph was taken out of the scope note of P48. Thus the scope notes of P1 and P48 changed accordingly to:

P1 is identified by (identifies)

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.

P48 has preferred identifier (is preferred identifier of), is a shortcut for the path from E1 CRM Entity through *P140 assigned attribute to (was attributed by)*, E15 Identifier Assignment, *P37 assigned (was assigned by)* to E42 Identifier.

P48 has preferred identifier (is preferred identifier of)

Scope note: This property records the preferred E42 Identifier that was used to identify an instance of E1 CRM Entity at the time this property was recorded.

More than one preferred identifier may have been assigned to an item over time.
Use of this property requires an external mechanism for assigning temporal validity to the respective CRM instance.

The fact that an identifier is a preferred one for an organisation can be better expressed in a context independent form by assigning a suitable E55 Type to the respective instance of E15 Identifier Assignment using the *P2 has type* property.

P10 falls within (contains)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 234,*** and completing the definition of P166 the subproperty/superproperty section of P10 has been completed. Thus the following additions made in P10

Subproperty of: E92 Spacetime Volume. P132 overlaps with:E92 Spacetime Volume
Superproperty of: E93 Presence. P166 was a presence of (had presence): E92 Spacetime Volume

P115 finishes (is finished by)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, the crm-sig resolving the ***issue 285***, the first paragraph of scope note changed

From

Scope note: This property allows the ending point for a E2 Temporal Entity to be situated by reference to the ending point of another temporal entity of longer duration.

To:
Scope note: This property identifies a situation in which the ending point of an instance of E2 Temporal Entity is equal to the ending point of another temporal entity of longer duration. There is no causal relationship implied by this property.

P130 shows features of (features are also found on)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 281***, the sig changed the scope note of P130 and the FOL representation

FROM:

Scope note: This property generalises the notions of "copy of" and "similar to" into a directed relationship, where the domain expresses the derivative, if such a direction can be established.
Otherwise, the relationship is symmetric. If the reason for similarity is a sort of derivation process, i.e., that the creator has used or had in mind the form of a particular thing during the creation or production, this process should be explicitly modelled. Moreover it expresses similarity in cases that can be stated between two objects only, without historical knowledge about its reasons.

Examples:

- the Parthenon Frieze on the Acropolis in Athens (E22) *shows features of* the Original Parthenon Frieze in the British museum (E22). *Kind of similarity*: Copy (E55)

In First Order Logic:

P130 (x,y) ⊃ E70(x)
P130 (x,y) ⊃ E70(y)
P130(x,y,z) ⊃ [P130(x,y) ∧ E55(z)]
P130(x,y) ⊃ P130(y,x)

TO:

Scope note: This property generalises the notions of "copy of" and "similar to" into a directed relationship, where the domain expresses the derivative or influenced item and the range the source or influencing item, if such a direction can be established. The property can also be used to express similarity in cases that can be stated between two objects only, without historical knowledge about its reasons. The property expresses a symmetric relationship in case no direction of influence can be established either from evidence on the item itself or from historical knowledge. This holds in particular for siblings of a derivation process from a common source or non-causal cultural parallels, such as some weaving patterns.

The *P130.1 kind of similarity* property of the *P130 shows features of (features are also found on)* property enables the relationship between the domain and the range to be further clarified, in the sense from domain to range, if applicable. For example, it may be expressed if both items are product "of the same mould", or if two texts "contain identical paragraphs".

If the reason for similarity is a sort of derivation process, i.e., that the creator has used or had in mind the form of a particular thing during the creation or production, this process should be explicitly modelled. In these cases, *P130 shows features of* can be regarded as a shortcut of such a process. However, the current model does not contain any path specific enough to infer this property. Specializations of the CIDOC CRM may however be more explicit, for instance describing the use of moulds etc.

In First Order Logic:

P130 (x,y) ⊃ E70(x),

P130 (x,y) ⊃ E70(y),

P130(x,y,z) ⊃ [P130(x,y) ∧ E55(z)]

P132 overlaps with

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the issue 234, the following examples and subproperties have been added. Also the label of the property changed . Thus the P132 changed

FROM:

P132 overlaps with
Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Superproperty of: E18 Physical Thing. P46 is composed of (forms part of): E18 Physical Thing

Examples:

- the "Urnfield" period (E4*) overlaps with* the "Hallstatt" period (E4)
- Example with a PO needed

In First Order Logic:

P132(x,y) ⊃ E92(x)
P132(x,y) ⊃ E92(y)
P132(x,y) ⊃ P132(y,x)

TO:

P132 spatiotemporally overlaps with
Domain: E92 Spacetime Volume
Range: E92 Spacetime Volume
Superproperty of: E18 Physical Thing. P46 is composed of (forms part of): E18 Physical Thing
E4 Period.P9 consists of (forms part of): E4 Period
E92 Spacetime Volume.P10 falls within (contains): E92 Spacetime Volume

Examples:

- the "Urnfield" period (E4*) overlaps with* the "Hallstatt" period (E4)
- (E78) Yale Peabody Collection of Artefacts P132 overlaps with (E27) Cuzco Museum [after repatriation]

In First Order Logic:

P132(x,y) ⊃ E92(x)
P132(x,y) ⊃ E92(y)
P132(x,y) ⊃ P132(y,x)
P132(x,y) ⊃ ¡P133(x,y)

Appropriate change are made to the subproperty section of P9 and P10.

P133 is separated from

In the **35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM** Harmonization meeting, resolving the issue 234, the following examples have been added

(E22) Parthenon Marbles P133 is separated from (E27) Acropolis Museum [through expropriation]

Also changes have been made to First Order logic representation

In the **36th joined meeting of the CIDOC CRM SIG and 29th FRBR - CIDOC CRM** Harmonization meeting, resolving the issue 234, the label of P133 is changed
FROM:
P133 is separated from
TO:
P133 spatiotemporally separated from

P150 defines typical parts of (defines typical wholes for)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 281***, the sig changed the scope note of P150

FROM:

Scope note: This property associates an instance of E55 Type "A" with an instance of E55 Type "B", when items **of** type "A" typically form part of items of type "B", such as "car motors" and "cars".

