



**Definition of the  
CIDOC  
Conceptual Reference Model**

Produced by the ICOM/CIDOC  
Documentation Standards Group,  
Continued by the  
CIDOC CRM Special Interest Group

Document Type: Current  
Editorial Status: In Progress since [26/11/2018]

Version 6.2.4

November 2018

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# Definition of the CIDOC Conceptual Reference Model

## 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-  
*Definition of the CIDOC Conceptual Reference Model version 6.2.4* *E.S.: In Progress since [1711/2018]*

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<sup>1</sup>. 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<sup>2</sup> 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

<sup>1</sup> The ICOM Statutes provide a definition of the term “museum” at <http://icom.museum/statutes.html#2>

<sup>2</sup> 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>

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.

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.

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
<i>E12</i>	- - - - - <i>Production</i>
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
<i>E24</i>	- - - - - <i>Physical Man-Made Thing</i>
E28	- - - - - Conceptual Object
E89	- - - - - Propositional Object
E30	- - - - - - Right
E73	- - - - - - Information Object
<i>E90</i>	- - - - - - <i>Symbolic Object</i>
E41	- - - - - - Appellation
<i>E73</i>	- - - - - - <i>Information Object</i>
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	E18 Physical 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
<i>P108</i>	- - <i>has produced (was produced by)</i>	<i>E12 Production</i>	<i>E24 Physical Man-Made Thing</i>
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
<i>P16</i>	- <i>used specific object (was used for)</i>	<i>E7 Activity</i>	<i>E70 Thing</i>
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

Property id	Property Name	Entity – Domain	Entity - Range
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)	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 Assignment	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.

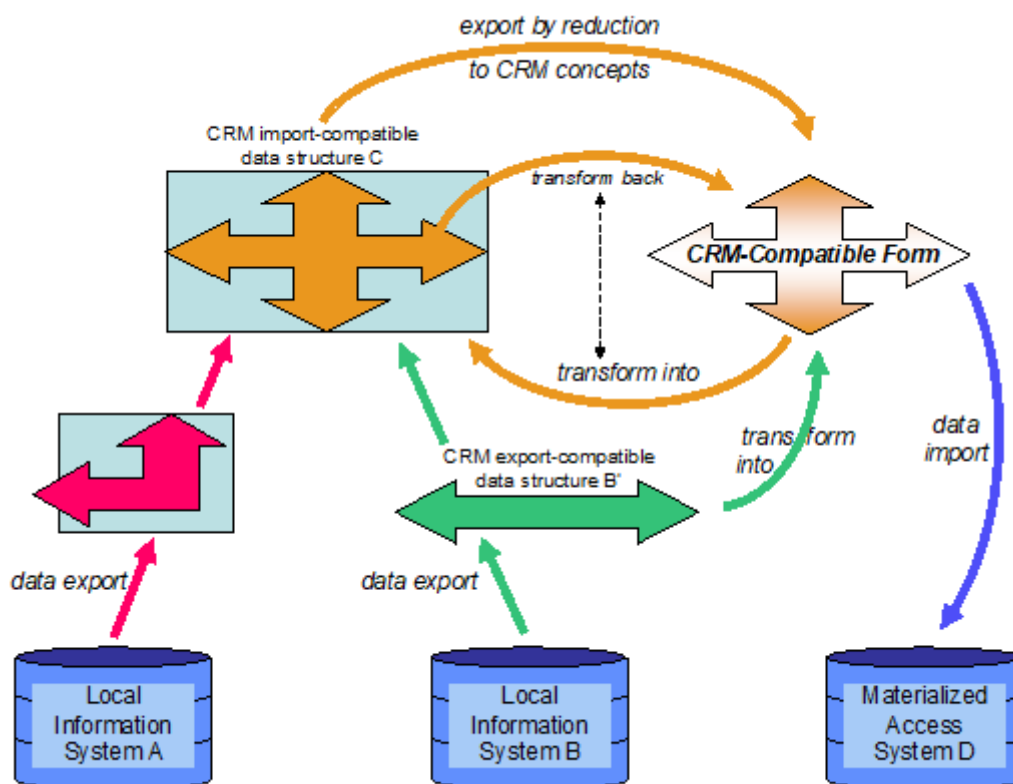


fig. 1: Possible data flow between different kinds of CRM-compatible systems and data structures  
 Definition of the CIDOC Conceptual Reference Model version 6.2.4 E.S.: In Progress since [1711/2018]

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)<sup>3</sup>, 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 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.

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<sup>3</sup> Information about the Resource Description Framework (RDF) can be found at <http://www.w3.org/RDF/>  
*Definition of the CIDOC Conceptual Reference Model version 6.2.4* E.S.: In Progress since [1711/2018]

intension	<p>The intension of a <b>class</b> or <b>property</b> is its intended meaning. It consists of one or more common traits shared by all <b>instances</b> 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 <b>scope note</b>) that refers to a conceptualisation common to domain experts. In particular the so-called <b>primitive</b> concepts, which make up most of the CRM, cannot be further reduced to other concepts by logical terms.</p>
extension	<p>The extension of a <b>class</b> is the set of all real life <b>instances</b> belonging to the class that fulfil the criteria of its <b>intension</b>. 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 (<b>Open World</b>). An information system may at any point in time refer to some instances of a class, which form a subset of its extension.</p>
scope note	<p>A scope note is a textual description of the <b>intension</b> of a <b>class</b> or <b>property</b>. 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 <b>instances</b> of classes and properties are also regularly provided in the scope notes for explanatory purposes.</p>
instance	<p>An instance of a <b>class</b> is a real world item that fulfils the criteria of the <b>intension</b> of the class. Note, that the number of <b>instances</b> 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.</p> <p>For example: The painting known as the “The Mona Lisa” is an instance of the class Man Made Object.</p> <p>An instance of a <b>property</b> is a factual relation between an instance of the <b>domain</b> and an instance of the <b>range</b> of the property that matches the criteria of the <b>intension</b> of the property.</p> <p>For example: “The Louvre <i>is current owner of</i> The Mona Lisa” is an instance of the property “<i>is current owner of</i>”.</p>
property	<p>A property serves to define a relationship of a specific kind between two <b>classes</b>. The property is characterized by an <b>intension</b>, which is conveyed by a <b>scope note</b>. A property plays a role analogous to a grammatical verb, in that it must be defined with reference to both its <b>domain</b> and <b>range</b>, 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 <b>subproperties</b> and their <b>superproperties</b>.</p> <p>In some contexts, the terms attribute, reference, link, role or slot are used synonymously with property.</p> <p>For example: “Physical Man-Made Thing <i>depicts</i> CRM Entity” is equivalent to “CRM Entity <i>is depicted by</i> Physical Man-Made Thing”.</p>
inverse of	<p>The inverse of a property is the reinterpretation of a <b>property</b> from <b>range</b> to <b>domain</b> 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.</p> <p>For example: “CRM Entity <i>is depicted by</i> Physical Man-Made Thing” is the inverse of “Physical Man-</p>

subproperty	<p>Made Thing <i>depicts</i> CRM Entity”</p> <p>A subproperty is a <b>property</b> that is a specialization of another property (its <b>superproperty</b>). Specialization or IsA relationship means that:</p> <ol style="list-style-type: none"> <li>1. all <b>instances</b> of the subproperty are also instances of its superproperty,</li> <li>2. the <b>intension</b> of the subproperty extends the intension of the superproperty, i.e. its traits are more restrictive than that of its superproperty,</li> <li>3. the <b>domain</b> of the subproperty is the same as the domain of its superproperty or a <b>subclass</b> of that domain,</li> <li>4. the <b>range</b> of the subproperty is the same as the range of its superproperty or a subclass of that range,</li> <li>5. the subproperty inherits the definition of all of the properties declared for its superproperty without exceptions (<b>strict inheritance</b>), in addition to having none, one or more properties of its own.</li> </ol> <p>A subproperty can have more than one immediate superproperty and consequently inherits the properties of all of its superproperties (<b>multiple inheritance</b>). 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.</p> <p>Alternatively, a property may be subproperty of the <b>inverse of</b> another property, i.e. reading the property from range to domain. In that case,</p> <ol style="list-style-type: none"> <li>1. all instances of the subproperty are also instances of the inverse of the other property,</li> <li>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,</li> <li>3. the domain of the subproperty is the same as the range of the other property or a subclass of that range,</li> <li>4. the range of the subproperty is the same as the domain of the other property or a subclass of that domain,</li> <li>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.</li> </ol>
superproperty	<p>A superproperty is a <b>property</b> that is a generalization of one or more other properties (its <b>subproperties</b>), which means that it subsumes all <b>instances</b> of its subproperties, and that it can also have additional instances that do not belong to any of its subproperties. The <b>intension</b> 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 <b>inverse of</b> another property</p>
domain	<p>The domain is the <b>class</b> for which a <b>property</b> is formally defined. This means that <b>instances</b> 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 <b>range</b>, 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.</p>
range	<p>The range is the <b>class</b> that comprises all potential values of a <b>property</b>. That means that <b>instances</b> 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 <b>domain</b> 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</p>

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	<p>Inheritance of <b>properties</b> from <b>superclasses</b> to <b>subclasses</b> means that if an item x is an <b>instance</b> of a <b>class</b> A, then</p> <ol style="list-style-type: none"><li>1. all properties that must hold for the instances of any of the superclasses of A must also hold for item x, and</li></ol> <p>all optional properties that may hold for the instances of any of the superclasses of A may also hold for item x.</p>
strict inheritance	<p>Strict <b>inheritance</b> means that there are no exceptions to the inheritance of <b>properties</b> from <b>superclasses</b> to <b>subclasses</b>. 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 <b>intension</b> of the concept elephant but an optional property. The CRM applies strict inheritance as a normalization principle.</p>
multiple inheritance	<p>Multiple <b>inheritance</b> means that a <b>class</b> A may have more than one immediate <b>superclass</b>. The <b>extension</b> of a class with multiple immediate superclasses is a subset of the intersection of all extensions of its superclasses. The <b>intension</b> 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.</p>
Multiple Instantiation	<p>Multiple <b>Instantiation</b> 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.</p>
endurant, perdurant	<p>“The difference between enduring and perduring entities (which we shall also call <i>endurants</i> and <i>perdurants</i>) 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).</p>
shortcut	<p>A shortcut is a formally defined single <b>property</b> that represents a deduction or join of a data path in the CRM. The <b>scope notes</b> 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.</p>
monotonic reasoning	<p>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</p>



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	<b>Classes</b> are disjoint if the intersection of their <b>extensions</b> is an empty set. In other words, they have no common <b>instances</b> 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 <b>class</b> . In particular, absence of a certain <b>property</b> 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 <b>complements</b> of a class with respect to a <b>superclass</b> 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 <b>superclasses</b> B is the set of all <b>instances</b> of B that are not instances of A. Formally, it is the set-theoretic difference of the <b>extension</b> of B minus the extension of A. Compatible extensions of the CRM should not declare any <b>class</b> with the <b>intension</b> of them being the complement of one or more other classes. To do so will normally violate the desire to describe an <b>Open World</b> . 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 <b>superclass</b> of Y.
interoperability	Interoperability means the capability of different information systems to communicate some of their contents. In particular, it may mean that <ol style="list-style-type: none"><li>1. two systems can exchange information, and/or</li><li>2. multiple systems can be accessed with a single method.</li></ol> Generally, syntactic interoperability is distinguished from <b>semantic interoperability</b> . 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 <i>semantic interoperability</i> .
semantic interoperability	Semantic <b>interoperability</b> means the capability of different information systems to communicate information consistent with the intended meaning. In more detail, the intended meaning encompasses <ol style="list-style-type: none"><li>1. the data structure elements involved,</li><li>2. the terminology appearing as data and</li><li>3. the identifiers used in the data for factual items such as places, people, objects etc.</li></ol>

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 quantifiers	We use the term "property quantifiers" for the declaration of the allowed number of <b>instances</b> of a certain <b>property</b> that can refer to a particular instance of the <b>range</b> class or the <b>domain</b> 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 <b>instances</b> in any possible world; universals are entities that do have instances. <b>Classes</b> and <b>properties</b> (corresponding to predicates in a logical language) are usually considered to be universals. (after Gangemi et al. 2002, pp. 166-181).
Knowledge Creation Process	<p>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.</p> <p>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.</p> <p>A distinct exception to this rule is represented by information in the data set that carries with it an explicit statement of responsibility.</p> <p>In CRM such statements of responsibility are expressed through 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.</p> <p>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.</p>
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 by P 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.