It allows types to be organised into hierarchies based on one type describing a typical part of another. This property is equivalent to "broader term partitive (BTP)" as defined in ISO 2788 and "broaderPartitive" in SKOS.

TO:

Scope note: This property associates an instance of E55 Type "A" with an instance of E55 Type "B", when items of type "A" typically form part of items of type "B", such as "car motors" and "cars". The property is in general not transitive.

It allows types to be organised into hierarchies based on one type describing a typical part of another. This property is equivalent to "broader term partitive (BTP)" as defined in ISO 2788 and "broaderPartitive" in SKOS.

P161 has spatial projection (is spatial projection of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the issue 234, the scope note of P161 has been changed.

FROM:

Scope note: This property associates an instance of a E92 Spacetime Volume with an instance of E53 Place that is the result of the spatial projection of the instance of a E92 Spacetime Volume on a reference space. In general there can be more than one useful reference space to describe the spatial projection of a spacetime volume, such as that of a battle ship versus that of the seafloor. Therefore the projection is not unique.
This is part of the fully developed path that is shortcut by *P7took place at (witnessed.* The more fully developed path from E4 Period through *P161 has spatial projection*, E53 Place, *P89 falls within (contains)* to E53 Place. MD

Example

In First Order Logic:
P161(x,y) ⊃ E92(x)
P161(x,y) ⊃ E53(y)

TO:

Scope note: This property associates an instance of an E92 Spacetime Volume with an instance of E53 Place that is the result of the spatial projection of the instance of the E92 Spacetime Volume on a reference space.

In general there can be more than one useful reference space (for reference space see *p156 occupies* and *p157 is at rest relative to*) to describe the spatial projection of a spacetime volume, for example, in describing a sea battle, the difference between the battle ship and the seafloor as reference spaces. Thus it can be seen that the projection is not unique.

The spatial projection is the actual spatial coverage of a spacetime volume, which normally has fuzzy boundaries. except Spacetime volumes which are geometrically defined in the same reference system as the range of this property are an exception to this and do not have fuzzy boundaries. Modelling explicitly fuzzy spatial projections serves therefore as a common topological reference of different spatial approximations rather than absolute geometric determination, for instance for relating outer or inner spatial boundaries for the respective spacetime volumes.

Comment [L8]: is there an issue with this 'except'?

In case the domain of an instance of *P161 has spatial projection* is an instance of E4 Period, the spatial projection describes all areas that period was ever present at, for instance, the Roman Empire. In case the domain of an instance of *P161 has spatial projection* is an instance of E19 Physical Object, the spatial projection has to be understood as the complete path along which the object has or has been moved during its existence.

This property is part of the fully developed path from E4 Period through *P161 has spatial projection*, E53 Place, *P89 falls within (contains)* to E53 Place, which in turn is shortcut by *P7took place at (witnessed.)*

Example

The Roman Empire *P161 has spatial projection* all areas ever claimed by Rome.

In First Order Logic:

P161(x,y) ⊃ E92(x), P161(x,y) ⊃ E53(y)

P164 during (was time-span of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the issue 234, an example was added to P164 and the scope note has been changed

FROM:

Scope note: This property relates an instance of E93 Presence with an arbitrary instance of E52 Time-Span that defines the section of the spacetime volume that this instance of E93 Presence is related to by the property *P166 was a presence of (had presence)*.

Examples:

TO:

Scope note: This property relates an instance of E93 Presence with the chosen instance of E52 Time-Span that defines the time-slice of the spacetime volume that this instance of E93 Presence is related to by the property *P166 was a presence of (had presence)*.

Examples:

2016-02-09 (E52 *was time-span of* the last day of the 2016 Carnival in Cologne (E93).

P165 incorporates (is incorporated in)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 281***, the sig changed the scope note of P165

FROM

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.

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

It is an implicit transitive property.

TO:

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

P166 was a presence of (had presence)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 234,*** the definition of P166 has been completed.

FROM

Domain: E93 Presence
Range: E92 Spacetime Volume
Quantification: (1,1 : 0,n)
Scope note: This property relates an E93 Presence with the STV it is part of…MD

In First Order Logic:
P166(x,y) ⊃ E93(x)

P166(x,y) ⊃ E92(y)

TO
Domain: E93 Presence
Range: E92 Spacetime Volume
Subproperty of: E92 Spacetime Volume. P10 falls within (contains): E92 Spacetime Volume
Quantification: (1,1 : 0,n)
Scope note: This property associates an instance of E93 Presence with the instance of E92 Spacetime Volume of which it represents a temporal restriction (i.e.: a time-slice). Instantiating this property constitutes a necessary part of the identity of the respective instance of E93 Presence.

In First Order Logic:
P166(x,y) ⊃ E93(x), P166(x,y) ⊃ E92(y), P166(x,y) ⊃ P10(x,y)

P167 at (was place of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the issue 234, the scope note of P167 was completed.

FROM:
Domain: E93 Presence
Range: E53 Place
Quantification:
Scope note: This property points to a wider area in which my thing /event was…MD

In First Order Logic:
P167(x,y) ⊃ E93(x)
P167(x,y) ⊃ E53(y)

TO:

Domain: E93 Presence

Range: E53 Place

Quantification:

Scope note: This property associates an instance of E93 Presence with an instance of E53 Place that geometrically includes the spatial projection of the respective instance of E93 Presence. Besides others, this property may be used to state in which space an object has been for some known time, such as a room of a castle or in a drawer. It may also be used to describe a confinement of the spatial extent of some realm during a known time-span. It is a shortcut of the more fully developed path from E93 Presence through *P161 has spatial projection*, E53 Place, *P89 falls within (contains)* to E53 Place.