## 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.

<b>many to many</b> <b>(0,n:0,n)</b>	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.
<b>one to many</b> <b>(0,n:0,1)</b>	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”.
<b>many to one</b> <b>(0,1:0,n)</b>	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”.
<b>many to many,</b> <b>necessary</b> <b>(1,n:0,n)</b>	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.
<b>one to many,</b> <b>necessary</b> <b>(1,n:0,1)</b>	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”.
<b>many to one,</b> <b>necessary</b> <b>(1,1:0,n)</b>	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”.
<b>one to many,</b> <b>dependent</b> <b>(0,n:1,1)</b>	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”.
<b>one to many,</b> <b>necessary,</b> <b>dependent</b> <b>(1,n:1,1)</b>	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”.
<b>many to one,</b> <b>necessary,</b> <b>dependent</b> <b>(1,1:1,n)</b>	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]<sup>4</sup>).

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-

<sup>4</sup> [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

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 modelling 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 in logic as the axiom:

$$(\text{forall } x) [E21(x) \text{ implies } E20(x)]$$

(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:

$$E21(x) \text{ implies } E20(x)$$

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

$$P152(x,y) \text{ implies } E21(x)$$

(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]<sup>5</sup>.

## 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,

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

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 “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 is 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.

## Assistance for reducing to core CRM model

CRMbase (or an extension of it) may be extended by declaring subclasses of existing classes as well as superclasses. In the former case, all properties of the CRM class will hold for the subclasses. In the latter case, the scope of the CRMbase will be extended and a property of the CRMbase class may hold for the new superclass but not necessarily. In the case a property p of a class A also holds for a new superclass B it should be a conservative extension. That is, when restricted to the original class the extended property, p’, is identical to the original property p. In general a superproperty is said to be a conservative extension of a subproperty when it is identical to the subproperty when restricted to its domain and range.

Taken on its own, CRMbase is not affected by such a conservative extension of scope, since it is not concerned with A. This is similar to what in logic is called a conservative extension of a theory. This construct is necessary for an effective modular management of ontologies, but is not possible with the current way RDF/OWL treats it.

In first order logic the conservative extension of a property can be expressed as follows. Assume that A and C are subclasses of B and D respectively and that p, p’ are properties between A,C and B, D respectively:

$$\begin{aligned} A(x) &\supset B(x) \\ C(x) &\supset D(x) \\ P(x,y) &\supset A(x) \end{aligned}$$

$$\begin{aligned}
P(x,y) &\supset C(y) \\
P'(x,y) &\supset B(x) \\
P'(x,y) &\supset D(y)
\end{aligned}$$

If  $p'$  is a conservative extension of  $p$  then

$$A(x) \wedge C(y) \wedge P'(x,y) \equiv P(x,y)$$

## 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 the 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 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**

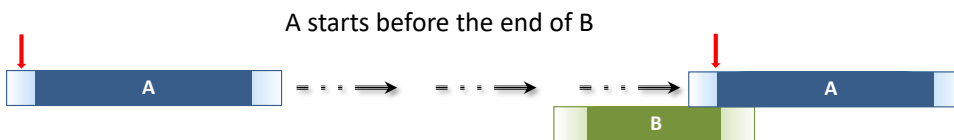
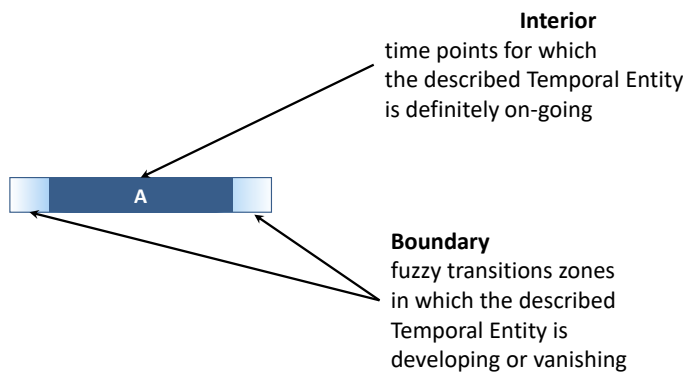
We use the following notation:

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 ( $\equiv$ )  $A^{start} < B^{end}$

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 at the end of**
  - $A^{start} \leq B^{end}$
2. **P174 starts before the end of**
  - $A^{start} < B^{end}$
3. **P175 starts before or with**
  - $A^{start} \leq B^{start}$
4. **P176 starts before**
  - $A^{start} < B^{start}$
5. **P182 ends before or at the start of**
  - $A^{end} \leq B^{start}$
6. **P183 ends before**

- $A^{end} < B^{start}$
- 7. **P184 ends before or with the end of**
  - $A^{end} \leq B^{end}$
- 8. **P185 ends before the end of**
  - $A^{end} < B^{end}$

Table 1, temporal relation primitives without inverse labels

## Examples

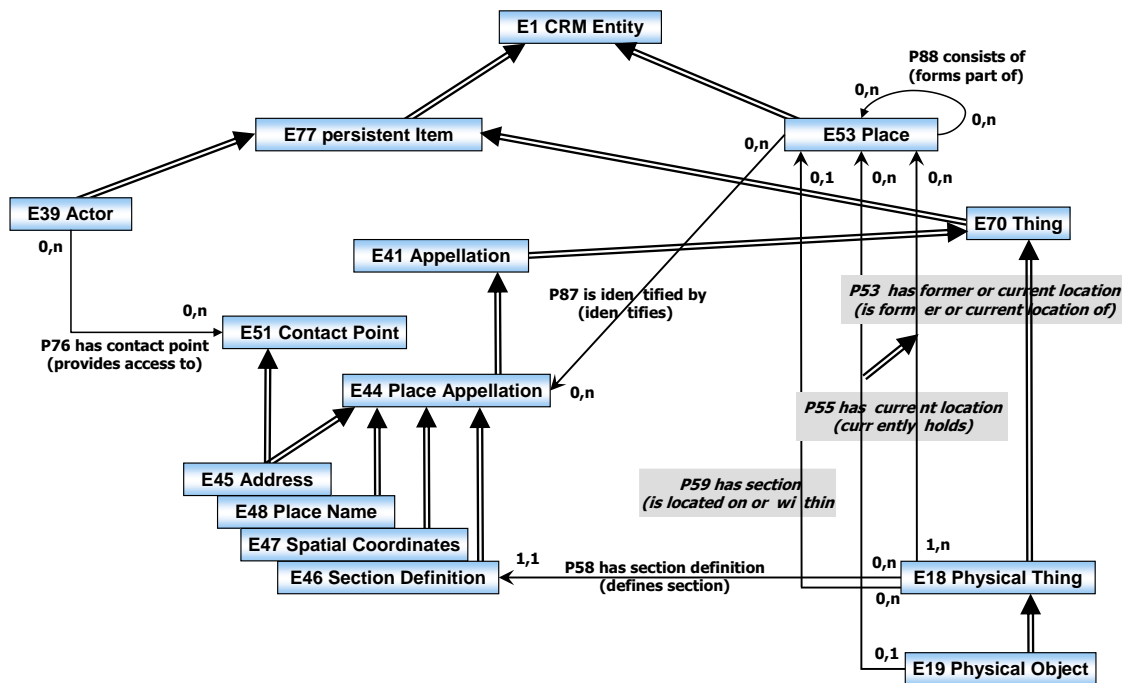


fig. 2 reasoning about spatial information

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.

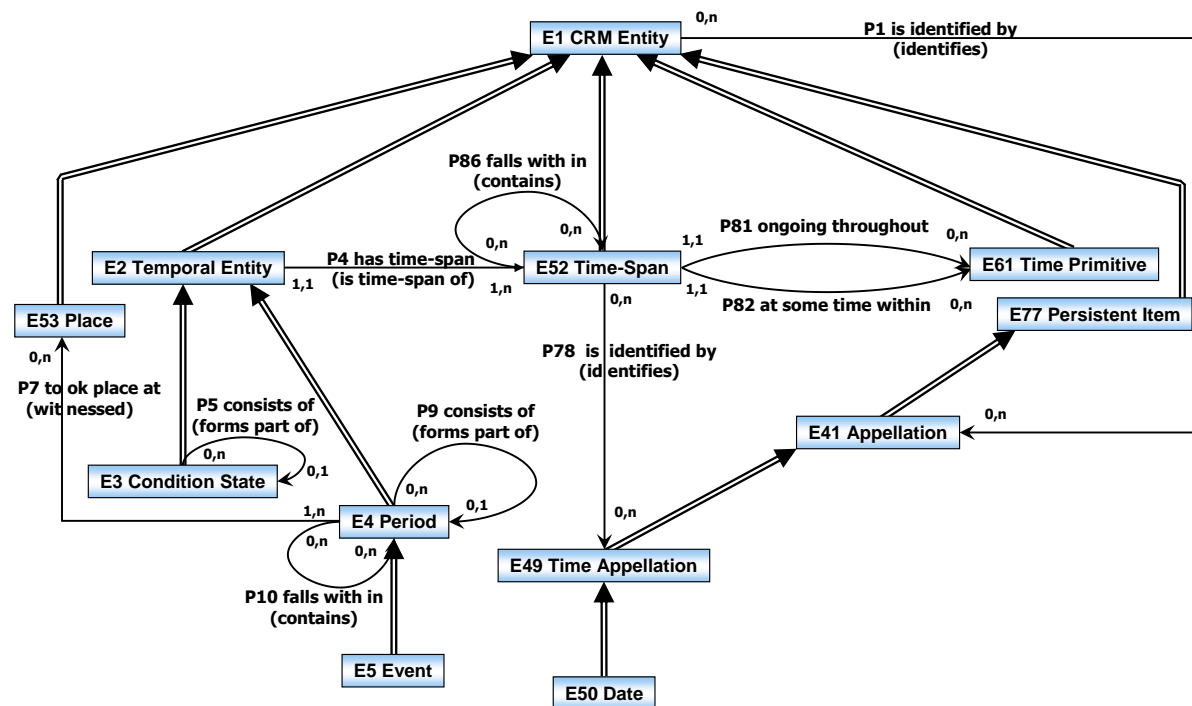


fig. 3 reasoning about temporal information

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 Is A hierarchies have been found to significantly aid comprehension and navigation of the CRM, and are therefore provided below.

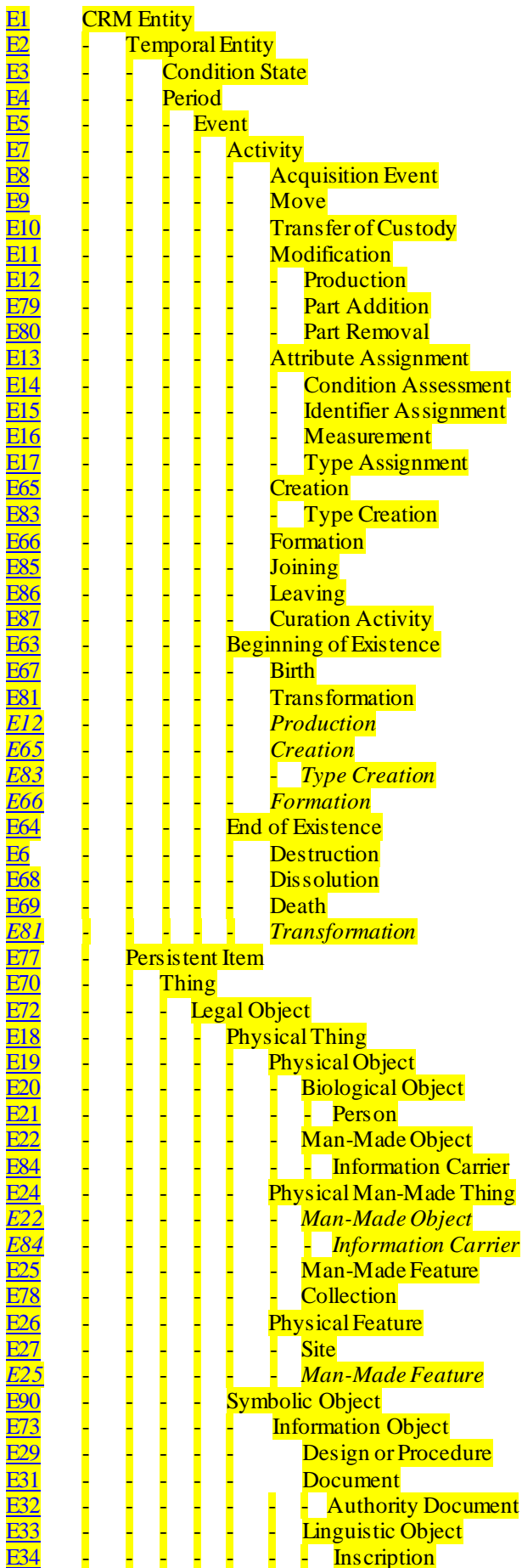
The class hierarchy presented below has the following format:

- 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 Is A 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 Is A 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