In First Order Logic: P167(x,y) ⊃ E93(x), P167(x,y) ⊃ E53(y), P167(x,y) ⊃ (∃z)[E53(z) ∧ P161(x,z) ∧ P89(z,y)]

P168 place is defined by (defines place)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 275 Space primitive*** changes made to the scope note of P168.

P168 place is defined by (defines place)

FROM

Scope note: This property associates an instance of E53 Place with an instance of E94 Space Primitive that defines it. Syntactic variants or use of different scripts may result in multiple instances of E94 Space Primitive defining exactly the same place. Transformations between different reference systems in general result in new definitions of places approximating each other and not in alternative definitions. Note that it is possible for a place to be defined by phenomena causal to it or other forms of identification rather than by an instance of E94 Space Primitive. In this case, this property must not be used for approximating the respective instance of E53 Place with an instance of E94 Space Primitive.

TO

This property associates an instance of E53 Place with an instance of E94 Space Primitive that defines it. Syntactic variants or use of different scripts may result in multiple instances of E94 Space Primitive defining exactly the same place. Transformations between different reference systems always result in new definitions of places approximating each other and not in alternative definitions.

P169 defines spacetime volume (spacetime volume is defined by)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the **issue 275,** new property have been added about spacetime primitive

Domain: E95 Spacetime Primitive
Range: E92 Spacetime Volume

Scope note: This property associates an instance of E95 Spacetime Primitive with the instance of E92 Spacetime Volume it defines.
{reference to CRMgeo.. check where references need to be made}

P170 defines time (time is defined by)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the **issue 275,** new property have been added about spacetime primitive

Domain: E61Time Primitive
Range: E52 Time Span

Scope note: This property associates an instance of E61 Time Primitive with the instance of E52 Time Span it defines.

P171 at some place within

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 275 Space primitive*** new property has been added. The following:

P171 at some place within

Domain: E53 Place

Range: E94 Space Primitive

Scope note: This property describes the maximum spatial extent within which an E53 Place falls. Since instances of E53 Places may not have precisely known spatial extents, the CRM supports statements about maximum spatial extents of E53 Places. This property allows an instance of an E53 Places's maximum spatial extent (i.e. its outer boundary) to be assigned an E94 Space Primitive value.
P171 at some place within is a shortcut of P89 falls within , P168, … (to be formulated by George) through a not represented declarative Place as defined in CRMgeo (Doerr and Hiebel 2013) to a Space Primitive.
Space Primitives are treated by the CRM as application or system specific spatial intervals, and are not further analysed. Does not belong to property.

Examples:

- the spatial extent of the Acropolis of Athens (E53) is *at some place within* POLYGON ((37.969172 23.720787, 37.973122 23.721495 37.972741 23.728994, 37.969299 23.729735, 37.969172 23.720787)) (Exx)

P172 contains

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, resolving the ***issue 275 Space primitive*** new property has been added. The following:

P172 contains

Domain: E53 Place

Range: E94 Space Primitive

Scope note: This property describes a minimum spatial extent which is contained within an E53 Place. Since instances of E53 Place may not have precisely known spatial extents, the CRM supports statements about minimum spatial extents of instances of E53 Place. This property allows an instance of E53 Places's minimum spatial extent (i.e. its inner boundary or a point being within a Place) to be assigned an E94 Space Primitive value.
P172 *contains* is a shortcut through a P89i, P168 (to be formulated george.).

Examples:

- the spatial extent of the Acropolis of Athens (E53) *contains* POINT (37.971431 23.725947) (Exx)

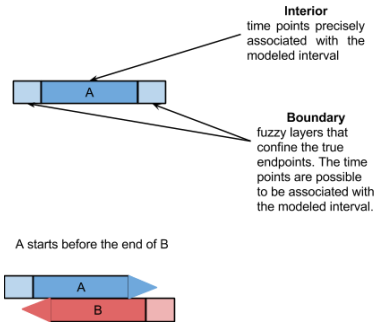
P173 starts before the end of (ends after the start of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, the sig, resolving the ***issue 195,*** added the property P173

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Superproperty of: E7 Activity. P134 continued by (was continued by): E7 Activity
Quantification: many to many (0,n:0,n)
Scope note:
This property associates instances of E7 Activity, representing the temporal topology implied among the activities' Time-Span, in order for an intentional continuation relation to hold between them. The domain is continued by the range and therefore the range activity is influenced by the domain one.

The main temporal primitive that fully expresses a continuation in time requires the starting time point of the domain activity to be before the ending time point of the range. Since, discrete endpoints extracted from a continuous spectrum (such as time) carry a level of imprecision, temporal endpoints are by nature vague, in terms of real phenomena. Consequently, adapting the fuzzy temporal interval model, we accept that the temporal endpoints are represented by fuzzy layers, which demarcate the possible time region in which the true endpoint exists. Consequently, the absolute comparative operators that form the temporal primitive is generalized in order to carry a fuzzy interpretation.

The final form of the temporal primitive states that the domain activity must have its *starting time point before or at the ending time point* of the range. It is worth noting that the inclusion of the the equality operator does not violate the initial temporal condition of continuation in time, since it refers to fuzzy zones overlap.



P174 starts before (starts after the start of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, the sig, resolving the ***issue 195,*** added the property P174

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E2 Temporal Entity. P173 starts before the end of (ends after the start of): E7 Activity
Quantification: many to many (0,n:0,n)
Scope note:
This property allows the starting time point of an E7 Activity to be situated before the starting time point of another Activity.

This property can be expressed using a set of possible Allen operators { Allen, 1983} such as: {before, meets, overlaps, starts, started-by, includes, finished-by, equals}. The temporal primitive is implied when the starting time point of the domain activity is before (or at) the start of the range. Time equality is considered as an overlap over fuzzy boundary zones, and serves the interpretation of time imprecision.

P175 starts within (includes the start of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, the sig, resolving the ***issue 195,*** added the property P175

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E7 Activity. P173 starts before the end of (ends after the start of): E7 Activity
Quantification: many to many (0,n:0,n)
Scope note:
This property allows the starting time point of an E7 Activity to be situated during the time extent of another Activity.

This property expresses a set of all of the following possible Allen operators {Allen, 1983} such as: {met-by, overlapped-by, started-by, starts, during, finishes, equals}. The temporal primitive is implied when the starting time point of the domain activity is after (or at) the start of the range **and** before (or at) the end of the range. Time equality is considered to be an overlap over fuzzy boundary zones, and serves the representation of time imprecision.

P176 ends before (starts after the end of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, the sig, resolving the ***issue 195,*** added the property P176

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E2 Activity. P173 starts before the end of (ends after the start of): E7 Activity
Quantification: many to many (0,n:0,n)
Scope note:
This property allows the ending time point of an E7 Activity to be situated before the starting time point of another Activity.

This property expresses a clear before association. Including the fuzzy interpretation, the corresponding Allen operator set that expresses this property is {before, meets}. The temporal primitive is implied when the ending point of the domain activity is before (or at) the starting point of the range. Time equality is considered as an overlap over fuzzy boundary zones, and serves the representation of time imprecision.

P177 ends within (includes the end of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, the sig, resolving the ***issue 195,*** added the property P177

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E7 Activity. P173 starts before the end of (ends after the start of): E7 Activity
Quantification: many to many (0,n:0,n)
Scope note:
This property allows the ending time point of an E7 Activity to be situated during the time extent of another Activity.
ends within ($A^{end} < B^{end}$ & $A^{end} > B^{start)}$

This property can be expressed using a set of possible Allen operators such as: {meets, overlaps, starts, during, finishes, finished-by, equals}. The temporal primitive is implied when the ending point of the domain activity is after (or at) the starting point of the range **and** before (or at) the end of the range. Time inequality is considered to be a non-overlap over the fuzzy boundary zones, and serves the representation of time imprecision. [There must not be an overlap between the fuzzy boundary zones.]

P178 ends after or with (ends before or at the end of)

In the 35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization meeting, the sig, resolving the ***issue 195,*** added the property P178

Domain: E2 Temporal Entity
Range: E2 Temporal Entity
Subproperty of: E7 Activity. P173 starts before the end of (ends after the start of): E7 Activity
Quantification: many to many (0,n:0,n)
Scope note:
This property allows the ending time point of an E7 Activity to be situated after the ending time point of another Activity.This is part of a set of temporal primitives.
This property can be expressed using a set of possible Allen operators such as: {meets, overlaps, starts, finishes, finished-by, equals}. This property is implied when the ending point of the domain activity is after (or at) the end of the range.

Time equality is considered as an overlap over fuzzy boundary zones, and serves the interpretation of time imprecision.

Transitivity

In the **35th joined meeting of the CIDOC CRM SIG and 28th FRBR - CIDOC CRM Harmonization** meeting, resolving the ***issue 281***, the following paragraph is added to the terminology section as well as to modelling principle sections.

Terminology

Transitivity is defined in the standard way found in mathematics or logic: A property P is transitive if the domain and range is the same class and for all instances x, y, z of this class the following is the case: If x is related by P to y and y is related byP to z, then x is related by P to z. The intention of a property as described in the scope note will decide whether a property is transitive. For example overlap in time or in space are not transitive, while occurs before is transitive. Transitivity is especially useful when CRM is implemented in a system with deduction.

Modelling principle

CRM is formulated as a class system with inheritance. A property P with domain A and range B will also be a property between possible subclasses of A and B. In many cases there will be a common subclass C of A and B. In these cases when the property restricted to C, that is, with C as domain and range, the restricted property could be transitive. For instance, an information object can be incorporated in a symbolic object and thus an information object can be incorporated in another information object.

In the definition of CRM the transitive properties are explicitly marked as such in the scope notes. All unmarked properties should be considered as not transitive.

Comment [GB9]: Put property number in

Comment [GB10]: Put property number in

Comment [GB11]: CEO comment: check term list of CRM in the intro, sometimes properties are mentioned by identifier and sometimes not. Standardize to introduce the identifier consistently across term list.

Comment [GB12]: Introduce class numbers

Comment [GB13]: Introduce class numbers

Comment [GB14]: For all properties that have same domain and range, and are not transitive, this shuold be explicitly stated.

Path descriptions

Resolving **the issue 234,** the crm-sig proposed to delete all the inverse part of the label in all path descriptions in the CRM text

Inverse property in FOL

Resolving the **issue 234**, the crm-sig noted that the FOL expression of a property should include the inverse property too.

36th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 29th FRBR - CIDOC CRM Harmonization meeting

P7 took place at (witnessed)

In the 36th joined meeting of the CIDOC CRM SIG and 29th FRBR - CIDOC CRM Harmonization meeting, resolving **the issue 234,** in the scope note of P7 a paragraph has been added to the end. The following:

E4 Period is a subclass of E92 Spacetime Volume. By the definition of P161 has spatial projection an instance of E4 Period takes place on all its spatial projections, that is, instances of E53 Place. Something happening at a given place can also be considered to happen at a larger place containing the first: The assault on the Bastille July 14th 1789 took place in Paris but also in France.

Also in the example the word 'France' changed to 'the area covered by France in 1789' (E53)

P62 depicts (is depicted by)

In the 36th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 29th FRBR - CIDOC CRM Harmonization meeting, the sig resolving the issue 276 made changes to the first paragraph of the scope note of P62

From:

Scope note: This property identifies something that is depicted by an instance of E24 Physical Man-Made Thing. Depicting is meant in the sense that the surface of the E24 Physical Man-Made Thing shows, through its passive optical qualities or form, a representation of the entity depicted. It does not pertain to inscriptions or any other information encoding.