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

<a href="#">E38</a>						<i>Image</i>
<a href="#">E30</a>						<i>Right</i>
<a href="#">E55</a>						<i>Type</i>
<a href="#">E56</a>						<i>Language</i>
<a href="#">E57</a>						<i>Material</i>
<a href="#">E58</a>						<i>Measurement Unit</i>
<a href="#">E39</a>						<i>Actor</i>
<a href="#">E74</a>						<i>Group</i>
<a href="#">E46</a>						<i>Legal Body</i>
<a href="#">E21</a>						<i>Person</i>
<a href="#">E52</a>						<i>Time-Span</i>
<a href="#">E53</a>						<i>Place</i>
<a href="#">E54</a>						<i>Dimension</i>
<a href="#">E92</a>						<i>Spacetime Volume</i>
<a href="#">E4</a>						<i>Period</i>
<a href="#">E5</a>						<i>Event</i>
<a href="#">E7</a>						<i>Activity</i>
<a href="#">E8</a>						<i>Acquisition Event</i>
<a href="#">E9</a>						<i>Move</i>
<a href="#">E10</a>						<i>Transfer of Custody</i>
<a href="#">E11</a>						<i>Modification</i>
<a href="#">E12</a>						<i>Production</i>
<a href="#">E79</a>						<i>Part Addition</i>
<a href="#">E80</a>						<i>Part Removal</i>
<a href="#">E13</a>						<i>Attribute Assignment</i>
<a href="#">E14</a>						<i>Condition Assessment</i>
<a href="#">E15</a>						<i>Identifier Assignment</i>
<a href="#">E16</a>						<i>Measurement</i>
<a href="#">E17</a>						<i>Type Assignment</i>
<a href="#">E65</a>						<i>Creation</i>
<a href="#">E83</a>						<i>Type Creation</i>
<a href="#">E66</a>						<i>Formation</i>
<a href="#">E85</a>						<i>Joining</i>
<a href="#">E86</a>						<i>Leaving</i>
<a href="#">E87</a>						<i>Curation Activity</i>
<a href="#">E63</a>						<i>Beginning of Existence</i>
<a href="#">E67</a>						<i>Birth</i>
<a href="#">E81</a>						<i>Transformation</i>
<a href="#">E12</a>						<i>Production</i>
<a href="#">E65</a>						<i>Creation</i>
<a href="#">E83</a>						<i>Type Creation</i>
<a href="#">E66</a>						<i>Formation</i>
<a href="#">E64</a>						<i>End of Existence</i>
<a href="#">E6</a>						<i>Destruction</i>
<a href="#">E68</a>						<i>Dissolution</i>
<a href="#">E69</a>						<i>Death</i>
<a href="#">E81</a>						<i>Transformation</i>
<a href="#">E18</a>						<i>Physical Thing</i>
<a href="#">E19</a>						<i>Physical Object</i>
<a href="#">E20</a>						<i>Biological Object</i>
<a href="#">E21</a>						<i>Person</i>
<a href="#">E22</a>						<i>Man-Made Object</i>
<a href="#">E84</a>						<i>Information Carrier</i>
<a href="#">E24</a>						<i>Physical Man-Made Thing</i>
<a href="#">E22</a>						<i>Man-Made Object</i>
<a href="#">E84</a>						<i>Information Carrier</i>
<a href="#">E25</a>						<i>Man-Made Feature</i>
<a href="#">E78</a>						<i>Collection</i>
<a href="#">E26</a>						<i>Physical Feature</i>
<a href="#">E27</a>						<i>Site</i>
<a href="#">E25</a>						<i>Man-Made Feature</i>
<a href="#">E93</a>						<i>Presence</i>
<a href="#">E59</a>						<i>Primitive Value</i>



<u>E60</u>		Number
<u>E61</u>		Time Primitive
<u>E62</u>		String
<u>E94</u>		Space Primitive

## CIDOC CRM Property Hierarchy:

Property id	Property Name	Entity – Domain	Entity - Range
<a href="#">P1</a>	is identified by (identifies)	<a href="#">E1</a> CRM Entity	<a href="#">E41</a> Appellation
<a href="#">P48</a>	- has preferred identifier (is preferred identifier of)	<a href="#">E1</a> CRM Entity	<a href="#">E42</a> Identifier
<a href="#">P78</a>	- is identified by (identifies)	<a href="#">E52</a> Time-Span	<a href="#">E40</a> Time Appellation
<a href="#">P87</a>	- is identified by (identifies)	<a href="#">E53</a> Place	<a href="#">E44</a> Place Appellation
<a href="#">P102</a>	- has title (is title of)	<a href="#">E71</a> Man-Made Thing	<a href="#">E35</a> Title
<a href="#">P131</a>	- is identified by (identifies)	<a href="#">E39</a> Actor	<a href="#">E82</a> Actor Appellation
<a href="#">P149</a>	- is identified by (identifies)	<a href="#">E28</a> Conceptual Object	<a href="#">E75</a> Conceptual Object Appellation
<a href="#">P2</a>	has type (is type of)	<a href="#">E1</a> CRM Entity	<a href="#">E55</a> Type
<a href="#">P137</a>	- exemplifies (is exemplified by)	<a href="#">E1</a> CRM Entity	<a href="#">E55</a> Type
<a href="#">P3</a>	has note	<a href="#">E1</a> CRM Entity	<a href="#">E62</a> String
<a href="#">P79</a>	- beginning is qualified by	<a href="#">E52</a> Time-Span	<a href="#">E62</a> String
<a href="#">P80</a>	- end is qualified by	<a href="#">E52</a> Time-Span	<a href="#">E62</a> String
<a href="#">P4</a>	has time-span (is time-span of)	<a href="#">E2</a> Temporal Entity	<a href="#">E52</a> Time-Span
<a href="#">P5</a>	consists of (forms part of)	<a href="#">E3</a> Condition State	<a href="#">E3</a> Condition State
<a href="#">P7</a>	took place at (witnessed)	<a href="#">E4</a> Period	<a href="#">E53</a> Place
<a href="#">P8</a>	took place on or within (witnessed)	<a href="#">E4</a> Period	<a href="#">E18</a> Physical Thing
<a href="#">P10</a>	falls within (contains)	<a href="#">E92</a> Spacetime Volume	<a href="#">E92</a> Spacetime Volume
<a href="#">P10i</a>	falls within (contains)	<a href="#">E92</a> Spacetime Volume	<a href="#">E92</a> Spacetime Volume
<a href="#">P9</a>	...consists of (forms part of)	<a href="#">E4</a> Period	<a href="#">E4</a> Period
<a href="#">P12</a>	occurred in the presence of (was present at)	<a href="#">E5</a> Event	<a href="#">E77</a> Persistent Item
<a href="#">P111</a>	- added (was added by)	<a href="#">E79</a> Part Addition	<a href="#">E18</a> Physical Thing
<a href="#">P113</a>	- removed (was removed by)	<a href="#">E80</a> Part Removal	<a href="#">E18</a> Physical Thing
<a href="#">P11</a>	- had participant (participated in)	<a href="#">E5</a> Event	<a href="#">E39</a> Actor
<a href="#">P14</a>	- - carried out by (performed)	<a href="#">E7</a> Activity	<a href="#">E39</a> Actor
<a href="#">P22</a>	- - - transferred title to (acquired title through)	<a href="#">E8</a> Acquisition	<a href="#">E39</a> Actor
<a href="#">P23</a>	- - - transferred title from (surrendered title through)	<a href="#">E8</a> Acquisition	<a href="#">E39</a> Actor
<a href="#">P28</a>	- - - custody surrendered by (surrendered custody through)	<a href="#">E10</a> Transfer of Custody	<a href="#">E39</a> Actor
<a href="#">P29</a>	- - - custody received by (received custody through)	<a href="#">E10</a> Transfer of Custody	<a href="#">E39</a> Actor
<a href="#">P96</a>	- - by mother (gave birth)	<a href="#">E67</a> Birth	<a href="#">E21</a> Person
<a href="#">P99</a>	- - dissolved (was dissolved by)	<a href="#">E68</a> Dissolution	<a href="#">E74</a> Group
<a href="#">P143</a>	- - joined (was joined by)	<a href="#">E85</a> Joining	<a href="#">E39</a> Actor
<a href="#">P144</a>	- - joined with (gained member by)	<a href="#">E85</a> Joining	<a href="#">E74</a> Group
<a href="#">P145</a>	- - separated (left by)	<a href="#">E86</a> Leaving	<a href="#">E39</a> Actor
<a href="#">P146</a>	- - separated from (lost member by)	<a href="#">E86</a> Leaving	<a href="#">E74</a> Group
<a href="#">P151</a>	- - was formed from (participated in)	<a href="#">E66</a> Formation	<a href="#">E74</a> Group
<a href="#">P16</a>	- used specific object (was used for)	<a href="#">E7</a> Activity	<a href="#">E70</a> Thing
<a href="#">P33</a>	- - used specific technique (was used by)	<a href="#">E7</a> Activity	<a href="#">E29</a> Design or Procedure
<a href="#">P111</a>	- - added (was added by)	<a href="#">E79</a> Part Addition	<a href="#">E18</a> Physical Thing
<a href="#">P142</a>	- - used constituent (was used in)	<a href="#">E15</a> Identifier Assignment	<a href="#">E90</a> Symbolic Object
<a href="#">P25</a>	- moved (moved by)	<a href="#">E9</a> Move	<a href="#">E19</a> Physical Object
<a href="#">P31</a>	- has modified (was modified by)	<a href="#">E11</a> Modification	<a href="#">E18</a> Physical Thing
<a href="#">P108</a>	- - has produced (was produced by)	<a href="#">E12</a> Production	<a href="#">E24</a> Physical Man-Made Thing
<a href="#">P110</a>	- - augmented (was augmented by)	<a href="#">E79</a> Part Addition	<a href="#">E24</a> Physical Man-Made Thing
<a href="#">P112</a>	- - diminished (was diminished by)	<a href="#">E80</a> Part Removal	<a href="#">E24</a> Physical Man-Made Thing
<a href="#">P92</a>	- brought into existence (was brought into existence by)	<a href="#">E63</a> Beginning of Existence	<a href="#">E77</a> Persistent Item
<a href="#">P94</a>	- - has created (was created by)	<a href="#">E65</a> Creation	<a href="#">E28</a> Conceptual Object
<a href="#">P135</a>	- - - created type (was created by)	<a href="#">E83</a> Type Creation	<a href="#">E55</a> Type
<a href="#">P95</a>	- - has formed (was formed by)	<a href="#">E66</a> Formation	<a href="#">E74</a> Group
<a href="#">P98</a>	- - brought into life (was born)	<a href="#">E67</a> Birth	<a href="#">E21</a> Person
<a href="#">P108</a>	- - has produced (was produced by)	<a href="#">E12</a> Production	<a href="#">E24</a> Physical Man-Made Thing
<a href="#">P123</a>	- - resulted in (resulted from)	<a href="#">E81</a> Transformation	<a href="#">E77</a> Persistent Item
<a href="#">P93</a>	- took out of existence (was taken out of existence by)	<a href="#">E64</a> End of Existence	<a href="#">E77</a> Persistent Item
<a href="#">P13</a>	- destroyed (was destroyed by)	<a href="#">E6</a> Destruction	<a href="#">E18</a> Physical Thing
<a href="#">P99</a>	- - dissolved (was dissolved by)	<a href="#">E68</a> Dissolution	<a href="#">E74</a> Group
<a href="#">P100</a>	- - was death of (died in)	<a href="#">E69</a> Death	<a href="#">E21</a> Person
<a href="#">P124</a>	- - transformed (was transformed by)	<a href="#">E81</a> Transformation	<a href="#">E77</a> Persistent Item
<a href="#">P142</a>	- - used constituent (was used in)	<a href="#">E15</a> Identifier Assignment	<a href="#">E90</a> Symbolic Object
<a href="#">P15</a>	was influenced by (influenced)	<a href="#">E7</a> Activity	<a href="#">E1</a> CRM Entity
<a href="#">P16</a>	- used specific object (was used for)	<a href="#">E7</a> Activity	<a href="#">E70</a> Thing
<a href="#">P33</a>	- - used specific technique (was used by)	<a href="#">E11</a> Modification	<a href="#">E29</a> Design or Procedure
<a href="#">P111</a>	- - added (was added by)	<a href="#">E79</a> Part Addition	<a href="#">E18</a> Physical Thing
<a href="#">P142</a>	- - used constituent (was used in)	<a href="#">E15</a> Identifier Assignment	<a href="#">E90</a> Symbolic Object
<a href="#">P17</a>	- was motivated by (motivated)	<a href="#">E7</a> Activity	<a href="#">E1</a> CRM Entity
<a href="#">P134</a>	- continued (was continued by)	<a href="#">E7</a> Activity	<a href="#">E7</a> Activity
<a href="#">P136</a>	- was based on (supported type creation)	<a href="#">E83</a> Type Creation	<a href="#">E1</a> CRM Entity
<a href="#">P19</a>	was intended use of (was made for)	<a href="#">E7</a> Activity	<a href="#">E71</a> Man-Made Thing
<a href="#">P20</a>	had specific purpose (was purpose of)	<a href="#">E7</a> Activity	<a href="#">E5</a> Event
<a href="#">P21</a>	had general purpose (was purpose of)	<a href="#">E7</a> Activity	<a href="#">E55</a> Type
<a href="#">P24</a>	transferred title of (changed ownership through)	<a href="#">E8</a> Acquisition	<a href="#">E18</a> Physical Thing
<a href="#">P26</a>	- moved to (was destination of)	<a href="#">E9</a> Move	<a href="#">E53</a> Place
<a href="#">P27</a>	- moved from (was origin of)	<a href="#">E9</a> Move	<a href="#">E53</a> Place
<a href="#">P30</a>	transferred custody of (custody transferred through)	<a href="#">E10</a> Transfer of Custody	<a href="#">E18</a> Physical Thing
<a href="#">P43</a>	has dimension (is dimension of)	<a href="#">E70</a> Thing	<a href="#">E54</a> Dimension