To:

Scope note: This property identifies something that is depicted by an instance of E24 Physical Man-Made Thing. Depicting is meant in the sense that an E24 Physical Man-Made Thing intentionally shows, through its optical qualities or form, a representation of the entity depicted. Photographs are by default regarded as being intentional in this sense. Anything that is designed to change the properties of the depiction, such as an e-book reader, is specifically excluded. The property does not pertain to inscriptions or any other information encoding.

E54 Dimension

The crm-sig discussed the **issue 273** added the following example.

- Christies' hammer price for "Vase with Fifteen Sunflowers" (E97) *has currency* British Pounds (E98)

E96 Purchase

In the **36th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 29th FRBR - CIDOC CRM** Harmonization meeting, the crm-sig discussed issue 273 changed the scope note of E96

FROM

This class comprises transfers of legal ownership from one or more instances of E39 Actor to one or more other instances of E39 Actor, which are completely compensated by payment of a monetary amount. In more detail, a purchase agreement establishes a fixed monetary obligation at its intialization on the receiving party to the giving party. An instance of E96 Purchase begins with the contract or equivalent agreement and ends with the fulfilment of the monetary obligation in whatever form. In the case that the activity is abandoned before both parties have fulfilled their contractual obligations, the activity is not regarded as an instance of E96 Purchase.

This class is a very specific case of much more complex social business practices of exchange of good and the creation and satisfaction of related social obligations. Purchase activities which define individual sales prices per object can be modelled by instantiating E96 Purchase for each object individually and as part of an overall transaction.

TO
This class comprises transfers of legal ownership from one or more instances of E39 Actor to one or more different instances of E39 Actor, where the transferring party is completely compensated by the payment of a monetary amount. In more detail, a purchase agreement establishes a fixed monetary obligation at its initialization on the receiving party, to the giving party. An instance of E96 Purchase begins with the contract or equivalent agreement and ends with the fulfilment of all contractual obligations. In the case that the activity is abandoned before both parties have fulfilled these obligations, the activity is not regarded as an instance of E96 Purchase.
This class is a very specific case of the much more complex social business practices of exchange of goods and the creation and satisfaction of related social obligations. Purchase activities which define individual sales prices per object can be modelled by instantiating E96 Purchase for each object individually and as part of an overall E96 Purchase transaction.

E97 Monetary Amount

The crm-sig discussed issue 273 changed the scope note of E97 and the example.

FROM

Scope note: This class comprises quantities of monetary possessions or obligations in terms of their nominal value with respect to a particular currency. These quantities may be abstract accounting units, the nominal value of a heap of coins or bank notes at the time of validity of the respective currency, the nominal value of a bill of exchange or other documents expressing monetary claims or obligations.

TO

Scope note: This class comprises quantities of monetary possessions or obligations in terms of their nominal value with respect to a particular currency. These quantities may be abstract accounting units, the nominal value of a heap of coins or bank notes at the time of validity of the respective currency, the nominal value of a bill of exchange or other documents expressing monetary claims or obligations. It specifically excludes amounts expressed in terms of weights of valuable items, like gold and diamonds, and quantities of other non-currency items, like goats or stocks and bonds.

Example:

- Christies' hammer price for "Vase with Fifteen Sunflowers" (E97) has currency British Pounds (E98)

P179 had sales price (was sales price of)

The crm-sig discussed **issue 273**, completed the definition of P179.

FROM:

Domain: E96 Purchase

Range: E97 Monetary Amount

Subproperty of:

Superproperty of:

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

Scope note: ???

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Examples:

TO:

Domain: E96 Purchase
Range: E97 Monetary Amount
Subproperty of: E8 Acquisition: P?? had consideration (): E70 Thing

Scope note: This property establishes the relationship between an instance of E96 Purchase and the instance of E97 Monetary Amount that forms the compensation for the transaction.

Examples:

- The sale of Vincent van Gogh's "Vase with Fifteen Sunflowers" on 1987/03/30 (E96) *had sales price* Christies' hammer price for "Vase with Fifteen Sunflowers" (E97)

P180 has currency (was_currency_of)

The crm-sig discussed **issue 273** changed the scope note of P180:

FROM:

Domain: E97 Monetary Amount
Range: E98 Currency
Subproperty of:
Superproperty of:

Quantification: many to many (0,n:0,n)
Scope note: ???

Examples:

TO:

Domain: E97 Monetary Amount
Range: E98 Currency
Subproperty of: P91 has unit (is unit of)
Superproperty of:

Scope note: This property establishes the relationship between an instance of E97 Monetary Amount and the currency that it is measured in.

Examples:
- Christies' hammer price for "Vase with Fifteen Sunflowers" (E97) has currency British Pounds (E98)

P181 has amount

The crm-sig discussed **issue 273** change the scope note

FROM:

Domain: E97 Monetary Amount
Range: E98 Currency
Subproperty of:
Superproperty of:
Quantification: many to many (0,n:0,n)
Scope note: ???

Examples:

TO:

Domain: E97 Monetary Amount
Range: E60 Number
Subproperty of: P90 has value

Scope note: This property establishes the relationship between an instance of E97 Monetary Amount and the amount of currency that it consists of.

Examples:
- Christies hammer price for "Vase with Fifteen Sunflowers" (E97) *has amount* 24,750,000 (E60)

Proofreading:

Page 42: the example of E92 Spacetime Volume is corrected
E85 Joining: The typo in the last example corrected, the 1973 became 1993
Shortcuts: Deleted all the inverse part of the label in all path descriptions in the CRM text (*decision taken in the 35nd joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 28th FRBR - CIDOC CRM Harmonization meeting*). The shortcut notation changed in P1, P7, P8, P41, P43, P44, P49, P50, P51, P52, P53, P55, P56, P58, P59, P62, P65, P105, P107, P143, P144
Editorial Status, Document Type: In the first page of the document, information has been added about the Document Type and Editorial Status of the CIDOC CRM text (*decision taken in the 36nd joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 29th FRBR - CIDOC CRM Harmonization meeting*)

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37th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 30th FRBR - CIDOC CRM Harmonization meeting

Modelling principles

Resolving **the issues 309 and 278-268**, the crm-sig decided to create new section entitled "Specific modelling constructs" for describing special cases of modelling, like Types, Temporal Relation Primitives based on fuzzy boundaries.

E3 Condition State

The crm-sig discussed the **issue 318** changed the examples of E3.

From :
'the "Amber Room" in Tsarskoje Selo being completely reconstructed from summer 2003 until now'
To :
'the "reconstructed" state of the "Amber Room" in Tsarskoje Selo from summer 2003 until now'

From :
'the Peterhof Palace near Saint Petersburg being in ruins from 1944 – 1946'
To :
'the "ruined" state of Peterhof Palace near Saint Petersburg from 1944 to 1946'

Also another example is added the following

'the topography of the leaves of Sinai Printed Book 3234.2361 on the 10th of July 2007 (described as: of type "cockled")'

E41 Appellation

Resolving the **issue 260**, the crm-sig added a paragraph after the third, the following:

"Thus, the use of subclasses of E41 is not determined of the characteristics of the object the appellation refers to, e.g., a person or a place, but rather the form of the appellation itself shows it as a special type of appellation, such as an identifier."

E44 Place Appellation

Resolving the **issue 260**, the crm-sig decided to delete this class.

E46 Section definition: delete

Resolving the **issue 260**, the crm-sig decided to delete this class

E54 Dimension

Resolving the **issue 293**, the examples of E54 Dimesion are changed

From:

- currency: £26.00
- length: 3.9-4.1 cm
- diameter 26 mm
- weight 150 lbs
- density: 0.85 gm/cc
- luminescence: 56 ISO lumens
- tin content: 0.46 %
- taille au garot: 5 hands
- calibrated C14 date: 2460-2720 years, etc
- Christies' hammer price for "Vase with Fifteen Sunflowers" (E97) has currency British Pounds (E98)

To:

- The 250 metric ton weight of the Luxor Obelisk
- The 5.17 m height of the statue of David by Michaelangelo
- The 530.2 carats of the Great Star of Africa diamond
- The AD1262-1312, 1303-1384 calibrated C14 date for the Shroud of Turin
- The 33 m diameter of the Stonehenge Sarcen Circle
- The 755.9 foot length of the sides of the Great Pyramid at Giza
- Christies' hammer price for "Vase with Fifteen Sunflowers" (E97) has currency British Pounds (E98)

E16 Measurement

The sig resolving the **issue 307** reviewed the proposed changes of the scope note. The new scope note for E16 changed:

From:

This class comprises actions measuring physical properties and other values that can be determined by a systematic procedure.
Examples include measuring the monetary value of a collection of coins or the running time of a specific video cassette.
The E16 Measurement may use simple counting or tools, such as yardsticks or radiation detection devices. The interest is in the method and care applied, so that the reliability of the result may be judged at a later stage, or research continued on the associated documents. The date of the event is important for dimensions, which may change value over time, such as the length of an object subject to shrinkage. Details of methods and devices are best handled as free text, whereas basic techniques such as "carbon 14 dating" should be encoded using *P2 has type (is type of:) E55 Type*.

To:

This class comprises actions measuring quantitative physical properties and other values that can be determined by a systematic, objective procedure of direct observation of particular states of physical reality. Properties of instances of E90 Symbolic Object may be measured by observing some of their representative carriers which may or may not be named explicitly. In the former case, the property *P16 used specific object* should be used to specify the information carriers used as empirical basis for the measurement activity.

Examples include measuring the nominal monetary value of a collection of coins or the running time of a movie on a specific video cassette.
The E16 Measurement may use simple counting or tools, such as yardsticks or radiation detection devices. The interest is in the method and care applied, so that the reliability of the result may be judged at a later stage, or research continued on the associated documents. The date of the event is important for dimensions, which may change value over time, such as the length of an object subject to shrinkage. Methods and devices employed should be associated with instances of E16 Measurement by properties such as *P33 used specific technique*, *P125 used object of type*, *P16 used specific object*, whereas basic techniques such as "carbon 14 dating" should be encoded using *P2 has type (is type of:) E55 Type*. Details of methods and devices reused or reusable in other instances of E16 Measurement should be documented for these entities rather than the measurements themselves, whereas details of particular execution may be documented by free text or by instantiating adequate subactivities, if the detail may be of interest for an overarching query.
Regardless whether a measurement is made by an instrument or by human senses, it represents the initial transition from physical reality to information without any other documented information object in between within the reasoning chain that would represent the result of the interaction of the observer or device with reality. Therefore, inferring properties of depicted items using image material, such as satellite images, is not regarded as an instance of E16 Measurement, but as a subsequent instance of E13 Attribute Assignment. Rather, only the production of the images, understood as arrays of radiation intensities, is regarded as an instance of E16 Measurement. The same reasoning holds for other sensor data.

E61 Time Primitive

Resolving ***the issue 275***, the crm-sig changed the scope note of E61

FROM:
This class comprises instances of E59 Primitive Value for time that should be implemented with appropriate validation, precision and interval logic to express date ranges relevant to cultural documentation.

E61 Time Primitive is not further elaborated upon within the model.

TO:
This class comprises instances of E59 Primitive Value for time that should be implemented with appropriate validation, precision and references to temporal coordinate systems to express time in some context relevant to cultural and scientific documentation.
Instantiating different instances of E61 Time Primitive relative to the same instance of E52 Time Span allows for the expression of multiple opinions/approximations of the same phenomenon. When representing different opinions/approximations of the E52 Time Span of some E2 Temporal Event, multiple instances of E61 Time Primitive should be instantiated relative to one E52 Time Span. Only one E52 Time Span should be instantiated since there is only one real phenomenal time extent of any given event.