Property id	Property Name	Entity – Domain	Entity - Range
<a href="#">P44</a>	has condition (is condition of)	<a href="#">E18</a> Physical Thing	<a href="#">E3</a> Condition State
<a href="#">P45</a>	consists of (is incorporated in)	<a href="#">E18</a> Physical Thing	<a href="#">E57</a> Material
<a href="#">P56</a>	- bears feature (is found on)	<a href="#">E19</a> Physical Object	<a href="#">E26</a> Physical Feature
<a href="#">P49</a>	has former or current keeper (is former or current keeper of)	<a href="#">E18</a> Physical Thing	<a href="#">E39</a> Actor
<a href="#">P50</a>	- has current keeper (is current keeper of)	<a href="#">E18</a> Physical Thing	<a href="#">E39</a> Actor
<a href="#">P109</a>	- has current or former curator (is current or former curator of)	<a href="#">E78</a> Collection	<a href="#">E39</a> Actor
<a href="#">P51</a>	has former or current owner (is former or current owner of)	<a href="#">E18</a> Physical Thing	<a href="#">E39</a> Actor
<a href="#">P52</a>	- has current owner (is current owner of)	<a href="#">E18</a> Physical Thing	<a href="#">E39</a> Actor
<a href="#">P53</a>	has former or current location (is former or current location of)	<a href="#">E18</a> Physical Thing	<a href="#">E53</a> Place
<a href="#">P55</a>	- has current location (currently holds)	<a href="#">E19</a> Physical Object	<a href="#">E53</a> Place
<a href="#">P54</a>	has current permanent location (is current permanent location of)	<a href="#">E19</a> Physical Object	<a href="#">E53</a> Place
<a href="#">P57</a>	has number of parts	<a href="#">E19</a> Physical Object	<a href="#">E60</a> Number
<a href="#">P58</a>	has section definition (defines section)	<a href="#">E18</a> Physical Thing	<a href="#">E46</a> Section Definition
<a href="#">P59</a>	has section (is located on or within)	<a href="#">E18</a> Physical Thing	<a href="#">E53</a> Place
<a href="#">P62</a>	depicts (is depicted by)	<a href="#">E24</a> Physical Man-Made Thing	<a href="#">E1</a> CRM Entity
<a href="#">P67</a>	refers to (is referred to by)	<a href="#">E89</a> Propositional Object	<a href="#">E1</a> CRM Entity
<a href="#">P68</a>	- foresees use of (use foreseen by)	<a href="#">E29</a> Design or Procedure	<a href="#">E57</a> Material
<a href="#">P70</a>	- documents (is documented in)	<a href="#">E31</a> Document	<a href="#">E1</a> CRM Entity
<a href="#">P71</a>	- lists (is listed in)	<a href="#">E32</a> Authority Document	<a href="#">E1</a> CRM Entity
<a href="#">P129</a>	- is about (is subject of)	<a href="#">E89</a> Propositional Object	<a href="#">E1</a> CRM Entity
<a href="#">P138</a>	- represents (has representation)	<a href="#">E36</a> Visual Item	<a href="#">E1</a> CRM Entity
<a href="#">P69</a>	has association with (is associated with)	<a href="#">E29</a> Design or Procedure	<a href="#">E29</a> Design or Procedure
<a href="#">P72</a>	has language (is language of)	<a href="#">E33</a> Linguistic Object	<a href="#">E56</a> Language
<a href="#">P74</a>	has current or former residence (is current or former residence of)	<a href="#">E39</a> Actor	<a href="#">E53</a> Place
<a href="#">P75</a>	possesses (is possessed by)	<a href="#">E39</a> Actor	<a href="#">E30</a> Right
<a href="#">P76</a>	has contact point (provides access to)	<a href="#">E39</a> Actor	<a href="#">E51</a> Contact Point
<a href="#">P81</a>	ongoing throughout	<a href="#">E52</a> Time-Span	<a href="#">E61</a> Time Primitive
<a href="#">P82</a>	at some time within	<a href="#">E52</a> Time-Span	<a href="#">E61</a> Time Primitive
<a href="#">P83</a>	had at least duration (was minimum duration of)	<a href="#">E52</a> Time-Span	<a href="#">E54</a> Dimension
<a href="#">P84</a>	had at most duration (was maximum duration of)	<a href="#">E52</a> Time-Span	<a href="#">E54</a> Dimension
<a href="#">P86</a>	falls within (contains)	<a href="#">E52</a> Time-Span	<a href="#">E52</a> Time-Span
<a href="#">P89</a>	falls within (contains)	<a href="#">E53</a> Place	<a href="#">E53</a> Place
<a href="#">P90</a>	has value	<a href="#">E54</a> Dimension	<a href="#">E60</a> Number
<a href="#">P91</a>	has unit (is unit of)	<a href="#">E54</a> Dimension	<a href="#">E58</a> Measurement Unit
<a href="#">P97</a>	from father (was father for)	<a href="#">E67</a> Birth	<a href="#">E21</a> Person
<a href="#">P101</a>	had as general use (was use of)	<a href="#">E70</a> Thing	<a href="#">E55</a> Type
<a href="#">P103</a>	was intended for (was intention of)	<a href="#">E71</a> Man-Made Thing	<a href="#">E55</a> Type
<a href="#">P104</a>	is subject to (applies to)	<a href="#">E72</a> Legal Object	<a href="#">E30</a> Right
<a href="#">P105</a>	right held by (has right on)	<a href="#">E72</a> Legal Object	<a href="#">E39</a> Actor
<a href="#">P52</a>	- has current owner (is current owner of)	<a href="#">E18</a> Physical Thing	<a href="#">E39</a> Actor
<a href="#">P106</a>	is composed of (forms part of)	<a href="#">E90</a> Symbolic Object	<a href="#">E90</a> Symbolic Object
<a href="#">P165</a>	- incorporates (is incorporated in)	<a href="#">E73</a> Information Object	<a href="#">E90</a> Symbolic Object
<a href="#">P107</a>	has current or former member (is current or former member of)	<a href="#">E74</a> Group	<a href="#">E39</a> Actor
<a href="#">P114</a>	is equal in time to	<a href="#">E2</a> Temporal Entity	<a href="#">E2</a> Temporal Entity
<a href="#">P115</a>	finishes (is finished by)	<a href="#">E2</a> Temporal Entity	<a href="#">E2</a> Temporal Entity
<a href="#">P116</a>	starts (is started by)	<a href="#">E2</a> Temporal Entity	<a href="#">E2</a> Temporal Entity
<a href="#">P117</a>	occurs during (includes)	<a href="#">E2</a> Temporal Entity	<a href="#">E2</a> Temporal Entity
<a href="#">P118</a>	overlaps in time with (is overlapped in time by)	<a href="#">E2</a> Temporal Entity	<a href="#">E2</a> Temporal Entity
<a href="#">P119</a>	meets in time with (is met in time by)	<a href="#">E2</a> Temporal Entity	<a href="#">E2</a> Temporal Entity
<a href="#">P120</a>	occurs before (occurs after)	<a href="#">E2</a> Temporal Entity	<a href="#">E2</a> Temporal Entity
<a href="#">P121</a>	overlaps with	<a href="#">E53</a> Place	<a href="#">E53</a> Place
<a href="#">P122</a>	borders with	<a href="#">E53</a> Place	<a href="#">E53</a> Place
<a href="#">P125</a>	used object of type (was type of object used in)	<a href="#">E7</a> Activity	<a href="#">E55</a> Type
<a href="#">P32</a>	- used general technique (was technique of)	<a href="#">E7</a> Activity	<a href="#">E55</a> Type
<a href="#">P126</a>	employed (was employed in)	<a href="#">E11</a> Modification	<a href="#">E57</a> Material
<a href="#">P127</a>	has broader term (has narrower term)	<a href="#">E55</a> Type	<a href="#">E55</a> Type
<a href="#">P65</a>	- shows visual item (is shown by)	<a href="#">E24</a> Physical Man-Made Thing	<a href="#">E36</a> Visual Item
<a href="#">P130</a>	shows features of (features are also found on)	<a href="#">E70</a> Thing	<a href="#">E70</a> Thing
<a href="#">P73i</a>	- is translation of	<a href="#">E33</a> Linguistic Object	<a href="#">E33</a> Linguistic Object
<a href="#">P128</a>	- carries (is carried by)	<a href="#">E18</a> Physical Thing	<a href="#">E90</a> Symbolic Object
<a href="#">P65</a>	- shows visual item (is shown by)	<a href="#">E24</a> Physical Man-Made Thing	<a href="#">E36</a> Visual Item
<a href="#">P132</a>	overlaps with	<a href="#">E92</a> Spacetime Volume	<a href="#">E92</a> Spacetime Volume
<a href="#">P46</a>	- is composed of (forms part of)	<a href="#">E18</a> Physical Thing	<a href="#">E18</a> Physical Thing
<a href="#">P133</a>	is separated from	<a href="#">E92</a> Spacetime Volume	<a href="#">E92</a> Spacetime Volume
<a href="#">P139</a>	has alternative form	<a href="#">E41</a> Appellation	<a href="#">E41</a> Appellation
<a href="#">P140</a>	assigned attribute to (was attributed by)	<a href="#">E13</a> Attribute Assignment	<a href="#">E1</a> CRM Entity
<a href="#">P34</a>	- concerned (was assessed by)	<a href="#">E14</a> Condition Assessment	<a href="#">E18</a> Physical Thing
<a href="#">P39</a>	- measured (was measured by)	<a href="#">E16</a> Measurement	<a href="#">E1</a> CRM Entity
<a href="#">P41</a>	- classified (was classified by)	<a href="#">E17</a> Type Assignment	<a href="#">E1</a> CRM Entity
<a href="#">P141</a>	assigned (was assigned by)	<a href="#">E13</a> Attribute Assignment	<a href="#">E1</a> CRM Entity
<a href="#">P35</a>	- has identified (identified by)	<a href="#">E14</a> Condition Assessment	<a href="#">E3</a> Condition State
<a href="#">P37</a>	- assigned (was assigned by)	<a href="#">E15</a> Identifier Assignment	<a href="#">E42</a> Identifier
<a href="#">P38</a>	- deassigned (was deassigned by)	<a href="#">E15</a> Identifier Assignment	<a href="#">E42</a> Identifier
<a href="#">P40</a>	- observed dimension (was observed in)	<a href="#">E16</a> Measurement	<a href="#">E54</a> Dimension
<a href="#">P42</a>	- assigned (was assigned by)	<a href="#">E17</a> Type Assignment	<a href="#">E55</a> Type
<a href="#">P147</a>	curated (was curated by)	<a href="#">E87</a> Curation Activity	<a href="#">E78</a> Collection
<a href="#">P148</a>	has component (is component of)	<a href="#">E89</a> Propositional Object	<a href="#">E89</a> Propositional Object

Property id	Property Name	Entity – Domain	Entity - Range
<a href="#">P150</a>	defines typical parts of(defines typical wholes for)	<a href="#">E55</a> Type	<a href="#">E55</a> Type
<a href="#">P152</a>	has parent(is parent of)	<a href="#">E21</a> Person	<a href="#">E21</a> Person
<a href="#">P157</a>	is at rest relative to (provides reference space for)	<a href="#">E53</a> Place	<a href="#">E18</a> Physical Thing
<a href="#">P59j</a>	- is located on or within	<a href="#">E53</a> Place	<a href="#">E18</a> Physical Thing
<a href="#">P160</a>	has temporal projection	<a href="#">E92</a> Spacetime Volume	<a href="#">E52</a> Time-Span
<a href="#">P164</a>	- during (was time-span of)	<a href="#">E93</a> Presence	<a href="#">E52</a> Time Span
<a href="#">P161</a>	has spatial projection	<a href="#">E92</a> Spacetime Volume	<a href="#">E53</a> Place
<a href="#">P156</a>	- occupies	<a href="#">E18</a> Physical Thing	<a href="#">E53</a> Place
<a href="#">P166</a>	was a presence of (had presence)	<a href="#">E93</a> Presence	<a href="#">E92</a> Spacetime Volume
<a href="#">P167</a>	was at(was place of)	<a href="#">E93</a> Presence	<a href="#">E53</a> Place
<a href="#">P168</a>	Place is defined by (defines place)	<a href="#">E53</a> Place	<a href="#">E94</a> 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](#)) (Chester, 2001)

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](#)) (Childe, 1963)**

the earthquake in Lisbon 1755 ([E5](#)) (Chester, 2001)

the Peterhof Palace near Saint Petersburg being in ruins from 1944 – 1946 ([E3](#))(Maddox, 2015)

In First Order Logic:

$E2(x) \supset E1(x)$

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 Entity

### 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 (Owen, 2009)
- the "ruined" state of Peterhof Palace near Saint Petersburg from 1944 to 1946 (Maddox, 2015)
- 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:

$E3(x) \supset E2(x)$

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.