The instances of E61 Time Primitive are not considered as elements of the universe of discourse that the CRM aims at defining and analysing. Rather, they play the role of a symbolic interface between the scope of this model and the world of mathematical and computational manipulations and the symbolic objects they define and handle.

Therefore they must not be represented in an implementation by a universal identifier associated with a content model of different identity. In a concrete application, it is recommended that the primitive value system from a chosen implementation platform and/or data definition language be used to substitute for this class and its subclasses.

E75 Conceptual Object Appellation

Resolving the **issue 260**, the crm-sig decided to delete this class

E82 Actor Appellation

Resolving the **issue 260**, the crm-sig decided to delete this class

E89 Propositional Object

Resolving ***the issue 312***, the crm-sig added the following examples in E89.

- The character "Little Red Riding Hood" variants of which appear amongst others in Grimm brothers' 'Rotkäppchen', other oral fairy tales and the film 'Hoodwinked'
- The place "Havnor" as invented by Ursula K. Le Guin for her 'Earthsea' book series, the related maps and appearing in derivative works based on these novels

E98 Currency

Resolving **the issue 273**, the crm-sig changed the scope note of E98

FROM

This class comprises the units in which a monetary system, supported by an administrational authority or other community, quantifies and arithmetically compares all monetary amounts declared in this unit. The unit of a monetary system must describe a nominal value which is kept constant by its authority and an associated banking system, and not by market value. For instance, one may pay with grams of gold, but the respective monetary amount may be agreed on as the gold price in US dollars the day of the payment. Under this definition, British Pounds, U.S. Dollars, and European Euros are examples of currency, but "grams of gold" are not. One monetary system has only one currency. Instances of this class must not be confused with coin denominations, such as "Dime" or "Sestertius". Non-monetary exchange of values in terms of quantities of a particular type of goods,

such as cows, do not constitute a currency.

TO

This class comprises the units in which a monetary system, supported by an administrative authority or other community, quantifies and arithmetically compares all monetary amounts declared in the unit. The unit of a monetary system must describe a nominal value which is kept constant by its administrative authority and an associated banking system if it exists, and not by market value. For instance, one may pay with grams of gold, but the respective monetary amount would have been agreed as the gold price in US dollars on the day of the payment. Under this definition, British Pounds, U.S. Dollars, and European Euros are examples of currency, but "grams of gold" is not. One monetary system has one and only one currency. Instances of this class must not be confused with coin denominations, such as "Dime" or "Sestertius". Non-monetary exchange of value in terms of quantities of a particular type of goods, such as cows, do not constitute a currency.

E99 Product Type

Resolving ***the issues 278-286***, the crm-sig added new class about Product Type

Subclass of: E55 Type

Superclass of:

Scope note: This class comprises concepts denoted by terms from thesauri and controlled vocabularies used to characterize and classify the intended outcome of a production of man.made things.

This class comprises types that characterize instances of E22 Man-Made Object that are the result of production activities using the same exact plans intending to result in potentially unlimited series of functionally and aesthetically identical and interchangeable items. In particular, component parts are typically interchangeable. Frequently, their uniform production is achieved by creating individual tools, such as molds or print plates, that are themselves carriers of the design of the product type. Modern tools may use the flexibility of electronically controlled devices to achieve such functionally and aesthetically identical products. The product type itself, i.e., the potentially unlimited series of aestetically equivalent items, may be the target of artistic design, rather than the individual object. In extreme cases, only one instance of a product type may have been produced, such as in a "print on demand" process. However, this should not be confused with industrial prototypes, such as car prototypes, which are produced prior to the production line being set up, or test the production line itself.

Examples: Volkswagen Type 11 (Beetle)

P7 took place at (witnessed)

Resolving ***the issue 234***, the crm-sig changed the scope note of P7

FROM

Scope note: This property describes the spatial location of an instance of E4 Period.

The related E53 Place should be seen as an approximation of the geographical area within which the phenomena that characterise the period in question occurred. *P7 took place at (witnessed)* does not convey any meaning other than spatial positioning (generally on the surface of the earth). For example, the period "Révolution française" can be said to have taken place in "France", the "Victorian" period, may be said to have taken place in "Britain" and its colonies, as well as other parts of Europe and north America.

A period can take place at multiple locations.

It is a shortcut of the more fully developed path from '*E4 Period*' through '*P161 has spatial projection'*, '*E53 Place*', *'P89 falls within'*E53 Place'.

E4 Period is a subclass of E92 Spacetime Volume. By the definition of *P161 has spatial projection* an instance of E4 Period takes place on all its spatial projections, that is, instances of E53 Place. Something happening at a given place can also be considered to happen at a larger place containing the first: The assault on the Bastille July 14th 1789 took place in Paris but also in France.

TO
Scope note: This property describes the spatial location of an instance of E4 Period.

The related E53 Place should be seen as a wider approximation of the geometric area within which the phenomena that characterise the period in question occurred, see below. *P7took place at (witnessed)* does not convey any meaning other than spatial positioning (frequently on the surface of the earth). For example, the period "Révolution française" can be said to have taken place in "France in 1789"; the "Victorian" period may be said to have taken place in "Britain" and its colonies, as well as other parts of Europe and North America. An instance of E4 Period can take place at multiple non-contiguous, non-overlapping locations.

It is a shortcut of the more fully developed path from E4 Period through *P161 has spatial projection*, E53 Place, *P89 falls within* to E53 Place. E4 Period is a subclass of E92 Spacetime Volume. By the definition of *P161 has spatial projection* an instance of E4 Period takes place on all its spatial projections, that is, instances of E53 Place. Something happening at a given place can also be considered to happen at a larger place containing the first. For example, the assault on the Bastille July 14th 1789 took place in the area covered by Paris in 1789 but also in the area covered by France in 1789.

Examples:

- the period "Révolution française" (E4) *took place at the* area covered by France in 1789 (E53)

P96 by mother (gave birth)

In the 37th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 30th FRBR - CIDOC CRM Harmonization meeting, the sig resolved the issue 319 by correcting the quantifiers of P96

From

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

To

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

P97 from father (was father for)

In the 37th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 30th FRBR - CIDOC CRM Harmonization meeting, the sig resolved the issue 319 by correcting the quantifiers of P97

From

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

To

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

P121 overlaps with

Resolving the ***issue 234***, the following example has been added to P121.

The maximal extent of the Greek Kingdom (E53) *overlaps with* the maximal extent of the Ottoman Empire(E53)

P132 spatiotemporally overlaps with

Resolving the ***issue 234***, the following examples has been added to P132

Catedral de Nuestra Señora de la Asunción (E92) *spatiotemporally overlaps with* Great Mosque of Córdoba (E92)

The facade of the Roman temple acquired by Hearst (E92) *spatiotemporally overlaps with* the Hearst Neptune Pool (E92)

Also the scope note of P132 is changed
FROM:
This symmetric property associates two instances of E92 Spacetime Volume that have some of their extent in common.
TO:
This symmetric property associates two instances of E92 Spacetime Volume that have some of their extents in common.

If only the fuzzy boundaries of the instances of E92 Spacetime Volume overlap, this property cannot be determined from observation alone and therefore should not be applied. However, there may be other forms of justification that the two instances of E92 Spacetime Volume must have some of their extents in common regardless of where and when precisely.

If this property holds for two instances of E92 Spacetime Volume then it cannot be the case that P133 also holds for the same two instances. Furthermore, there are cases where neither P132 nor P133 holds between two instances of E92 Spacetime Volume. This would occur where only an overlap of the fuzzy boundaries of the two instances of E92 Spacetime Volume occurs and no other evidence is available.

P133 is spatiotemporally separated from

Resolving the ***issue 234***, the following examples has been added to P133

Kingdom of Greece (1831-1924) (E92) *is spatiotemporally separated from* Ottoman Empire (1299-1922) (E92)

The path of the army of Alexander (335-323 B.C.) (E92) *is spatiotemporally separated from* the Mauryan Empire (E92)

Also the scope note of P133 has been changed

FROM:
This symmetric property associates two instances of E92 Spacetime Volume that have no extent in common.
TO:
This symmetric property associates two instances of E92 Spacetime Volume that have no extents in common. If only the fuzzy boundaries of the instances of E92 Spacetime Volume overlap, this property cannot be determined from observation alone and therefore should not be applied. However, there may be other forms of justification that the two instances of E92 Spacetime Volume must not have any of their extents in common regardless of where and when precisely.

If this property holds for two instances of E92 Spacetime Volume then it cannot be the case that P132 also holds for the same two instances. Furthermore, there are cases where neither P132 nor P133 holds between two instances of E92 Spacetime Volume. This would occur where only an overlap of the fuzzy boundaries of the two instances of E92 Spacetime Volume occurs and no other evidence is available.

P169 defines spacetime volume (spacetime volume is defined by)

Resolving the ***issue 275***, it is decided to be removed the reference note in the scope note of P169

P171 at some place within

Resolving the ***issue 275***, the crm-sig changed the scope note and completed the example of P171

FROM:

Scope note: This property describes the maximum spatial extent within which an E53 Place falls. Since instances of E53 Places may not have precisely known spatial extents, the CRM supports statements about

maximum spatial extents of E53 Places. This property allows an instance of an E53 Places's maximum spatial extent (i.e. its outer boundary) to be assigned an E94 Space Primitive value.
P171 at some place within is a shortcut of P89 falls within , P168, … (to be formulated by George) through a not represented declarative Place as defined in CRMgeo (Doerr and Hiebel 2013) to a Space Primitive.
Space Primitives are treated by the CRM as application or system specific spatial intervals, and are not further analysed. Does not belong to property.

Examples:

- the spatial extent of the Acropolis of Athens (E53) is *at some place within* POLYGON ((37.969172 23.720787, 37.973122 23.721495 37.972741 23.728994, 37.969299 23.729735, 37.969172 23.720787)) (Exx)

TO:

Scope note: This property describes the maximum spatial extent within which an E53 Place falls. Since instances of E53 Places may not have precisely known spatial extents, the CRM supports statements about maximum spatial extents of E53 Places. This property allows an instance of an E53 Places's maximum spatial extent (i.e. its outer boundary) to be assigned an E94 Space Primitive value.
P171 at some place within is a shortcut of the fully developed path *E53 Place P89 falls within E53 Place P168 place is defined by E94 Space Primitive* through a not represented declarative Place as defined in CRMgeo (Doerr and Hiebel 2013) to a Space Primitive.

Examples:

- the spatial extent of the Acropolis of Athens (E53) is *at some place within* POLYGON ((37.969172 23.720787, 37.973122 23.721495 37.972741 23.728994, 37.969299 23.729735, 37.969172 23.720787)) (E94)

P172 contains

Resolving the ***issue 275***, the crm-sig changed the second paragraph of the scope note of P172

FROM

P172 *contains* is a shortcut through a P89i, P168 (to be formulated george.).

TO:

This property is a shortcut of the fully developed path: *E53 Place, P89i contains, E53 Place, P168 place is defined by, E94 Space Primitive*

P179 had sales price (was sales price of)

Resolving the **issue 273**, the crm-sig deleted the super property of P179

P186 produced thing of product type (is produced by)

Resolving ***the issues 278-286***, the crm-sig added new property about produced things of type

Domain: E12 Production
Range: E99 Product Type
Quantification: many to many (0,n:0,n)

Scope note: This property associates an instance of E12 Production with the instance of E99 Production Type, that is, the type of the things it produces.

Examples:

- The production activity of the Volkswagen factory during 1949-1953 (E12) *produced thing of product type* Volkswagen Type 11 (Beetle) (E99).

Proofreading:

P132 spatiotemporally overlaps with: the property labels in the first two examples are corrected