A geopolitical unit as a specific case of an E4 Period is the set of activities and phenomena related to the claim of power, the consequences of belonging to a jurisdictional area and an administrative system that establishes a geopolitical unit. Examples from the modern period are countries or administrative areas of countries such as districts whose actions and structures define activities and phenomena in the area that they intend to govern. The borders of geopolitical units are often defined in contracts or treaties although they may deviate from the actual practice. The spatiotemporal properties of Geopolitical units can be modelled through the properties inherited from E92 Spacetime volume.

Another specific case of an E4 Period is the actual extent of the set of activities and phenomena as evidenced by their physical traces that define a settlement, such as the populated period of Nineveh.

Examples:

- Jurassic (Hallam, 1975)
- Populated Period of Nineveh
- Imperial Rome under Marcus Aurelius
- European Bronze Age (Harrison, c2004)



- Italian Renaissance (Macdonald, 1992)
- Thirty Years War (Lee, 1991)
- Sturm und Drang (Berkoff, 2013)
- Cubism (Cox, 2000)

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](#)) (Pomeroy, 1984)
- the destruction of Herculaneum by volcanic eruption in 79 AD ([E6](#)) (Camardo, 2013)
- World War II ([E7](#)) (Barber, 1994)
- the Battle of Stalingrad ([E7](#)) (Hoyt, 1993)
- the Yalta Conference ([E7](#)) (Harbutt, 2010) 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 (Camardo, 2013)
- the destruction of Nineveh (E6, E7) (George, 2000)
- the breaking of a champagne glass yesterday by my dog

In First Order Logic:

$E6(x) \supset E64(x)$

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 (Hoyt, 1993)
- the Yalta Conference (Harbutt, 2010)
- my birthday celebration 28-6-1995
- the writing of "Faust" by Goethe (E65) (Williams, 1987)
- the formation of the Bauhaus 1919 (E66)(Droste, 2006)
- calling the place identified by TGN '7017998' 'Qyunjig' 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:

$E7(x) \supset E5(x)$

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* (Carchariformes) XXXtbc by John Steinbeck and Edward Ricketts at Puerto Escondido in the Gulf of Mexico on March 25th, 1940. (Steinbeck, 2000)
- 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:

$E8(x) \supset E7(x)$

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. (Clarke, 1992)
- the movement of the exhibition "Treasures of Tut-Ankh-Amun" 1976-1979 (Treasures of Tutankhamun, exhibition catalogue, 1972).

In First Order Logic:

$E9(x) \supset E7(x)$

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 (Chipp, 1988)

In First Order Logic:

$E10(x) \supset E7(x)$

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)(Gregor,1971)
- the impregnation of the Vasa warship in Stockholm for preservation after 1956(Håfors, 2010)
- 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) (Yake1,2000)
- the last renewal of the gold coating of the Toshogu shrine in Nikko, Japan (Cali and Dougil, 2012)

In First Order Logic:

$E11(x) \supset E7(x)$

Properties:

[P31](#) has modified (was modified by): [E18](#) Physical 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(Gregor, 1971)
- the first casting of the Little Mermaid from the harbour of Copenhagen(Dewey, 2003)
- 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)(Hind, 1923)

In First Order Logic:

$E12(x) \supset E11(x)$   
 $E12(x) \supset E63(x)$

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 one property of an object or any single relation between two items or concepts. The type of the property asserted to hold between two items or concepts can be described by the property P2 has type.  
For example, the class describes the actions of people making propositions and statements during certain scientific/scholarly 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 whether this information should be accessible by structured queries.  
This class allows for the documentation of how the respective assignment came about, and whose opinion it was. Note that all instances of properties described in a knowledge base are the opinion of someone. Per default, they are the opinion of the team maintaining the knowledge base. This fact must not individually be registered for all instances of properties provided by the maintaining team, because it would result in an endless recursion of whose opinion was the description of an opinion. Therefore, the use of E13 Attribute Assignment marks the fact, that the maintaining team is in general neutral to the validity of the respective assertion, but registers someone else's opinion and how it came about. All properties assigned in such an action can also be seen as directly relating the respective pair of items or concepts. Multiple use of E13 Attribute Assignment may possibly lead to a collection of contradictory values. All cases of properties in this model that are also described indirectly through a subclass of E13 Attribute Assignment are characterised as "short cuts" of a path via this subclass. This redundant modelling of two alternative views is preferred because many implementations may have good reasons to model either the action of assertion or the short cut, and the relation between both alternatives can be captured by simple rules.

Examples:

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

In First Order Logic:

$E13(x) \supset E7(x)$

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:

$E14(x) \supset E13(x)$

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 17<sup>th</sup> 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:

$E15(x) \supset E13(x)$

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 31<sup>st</sup> August 1997
- the carbon 14 dating of the “Schoeningen Speer II” in 1996 [an about 400.000 years old Palaeolithic complete wooden spear found in Schoeningen, Niedersachsen, Germany in 1995](Kouwenhoven, 1997)
- The pixel size of the jpeg version of Titian’s painting Bacchus and Ariadne from 1520–3, as freely downloadable from the National Gallery in London’s web page <<https://www.nationalgallery.org.uk/paintings/titian-bacchus-and-ariadne>> is 581600 pixels.
- The scope note of E21 Person in the Definition of the CIDOC Conceptual Reference Model Version 5.0.4 as downloaded from <[http://www.cidoc-crm.org/sites/default/files/cidoc\\_crm\\_version\\_5.0.4.pdf](http://www.cidoc-crm.org/sites/default/files/cidoc_crm_version_5.0.4.pdf)> consists of 77 words.

In First Order Logic:

$E16(x) \supset E13(x)$

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 2<sup>nd</sup>
- the determination of a cactus in Martin Doerr’s garden as ‘*Cereus hildmannianus* K.Schumann’, July 2003

In First Order Logic:

$E17(x) \supset E13(x)$

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) (Scarratt and Shor, 2006)
- the cave “Ideon Andron” in Crete (E26) (Smith, 1844-49)
- the Mona Lisa (E22) (Mohem, 2006)

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

## 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 (Kousser, 2005)
- the Palace of Knossos (Evans, 1921-36)

- the Cullinan Diamond (Scarratt and Shor, 2006)
- Apollo 13 at the time of launch (Lovell and Kluger, 1994)

In First Order Logic:

$E19(x) \supset E18(x)$

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 (Edwards, 1979)
- Boukephalas [Horse of Alexander the Great] (Lamb, 2005)
- petrified dinosaur excrement PA1906-344

In First Order Logic:

$E20(x) \supset E19(x)$

## **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.

In a bibliographic context, a name presented following the conventions usually employed for personal names will be assumed to correspond to an actual real person (E21 Person), unless evidence is available to indicate that this is not the case. The fact that a persona may erroneously be classified as an instance of E21 Person does not imply that the concept comprises personae. So, we keep this in CRMbase. The E21 Person will be the two paragraphs

Examples:

Tut-Ankh-Amun (Edwards, 1979) Nelson Mandela (Brown, 2006)

In First Order Logic:

$E21(x) \supset E20(x)$

$E21(x) \supset E39(x)$

Properties:

[P152](#) has parent (is parent of): [E21](#) Person

## **E22 Man-Made Object**

Subclass of: [E19](#) Physical Object

Superclass of: [E24](#) Physical Man-Made Thing  
[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)(Solomon, 2003)
- the Portland Vase (Walker, 2004)
- the Coliseum(Hopkins, 2005)

In First Order Logic:

$E22(x) \supset E19(x)$

$E22(x) \supset E24(x)$

### **E24 Physical Man-Made Thing**

Subclass of: [E18](#) Physical Thing

[E71](#) Man-Made Thing

Superclass of: [E22](#) Man-Made Object

[E25](#) Man-Made Feature

[E78](#) Collection

Scope Note: This class comprises all persistent physical items that are purposely created by human activity.

This class comprises man-made objects, such as swords, and man-made features, such as rock art. No assumptions are made as to the extent of modification required to justify regarding an object as man-made. For example, a "cup and ring" carving on bedrock is regarded as instance of E24 Physical Man-Made Thing.

Instances of this class may act as carriers of instances of E73 Information Object.

Examples:

- the Forth Railway Bridge (E22) (The Forth Railway Bridge centenary 1890-1990 ICE Proceedings, 1990, Vol.88(6), pp.1079-1107..)
- the Channel Tunnel (E25) (Holliday, I., Marcou, G., and Vickerman, R. W., 1991)
- the Historical Collection of the Museum Benaki in Athens (E78) (Georgoula, E., 2005)
- the Rosetta Stone (E22)
- my paperback copy of Crime & Punishment (E22) (fictitious)
- the computer disk at ICS-FORTH that stores the canonical Definition of the CIDOC CRM v.3.2 (E22)
- my empty DVD disk (E22) (fictitious)

In First Order Logic:

$E24(x) \supset E18(x)$

$E24(x) \supset E71(x)$

Properties:

[P62](#) depicts (is depicted by): [E1](#) CRM Entity  
(P62.1 mode of depiction: [E55](#) Type)

[P65](#) shows visual item (is shown by): [E36](#) Visual Item

### **E25 Man-Made Feature**

Subclass of: [E24](#) Physical Man-Made Thing

[E26](#) Physical Feature

Scope Note: This class comprises physical features that are purposely created by human activity, such as scratches, artificial caves, artificial water channels, etc. In particular, it includes the information encoding features on mechanical or digital carriers.

No assumptions are made as to the extent of modification required to justify regarding a feature as man-made. For example, rock art or even “cup and ring” carvings on bedrock are regarded as types of E25 Man-Made Feature.

Examples:

- the Manchester Ship Canal (Famie, 1980)
- Michael Jackson’s nose following plastic surgery
- The laser-readable “pits” engraved June 2014 on Martin Doerr’s CD-R, copying songs of Edith Piaf’s.
- The carved letters on the Rosetta Stone

In First Order Logic:

$E25(x) \supset E26(x)$

$E25(x) \supset E24(x)$

## **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 (Hawass, 2000)
- Albrecht Durer’s signature on his painting of Charles the Great (Strauss, 1974)
- the damage to the nose of the Great Sphinx in Giza (Temple, 2009)
- Michael Jackson’s nose prior to plastic surgery

In First Order Logic:

$E26(x) \supset E18(x)$

## **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 (Hegen, 1966)
- Knossos (Evans, 1921-36)
- the Apollo 11 landing site (Siegler and Smrekar, 2014)
- Heathrow Airport (Wicks, 2014)
- the submerged harbour of the Minoan settlement of Gournia, Crete (Watrous, 2012)

In First Order Logic:

$E27(x) \supset E26(x)$

## 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) (Kershaw, 1999)
- the definition of "ontology" in the Oxford English Dictionary (E73)
- the knowledge about the victory at Marathon carried by the famous runner (E89)

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

- 'Maxwell equations' [preferred subject access point from LCSH] (E41)  
<http://lccn.loc.gov/sh85082387> [5], as of 19 November 2012]

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

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

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

- Maxwell's equations (E89)

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

- The encoding of Maxwells equations as in

[https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Maxwell \[6\]'s Equations.svg/500px-Maxwell'sEquations.svg.png](https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Maxwell%20%5B6%5D%27s%20Equations.svg/500px-Maxwell%27sEquations.svg.png) (E73)

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

In First Order Logic:

$E28(x) \supset E71(x)$

Properties: [P149](#) is identified by (identifies): [E28](#) 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:

$E29(x) \supset E73(x)$

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:

$E30(x) \supset E89(x)$

### **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) (Kogan, 1958)
- The image content of the photo of the Allied Leaders at Yalta published by UPI, 1945 (E38)
- the Doomsday Book

In First Order Logic:

$E31(x) \supset E73(x)$

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
  - 64. (Herbert, 1994)
  - Getty Art and Architecture Thesaurus (Getty Trust, 1990) ??? Published on behalf of Paul Getty Trust.
- the CIDOC Conceptual Reference Model (Gergatsoulis, M. et al., 2010)

In First Order Logic:

$E32(x) \supset E31(x)$

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 (Hilmo, 2004)
- the lyrics of the song "Blue Suede Shoes" (Cooper, 2008)
- the text of the Jabberwocky by Lewis Carroll (Carroll, 1981)
- the text of "Doktoro Jekyll kaj Sinjoro Hyde" (an Esperanto translation of Dr Jekyll and Mr Hyde). (Stevenson, 1909)

In First Order Logic:

$E33(x) \supset E73(x)$

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:

$E34(x) \supset E33(x)$

$E34(x) \supset E37(x)$

### E35 Title

Subclass of: [E33](#) Linguistic Object  
[E41](#) Appellation

Scope note: This class comprises textual strings that within a cultural context can be clearly identified as titles due to their form. Being a subclass of E41 Appellation, E35 Title can only be used when such a string is actually used as a title of a work, such as a text, an artwork, or a piece of music.

Titles are proper noun phrases or verbal phrases, and should not be confused with generic object names such as “chair”, “painting” or “book” (the latter are common nouns that stand for instances of E55 Type). Titles may be assigned by the creator of the work itself, or by a social group.

This class also comprises the translations of titles that are used as surrogates for the original titles in different social contexts.

Examples:

- “The Merchant of Venice” (McCullough, 2005)
- “Mona Lisa” (Mohen, 2006)
- “La Pie or The Magpie” (Bortolatto, 1981)
- “Lucy in the Sky with Diamonds” (Lennon, 1967)

In First Order Logic:

$E35(x) \supset E33(x)$

$E35(x) \supset E41(x)$

### 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:

$E36(x) \supset E73(x)$

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 (Lowe Fri, 2011)
- ©
- ☺

In First Order Logic:

$E37(x) \supset E36(x)$

### E38 Image

Deprecated, use [E36 Visual Item](#) instead

### 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](#)) (Gibson, 1986)

In First Order Logic:

$E39(x) \supset E77(x)$

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): [E53](#) Actor Appellation

## E40 Legal Body

Deprecated, use [E74](#) Group instead

## 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](#))(McCullough, 2005)
- "*Spigelia marilandica* (L.) L." [not the species, just the *name*](Hershberger, Jenkins and Robacker, 2015)
- "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:

$E41(x) \supset E90(x)$

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](Reaney, 1974)

In First Order Logic:

$E42(x) \supset E41(x)$

## **E44 Place Appellation**

Deprecated, use [E41](#) Appellation instead

## **E45 Address**

Deprecated, use [E41](#) Appellation instead

## **E46 Section Definition**

Deprecated, use [E41](#) Appellation instead

## **E47 Spatial Coordinates**

Deprecated, use [E41](#) Appellation instead

## **E48 Place Name**

Deprecated, use [E41](#) Appellation instead

## **E49 Time Appellation**

Deprecated, use [E41](#) Appellation instead

## **E50 Date**

Deprecated use [E41](#) Appellation instead

## E51 Contact Point

Deprecated use [E41](#) Appellation instead

## 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 4<sup>th</sup> July 1945
- 9.30 am 1.1.1999 to 2.00 pm 1.1.1999
- duration of the Ming Dynasty (*Chan, 2011*)

In First Order Logic:

$E52(x) \supset E1(x)$

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:

$E53(x) \supset E1(x)$

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 : [E94](#) Space Primitive

[P172](#) contains : [E94](#) Space Primitive

## E54 Dimension

Subclass of: [E1](#) CRM Entity

Superclass of: [E97](#) Monetary Amount

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. Equivalent instances 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:

$E54(x) \supset E1(x)$

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:

$E55(x) \supset E28(x)$

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](*Palmer*, 1980)
- en [English](*Wilson*, 1983)
- eo [Esperanto](*Nuessel*, 2000)
- es [Spanish](*Pineda*, 1993)
- fr [French](*Rickard*, 1974)

In First Order Logic:

$E56(x) \supset E55(x)$

## 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(*Gurcke, 1987*)
- Gold(*Watson, 1990*)
- Aluminium(*Norman, 1986*)
- Polycarbonate(*Mhaske, 2011*)
- Resin(*Barton, 1992*)

In First Order Logic:

$E57(x) \supset E55(x)$

## E58 Measurement Unit

Subclass of: [E55](#) Type

Superclass of: [E98](#) Currency

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. (ISO80000:2009). Archaic Measurement Units used in historical records should be preserved.

Examples:

- cm [centimetre]
- km [kilometre]
- m [meter]
- m/s [meters per second](*Hau, 1999*)
- A [Ampere]
- GRD [Greek Drachme](*Daniel, 2014*) (E98)
- °C [degrees centigrade](*Beckman, 1998*)

In First Order Logic:

$E58(x) \supset E55(x)$

## 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.,  $1924-01-31 + 2 \text{ days} = 1924-02-02$ . Cf. [E54 Dimension](#)

Examples:

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

In First Order Logic:

$E60(x) \supset E59(x)$

## **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 Entity](#), 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 temporal entity.

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.

Examples:

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

In First Order Logic:

$E61(x) \supset E59(x)$

### **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:

$E62(x) \supset E59(x)$

### **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 (Tissandier, 1889)

In First Order Logic:

$E63(x) \supset E5(x)$

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 (Trell, 1945)

In First Order Logic:

$E64(x) \supset E5(x)$

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 (Farrand, 1913)  
the drafting of U.N. resolution 1441 (United Nations Security Council, 2002)

In First Order Logic:

$E65(x) \supset E7(x)$

$E65(x) \supset E63(x)$

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 (Pipes, 1964)
- the conspiring of the murderers of Caesar (Irwin, 1935)

In First Order Logic:

$E66(x) \supset E7(x)$

$E66(x) \supset E63(x)$

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 (Stoneman, 2004)

In First Order Logic:

$E67(x) \supset E63(x)$

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 (Whittington, 1964)
- the liquidation of Enron Corporation (Atlas, 2001)

In First Order Logic:

$E68(x) \supset E64(x)$

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) (Irwin, 1935)
- the death of Senator Paul Wellstone (Monast, 2003)

In First Order Logic:

$E69(x) \supset E64(x)$

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](#)) (Psimenos. 2005)

In First Order Logic:

$E70(x) \supset E77(x)$

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 5<sup>th</sup> Symphony ([E73](#)) (Lockwood, 2015)
- Michelangelo's David (Paoletti, 2015)
- Einstein's Theory of General Relativity ([E73](#)) (Hartle, 2003)
- the taxon '*Fringilla coelebs* Linnaeus, 1758' ([E55](#)) (Sinkevicius and Narusevicius, 2002)

In First Order Logic:

$E71(x) \supset E70(x)$

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](#)) (Scarratt and Shor, 2006)
- definition of the CIDOC Conceptual Reference Model Version 2.1 ([E73](#)) (ISO 21127, 2014)

In First Order Logic:

$E72(x) \supset E70(x)$

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 ([E31](#))
- E. A. Poe's "The Raven" (Poe, 1869)
- the movie "The Seven Samurai" by Akira Kurosawa (Mellen, 2002)

the Maxwell Equations (Huray, 2010)The Getty AAT as published as Linked Open Data, accessed 1/10/2014

In First Order Logic:

$E73(x) \supset E89(x)$

$E73(x) \supset E90(x)$

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 (Wilson, 1983)
- the Navajo (Correll, 1972)
- the Greeks (Williams, 1993)
- the peace protestors in New York City on February 15 2003
- Exxon-Mobil ('*Exxon Mobil Corp*', *Mergent's dividend achievers*, vol. 3, no. 3, 2006, pp. 97-97)
- King Solomon and his wives (Thieberger, 1947)
- The President of the Swiss Confederation
- Nicolas Bourbaki (Aczel, 2007)
- Betty Crocker (Crocker, 2012)

Elery Queen ([Queen, 1964](#))

In First Order Logic:

$$E74(x) \supset E39(x)$$

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 (Strano, 1953)
- Stonehenge (Richards, 2005)
- the hole in the ozone layer (Hufford and Horwitz, 2005)
- the First Law of Thermodynamics (Craig and Gislason, 2002)
- the Bermuda Triangle (Dolan, 2005)

In First Order Logic:

$$E77(x) \supset E1(x)$$

## 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 (Ingamells, 1990)
- Mikael Heggelund Foslie’s coralline red algae Herbarium at Museum of Natural History and Archaeology, Trondheim, Norway
- The Digital Collections of the Munich Digitization Center (MDZ) accessible via <https://www.digitale-sammlungen.de/> at least in January 2018.

In First Order Logic:

$$E78(x) \supset E24(x)$$

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 (Dalrymple, 2017)
- 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:

$$E79(x) \supset E11(x)$$

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:

$$E80(x) \supset E11(x)$$

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 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:

$E81(x) \supset E63(x)$

$E81(x) \supset E64(x)$

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 “original 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:

$E83(x) \supset E65(x)$

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

Deprecated use E22 Man-Made Object instead

## 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(Gleick,2003)
- The inauguration of Mikhail Sergeyeovich Gorbachev as leader of the Union of Soviet Socialist Republics (USSR) in 1985 (Butson, 1986)
- The implementation of the membership treaty between EU and Denmark January 1. 1993

In First Order Logic:

$E85(x) \supset E7(x)$

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 dis associated 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(Gleick, 2003)
- George Washington's leaving office in 1797(Jones, 1979)
- 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:

$E86(x) \supset E7(x)$

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 [E87 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:

$E87(x) \supset E7(x)$

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(Huray, 2010)
- 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:

$E89(x) \supset E28(x)$

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:

$E90(x) \supset E28(x)$

$E90(x) \supset E72(x)$

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 6<sup>th</sup> and 9<sup>th</sup> of August 2002

In First Order Logic:

$E92(x) \supset E1(x)$

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:

$$E93(x) \supset E92(x)$$

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. [E94](#) Space Primitive is not further elaborated upon within this model. Compatibility with OGC standards is 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:

$$E94(x) \supset E59(x)$$

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

Subclass of: [E58](#) Measurement Unit

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", (Temperton, 1997)

"US Dollar" (Rose, 1978)

### **E99 Product Type**

Subclass of: E55 Type

**Scope note:** This classes comprises types that stand as the models for instances of E22 Man-Made Object that are produced as the result of production activities using plans exact enough to result in one or more series of uniform, functionally and aesthetically identical and interchangeable items. The product type is the

intended ideal form of the manufacture process. It is typical of instances of E22 that conform to an instance of E99 Product Type that its component parts are interchangeable with component parts of other instances of E22 made after the model of the same instance of E99. Frequently, the uniform production according to a set E99 Product Type is achieved by creating individual tools, such as moulds 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 uniformity. The product type itself, i.e., the potentially unlimited series of aesthetically 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 which was only triggered once. 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)  
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): [E89](#) Actor Appellation

[E28](#) Conceptual Object. [P139](#) 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:

$P1(x,y) \supset E1(x)$

$P1(x,y) \supset E41(y)$

### 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 be 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:

$P2(x,y) \supset E1(x)$

$P2(x,y) \supset E55(y)$

### 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:

$P3(x,y) \supset E1(x)$   
 $P3(x,y) \supset E62(y)$   
 $P3(x,y,z) \supset [P3(x,y) \wedge E55(z)]$

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:

$P4(x,y) \supset E2(x)$   
 $P4(x,y) \supset E52(y)$

#### **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)<sup>6</sup>

In First Order Logic:

$P5(x,y) \supset E3(x)$

$P5(x,y) \supset E3(y)$

### **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 from 1837-1901” 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:

$P7(x,y) \supset E4(x)$

$P7(x,y) \supset E53(y)$

### **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’, ‘P156i 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.

Examples:

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

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<sup>6</sup> 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:

$P8(x,y) \supset E4(x)$   
 $P8(x,y) \supset E18(y)$

### **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:

$P9(x,y) \supset E4(x)$   
 $P9(x,y) \supset E4(y)$   
 $P9(x,y) \supset P10(y,x)$

### **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:

$P10(x,y) \supset E92(x)$   
 $P10(x,y) \supset E92(y)$

### **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:

$P11(x,y) \supset E5(x)$   
 $P11(x,y) \supset E39(y)$   
 $P11(x,y) \supset P12(x,y)$

### **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): [E18](#) Physical 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:

$P12(x,y) \supset E5(x)$   
 $P12(x,y) \supset E77(y)$

### **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:

$P13(x,y) \supset E6(x)$   
 $P13(x,y) \supset E18(y)$   
 $P13(x,y) \supset P93(x,y)$

### **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:

$P14(x,y) \supset E7(x)$   
 $P14(x,y) \supset E39(y)$   
 $P14(x,y) \supset P11(x,y)$   
 $P14(x,y,z) \supset [P14(x,y) \wedge E55(z)]$

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:

$P15(x,y) \supset E7(x)$   
 $P15(x,y) \supset E1(y)$

### **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:

$P16(x,y) \supset E7(x)$   
 $P16(x,y) \supset E70(y)$   
 $P16(x,y) \supset P12(x,y)$   
 $P16(x,y) \supset P15(x,y)$   
 $P16(x,y,z) \supset [P16(x,y) \wedge E55(z)]$

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 Swiss Air ([E68](#)).
- the coronation of Elizabeth II ([E7](#)) *was motivated by* the death of George VI ([E69](#))

In First Order Logic:

$P17(x,y) \supset E7(x)$   
 $P17(x,y) \supset E1(y)$   
 $P17(x,y) \supset P15(x,y)$

### **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:

$P19(x,y) \supset E7(x)$   
 $P19(x,y) \supset E71(y)$   
 $P19(x,y,z) \supset [P19(x,y) \wedge E55(z)]$

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:

$P21(x,y) \supset E7(x)$   
 $P21(x,y) \supset E55(y)$

### **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. *P21 had 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 17<sup>th</sup> 1874 (E7) *had general purpose* Catching Moose (E55) (Activity type)

In First Order Logic:

$P21(x,y) \supset E7(x)$   
 $P21(x,y) \supset E55(y)$

### **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:

$$\begin{aligned} P22(x,y) &\supset E8(x) \\ P22(x,y) &\supset E39(y) \\ P22(x,y) &\supset P14(x,y) \end{aligned}$$

### **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:

$$\begin{aligned} P23(x,y) &\supset E8(x) \\ P23(x,y) &\supset E39(y) \\ P23(x,y) &\supset P14(x,y) \end{aligned}$$

### **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:

$$\begin{aligned} P24(x,y) &\supset E8(x) \\ P24(x,y) &\supset E18(y) \end{aligned}$$

### **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:

$$\begin{aligned} P25(x,y) &\supset E9(x) \\ P25(x,y) &\supset E19(y) \\ P25(x,y) &\supset P12(x,y) \end{aligned}$$

### **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:

$$\begin{aligned} P26(x,y) &\supset E9(x) \\ P26(x,y) &\supset E53(y) \\ P26(x,y) &\supset (\exists z)[E53(z) \wedge P7(x,z) \wedge P89(y,z)] \end{aligned}$$

### **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:

$P27(x,y) \supset E9(x)$   
 $P27(x,y) \supset E53(y)$   
 $P27(x,y) \supset (\exists z)[E53(z) \wedge P7(x,z) \wedge P89(y,z)]$

### **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:

$P28(x,y) \supset E10(x)$   
 $P28(x,y) \supset E39(y)$   
 $P28(x,y) \supset P14(x,y)$

### **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:

$P29(x,y) \supset E10(x)$   
 $P29(x,y) \supset E39(y)$   
 $P29(x,y) \supset P14(x,y)$

### **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:

$P30(x,y) \supset E10(x)$   
 $P30(x,y) \supset E18(y)$

### **P31 has modified (was modified by)**

Domain: [E11](#) Modification  
Range: [E18](#) Physical 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. (OBSOLETE)**

Examples:

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

In First Order Logic:

$P31(x,y) \supset E11(x)$   
 $P31(x,y) \supset E18(y)$   
 $P31(x,y) \supset P12(x,y)$

### **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:

$P32(x,y) \supset E7(x)$   
 $P32(x,y) \supset E55(y)$   
 $P32(x,y) \supset P125(x,y)$

### **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:

$P33(x,y) \supset E7(x)$   
 $P33(x,y) \supset E29(y)$   
 $P33(x,y) \supset P16(x,y)$

### **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:

$P34(x,y) \supset E14(x)$   
 $P34(x,y) \supset E18(y)$   
 $P34(x,y) \supset P140(x,y)$

### **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:

$P35(x,y) \supset E14(x)$   
 $P35(x,y) \supset E3(y)$   
 $P35(x,y) \supset P141(x,y)$

### **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:

$P37(x,y) \supset E15(x)$   
 $P37(x,y) \supset E42(y)$   
 $P37(x,y) \supset P141(x,y)$

### **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:

$P38(x,y) \supset E15(x)$   
 $P38(x,y) \supset E42(y)$   
 $P38(x,y) \supset P141(x,y)$

### **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:

$P39(x,y) \supset E16(x)$   
 $P39(x,y) \supset E1(y)$   
 $P39(x,y) \supset P140(x,y)$

#### **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:

$P40(x,y) \supset E16(x)$   
 $P40(x,y) \supset E54(y)$   
 $P40(x,y) \supset P141(x,y)$

#### **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 '*P41 i 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:

$P41(x,y) \supset E17(x)$   
 $P41(x,y) \supset E1(y)$   
 $P41(x,y) \supset P140(x,y)$

#### **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:

$P42(x,y) \supset E17(x)$   
 $P42(x,y) \supset E55(y)$   
 $P42(x,y) \supset P141(x,y)$

### **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:

$P43(x,y) \supset E70(x)$   
 $P43(x,y) \supset E54(y)$

### **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:

$P44(x,y) \supset E18(x)$   
 $P44(x,y) \supset E3(y)$

### **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:

$P45(x,y) \supset E18(x)$

$P45(x,y) \supset E57(y)$

### **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:

$P46(x,y) \supset E18(x)$

$P46(x,y) \supset E18(y)$

$P46(x,y) \supset P132(x,y)$

$P46(x,y) \supset (\exists uzw)[E93(u) \wedge P166(x,u) \wedge E52(z) \wedge P164(u,z) \wedge E93(w) \wedge P166(y,w) \wedge P164(w,z) \wedge P10(w,u)]$

### **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:

$P48(x,y) \supset E1(x)$   
 $P48(x,y) \supset E42(y)$   
 $P48(x,y) \supset P1(x,y)$

### **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:

$P49(x,y) \supset E18(x)$   
 $P49(x,y) \supset E39(y)$

### **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:

$P50(x,y) \supset E18(x)$   
 $P50(x,y) \supset E39(y)$   
 $P50(x,y) \supset P49(x,y)$

### **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:

$P51(x,y) \supset E18(x)$   
 $P51(x,y) \supset E39(y)$

### **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:

$P52(x,y) \supset E18(x)$

$P52(x,y) \supset E39(y)$   
 $P52(x,y) \supset P51(x,y)$   
 $P52(x,y) \supset P105(x,y)$

### **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:

$P53(x,y) \supset E18(x)$   
 $P53(x,y) \supset E53(y)$

### **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:

$P54(x,y) \supset E19(x)$   
 $P54(x,y) \supset E53(y)$

### **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:

$P55(x,y) \supset E19(x)$

$P55(x,y) \supset E53(y)$

$P55(x,y) \supset P53(x,y)$

### **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:

$P56(x,y) \supset E19(x)$

$P56(x,y) \supset E26(y)$

$P56(x,y) \supset P46(x,y)$

### **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:

$P57(x,y) \supset E19(x)$

$P57(x,y) \supset E60(y)$

### **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:

$P58(x,y) \supset E18(x)$

$P58(x,y) \supset E46(y)$

### **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:

$P59(x,y) \supset E18(x)$

$P59(x,y) \supset E53(y)$

### **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*, E1 CRM 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:

$P62(x,y) \supset E24(x)$   
 $P62(x,y) \supset E1(y)$   
 $P62(x,y,z) \supset [P62(x,y) \wedge E55(z)]$

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:

$P65(x,y) \supset E24(x)$   
 $P65(x,y) \supset E36(y)$   
 $P65(x,y) \supset P128(x,y)$



### **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:

$P67(x,y) \supset E89(x)$

$P67(x,y) \supset E1(y)$

$P67(x,y,z) \supset [P67(x,y) \wedge E55(z)]$

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 foreseen 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:

$P68(x,y) \supset E29(x)$

$P68(x,y) \supset E57(y)$

$P68(x,y) \supset P67(x,y)$

### **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:

$P69(x,y) \supset E29(x)$

$P69(x,y) \supset E29(y)$

$P69(x,y,z) \supset [P69(x,y) \wedge E55(z)]$

$P69(x,y) \supset P69(y,x)$

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:

$P70(x,y) \supset E31(x)$

$P70(x,y) \supset E1(y)$

$P70(x,y) \supset P67(x,y)$

### **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:

$P71(x,y) \supset E32(x)$

$P71(x,y) \supset E1(y)$

$P71(x,y) \supset P67(x,y)$

### **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* 18<sup>th</sup> Century English (E56)

In First Order Logic:

$P72(x,y) \supset E33(x)$   
 $P72(x,y) \supset E56(y)$

### **P73 has translation (is translation of)**

Domain: [E33](#) Linguistic Object  
Range: [E33](#) Linguistic Object  
Subproperty of: [E70](#) Thing. [P130](#)i 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:

$P73(x,y) \supset E33(x)$   
 $P73(x,y) \supset E33(y)$   
 $P73(x,y) \supset P130(y,x)$

### **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:

$P74(x,y) \supset E39(x)$   
 $P74(x,y) \supset E53(y)$

### **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:

$P75(x,y) \supset E39(x)$

$P75(x,y) \supset E30(y)$

### **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:

$P76(x,y) \supset E39(x)$

$P76(x,y) \supset E51(y)$

### **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 [E49](#) Time Appellation.

Examples:

- the time span 1926 to 1988 (E52) *is identified by* "Showa" (Japanese time appellation) ([E49](#))

In First Order Logic:

$P78(x,y) \supset E52(x)$

$P78(x,y) \supset E49(y)$

$P78(x,y) \supset P1(x,y)$

### **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:

$P79(x,y) \supset E52(x)$   
 $P79(x,y) \supset E62(y)$   
 $P79(x,y) \supset P3(x,y)$

### **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:

$P80(x,y) \supset E52(x)$   
 $P80(x,y) \supset E62(y)$   
 $P80(x,y) \supset P3(x,y)$

### **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 systemspecific 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:

$P81(x,y) \supset E52(x)$   
 $P81(x,y) \supset E61(y)$

### **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 systemspecific 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:

$P82(x,y) \supset E52(x)$

$P82(x,y) \supset E61(y)$

### **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 its minimum duration (i.e. its 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:

$P83(x,y) \supset E52(x)$

$P83(x,y) \supset E54(y)$

### **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 its maximum duration (i.e. its 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:

$P84(x,y) \supset E52(x)$

$P84(x,y) \supset E54(y)$

### **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:

$P86(x,y) \supset E52(x)$

$P86(x,y) \supset E52(y)$

### **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:

$P87(x,y) \supset E53(x)$

$P87(x,y) \supset E44(y)$

$P87(x,y) \supset P1(x,y)$

### **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:

$P89(x,y) \supset E53(x)$

$P89(x,y) \supset E53(y)$

### **P90 has value**

Domain: [E54](#) Dimension

Range: [E60](#) Number

Superproperty of: E97 Monetary Amount. P181 has amount: 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:

$P90(x,y) \supset E54(x)$   
 $P90(x,y) \supset E60(y)$

### **P91 has unit (is unit of)**

Domain: [E54](#) Dimension

Range: [E58](#) Measurement Unit

Superproperty of: [E97](#) Monetary Amount. [P180](#) has currency: [E98](#) Currency

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:

$P91(x,y) \supset E54(x)$   
 $P91(x,y) \supset E58(y)$

### **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:

$P92(x,y) \supset E63(x)$   
 $P92(x,y) \supset E77(y)$   
 $P92(x,y) \supset P12(x,y)$

### **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](#) Dis solution. [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:

$P93(x,y) \supset E64(x)$

$P93(x,y) \supset E77(y)$

$P93(x,y) \supset P12(x,y)$

### **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:

$P94(x,y) \supset E65(x)$

$P94(x,y) \supset E28(y)$

$P94(x,y) \supset P92(x,y)$

### **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:

$P95(x,y) \supset E66(x)$

$P95(x,y) \supset E74(y)$

$P95(x,y) \supset P92(x,y)$

### **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:

$P96(x,y) \supset E67(x)$   
 $P96(x,y) \supset E21(y)$   
 $P96(x,y) \supset P11(x,y)$

### **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:

$P97(x,y) \supset E67(x)$   
 $P97(x,y) \supset E21(y)$

### **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 E67 Birth 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:

$P98(x,y) \supset E67(x)$   
 $P98(x,y) \supset E21(y)$   
 $P98(x,y) \supset P92(x,y)$

### **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:

$P99(x,y) \supset E68(x)$   
 $P99(x,y) \supset E74(y)$   
 $P99(x,y) \supset P11(x,y)$   
 $P99(x,y) \supset P93(x,y)$

### **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:

$P100(x,y) \supset E69(x)$   
 $P100(x,y) \supset E21(y)$   
 $P100(x,y) \supset P93(x,y)$   
 $P101(x,y) \supset E70(x)$   
 $P101(x,y) \supset E55(y)$

### **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:

$P101(x,y) \supset E70(x)$

$P101(x,y) \supset E55(y)$

### **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:

$P102(x,y) \supset E71(x)$

$P102(x,y) \supset E35(y)$

$P102(x,y,z) \supset [P102(x,y) \wedge E55(z)]$

$P102(x,y) \supset P1(x,y)$

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:

$P103(x,y) \supset E71(x)$

$P103(x,y) \supset E55(y)$

### **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:

$P104(x,y) \supset E72(x)$

$P104(x,y) \supset E30(y)$

### **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:

$P105(x,y) \supset E72(x)$

$P105(x,y) \supset E39(y)$

### **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:

$P106(x,y) \supset E90(x)$

$P106(x,y) \supset E90(y)$

### **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:

$P107(x,y) \supset E74(x)$

$P107(x,y) \supset E39(y)$

$P107(x,y,z) \supset [P107(x,y) \wedge E55(z)]$

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): [E18](#) Physical 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:

$P108(x,y) \supset E12(x)$

$P108(x,y) \supset E24(y)$

$P108(x,y) \supset P31(x,y)$

$P108(x,y) \supset P92(x,y)$

### **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:

$P109(x,y) \supset E78(x)$   
 $P109(x,y) \supset E39(y)$   
 $P109(x,y) \supset P49(x,y)$

### **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): [E18](#) Physical 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:

$P110(x,y) \supset E79(x)$   
 $P110(x,y) \supset E24(y)$   
 $P110(x,y) \supset P31(x,y)$

### **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:

$P111(x,y) \supset E79(x)$   
 $P111(x,y) \supset E18(y)$   
 $P111(x,y) \supset P12(x,y)$   
 $P111(x,y) \supset P16(x,y)$

### **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): [E18](#) Physical 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:

$P112(x,y) \supset E80(x)$   
 $P112(x,y) \supset E24(y)$   
 $P112(x,y) \supset P31(x,y)$

### **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:

$P113(x,y) \supset E80(x)$   
 $P113(x,y) \supset E18(y)$   
 $P113(x,y) \supset P12(x,y)$

### **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:

$P114(x,y) \supset E2(x)$   
 $P114(x,y) \supset E2(y)$   
 $P114(x,y) \supset P114(y,x)$

### **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:

$P115(x,y) \supset E2(x)$

$P115(x,y) \supset E2(y)$

### **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:

$P116(x,y) \supset E2(x)$

$P116(x,y) \supset E2(y)$

### **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:

$P117(x,y) \supset E2(x)$

$P117(x,y) \supset E2(y)$

### **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:

$P118(x,y) \supset E2(x)$   
 $P118(x,y) \supset E2(y)$

### **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:

$P119(x,y) \supset E2(x)$   
 $P119(x,y) \supset E2(y)$

### **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:

$P120(x,y) \supset E2(x)$

$P120(x,y) \supset E2(y)$

### **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:

$P121(x,y) \supset E53(x)$

$P121(x,y) \supset E53(y)$

$P121(x,y) \supset P121(y,x)$

### **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:

$P122(x,y) \supset E53(x)$

$P122(x,y) \supset E53(y)$

$P122(x,y) \supset P122(y,x)$

### **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:

$P123(x,y) \supset E81(x)$   
 $P123(x,y) \supset E77(y)$   
 $P123(x,y) \supset P92(x,y)$

### **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 Pharaoh Tut-Ankh-Amun (E21)

In First Order Logic:

$P124(x,y) \supset E81(x)$   
 $P124(x,y) \supset E77(y)$   
 $P124(x,y) \supset P93(x,y)$

### **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:

$P125(x,y) \supset E7(x)$   
 $P125(x,y) \supset E55(y)$

### **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:

$P126(x,y) \supset E11(x)$

$P126(x,y) \supset E57(y)$

### **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:

$P127(x,y) \supset E55(x)$

$P127(x,y) \supset E55(y)$

### **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:

$P128(x,y) \supset E18(x)$

$P128(x,y) \supset E90(y)$

$P128(x,y) \supset P130(x,y)$

### **P129 is about (is subject of)**

Domain: [E89](#) Propositional Object  
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 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:

$P129(x,y) \supset E89(x)$

$P129(x,y) \supset E1(y)$

$P129(x,y) \supset P67(x,y)$

### **P130 shows features of (features are also found on)**

Domain: [E70](#) Thing

Range: [E70](#) Thing

Superproperty of: [E33](#) Linguistic Object. [P73i](#) 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:

$P130(x,y) \supset E70(x)$

$P130(x,y) \supset E70(y)$

$P130(x,y,z) \supset [P130(x,y) \wedge E55(z)]$

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:

$P131(x,y) \supset E39(x)$

$P131(x,y) \supset E82(y)$

$P131(x,y) \supset P1(x,y)$

### **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.

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:

$P132(x,y) \supset E92(x)$

$P132(x,y) \supset E92(y)$

$P132(x,y) \supset P132(y,x)$

$P132(x,y) \supset \neg P133(x,y)$

### **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:

$P133(x,y) \supset E92(x)$   
 $P133(x,y) \supset E92(y)$   
 $P133(x,y) \supset P133(y,x)$   
 $P133(x,y) \supset \neg P132(x,y)$

### **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:

$P134(x,y) \supset E7(x)$   
 $P134(x,y) \supset E7(y)$   
 $P134(x,y) \supset P15(x,y)$

### **P135 created type (was created by)**

Domain: [E83](#) Type Creation  
Range: [E55](#) Type  
Subproperty of: [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 E83 Type 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:

$P135(x,y) \supset E83(x)$   
 $P135(x,y) \supset E55(y)$



$P135(x,y) \supset P94(x,y)$

### **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:

$P136(x,y) \supset E83(x)$   
 $P136(x,y) \supset E1(y)$   
 $P136(x,y,z) \supset [P136(x,y) \wedge E55(z)]$   
 $P136(x,y) \supset P15(x,y)$

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:

$P137(x,y) \supset E1(x)$   
 $P137(x,y) \supset E55(y)$   
 $P137(x,y,z) \supset [P137(x,y) \wedge E55(z)]$   
 $P137(x,y) \supset P2(x,y)$

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 *P62 depicts (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](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 (E22) 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:

$P138(x,y) \supset E36(x)$   
 $P138(x,y) \supset E1(y)$   
 $P138(x,y,z) \supset [P138(x,y) \wedge E55(z)]$   
 $P138(x,y) \supset P67(x,y)$

### **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:

$P139(x,y) \supset E41(x)$   
 $P139(x,y) \supset E41(y)$   
 $P139(x,y,z) \supset [P139(x,y) \wedge E55(z)]$   
 $P139(x,y) \supset P139(y,x)$

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:

$P140(x,y) \supset E13(x)$

$P140(x,y) \supset E1(y)$

### **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:

$P141(x,y) \supset E13(x)$

$P141(x,y) \supset E1(y)$

### **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:

$P142(x,y) \supset E15(x)$   
 $P142(x,y) \supset E90(y)$   
 $P142(x,y) \supset P16(x,y)$

### 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:

$P143(x,y) \supset E85(x)$   
 $P143(x,y) \supset E39(y)$   
 $P143(x,y) \supset P11(x,y)$

### 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:

$P144(x,y) \supset E85(x)$   
 $P144(x,y) \supset E74(y)$   
 $P144(x,y,z) \supset [P144(x,y) \wedge E55(z)]$   
 $P144(x,y) \supset P11(x,y)$

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:

$P145(x,y) \supset E86(x)$   
 $P145(x,y) \supset E39(y)$   
 $P145(x,y) \supset P11(x,y)$

### **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:

$P146(x,y) \supset E86(x)$   
 $P146(x,y) \supset E74(y)$   
 $P146(x,y) \supset P11(x,y)$

### **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:

$P147(x,y) \supset E87(x)$   
 $P147(x,y) \supset E78(y)$

### **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:

$P148(x,y) \supset E89(x)$   
 $P148(x,y) \supset E89(y)$

### **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:

$P149(x,y) \supset E28(x)$

P149(x,y)  $\supset$  E75(y)  
P149(x,y)  $\supset$  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)  $\supset$  (E55 Type)  
P150(x,y)  $\supset$  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)  $\supset$  E66(x)  
P151(x,y)  $\supset$  E74(y)  
P151(x,y)  $\supset$  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:

$P152(x,y) \supset E21(x)$

$P152(x,y) \supset E21(y)$

### **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:

$P156(x,y) = [E18(x) \wedge E53(y) \wedge P161(x,y) \wedge P157(y,x)]$

### **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:

$P157(x,y) \supset E53(x)$

$P157(x,y) \supset E18(y)$

### **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:

$P160(x,y) \supset E92(x)$

$P160(x,y) \supset E52(y)$

### **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 *P7 took place at (witnessed.)*

Example:

The Roman Empire *P161* has spatial projection all areas ever claimed by Rome .

In First Order Logic:

$P161(x,y) \supset E92(x)$ ,                       $P161(x,y) \supset E53(y)$

### **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:

$P164(x,y) \supset E93(x)$

$P164(x,y) \supset E52(y)$

### **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 a manuscript page, if the respective text is defined as a sequence of symbols of a particular type, such as Latin characters, and the resolution and quality of the digital image is sufficient to resolve these symbols so they are readable on the digital image.

Examples:

- The content of Charles-Moïse Briquet's 'Les Filigranes: dictionnaire historique des marques du papier' ([E32](#)) [P165](#) incorporates the visual aspect of the watermark used around 1358-61 by some

Spanish papermaker(s) and identified as ‘Briquet 4019’ (E37)

- The visual content of Jacopo Amigoni’s painting known as ‘The Singer Farinelli and friends’ (E38) *P165 incorporates* the musical notation of Farinelli’s musical work entitled ‘La Partenza’ (E73)
- The visual content of Nicolas Poussin’s painting entitled ‘Les Bergers d’Arcadie’ (E38) *P165 incorporates* the Latin phrase ‘Et in Arcadia ego’ (E33)

In First Order Logic:

$P165(x,y) \supset E73(x)$   
 $P165(x,y) \supset E90(y)$   
 $P165(x,y) \supset P106(x,y)$

### **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:

$P166(x,y) \supset E93(x)$ ,  
 $P166(x,y) \supset E92(y)$ ,  
 $P166(x,y) \supset P10(x,y)$

### **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:

$P167(x,y) \supset E93(x)$ ,  $P167(x,y) \supset E53(y)$ ,  $P167(x,y) \supset (\exists z)[E53(z) \wedge P161(x,z) \wedge P89(z,y)]$

### **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:

$P168(x,y) \supset E53(x)$

$P168(x,y) \supset E94(y)$

### **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: [E61](#) Time 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 with the end of (ends after or with 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}



Figure 1: Temporal entity A starts before or with the end of temporal entity B. Here A is longer than B



Figure 2: Temporal entity A starts before or with the end of temporal entity B. Here A is shorter than B

### **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



Figure 3: Temporal entity A starts before the end of temporal entity B. Here A is longer than B



Figure 4: Temporal entity A starts before the end of temporal entity B. Here A is shorter than B

**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}



Figure 5: Temporal entity A starts before or with the start of temporal entity B. Here A is longer than B



Figure 6: Temporal entity A starts before or with the start of temporal entity B. Here A is shorter than B

### 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}



Figure 7: Temporal entity A starts before the start of temporal entity B. Here A is longer than B

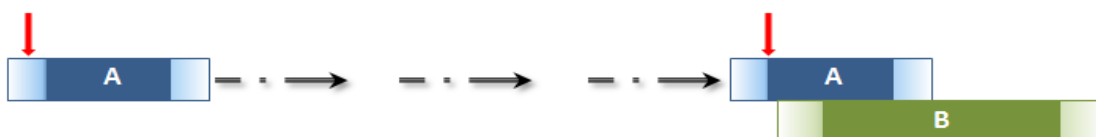


Figure 8: Temporal entity A starts before the start of temporal entity B. Here A is shorter than B

### P177 ends within (includes the end of)

Deprecated, use P185 ends before or with the start of (starts after or with the end of) instead

### P178 ends after or with (ends before or at the end of)

Deprecated, P184 ends before or with the end of (ends with or after the end of) instead

### 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: [E54](#) Dimension. [P91](#) has unit (is unit of):[E58](#) Measurement Unit

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: [E54](#) Dimension .[P90](#) has value:[E60](#) Number

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 }



Figure 9: Temporal entity A ends before or with the start of temporal entity B. Here A is longer than B



Figure 10: Temporal entity A ends before or with the start of temporal entity B. Here A is shorter



than B

### 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  $A = [A^{\text{start}}, A^{\text{end}}]$  and  $B = [B^{\text{start}}, B^{\text{end}}]$ , we mean  $A^{\text{end}} < B^{\text{start}}$  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}

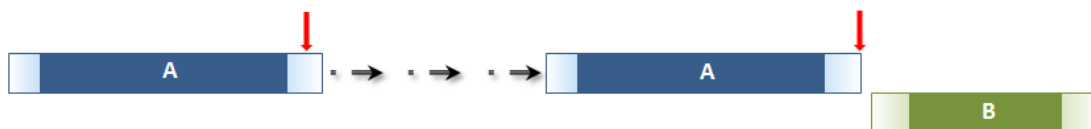


Figure 11: Temporal entity A ends before the start of temporal entity B. Here A is longer than B



Figure 12: Temporal entity A ends before the start of temporal entity B. Here A is shorter than B

### 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  $A = [A^{\text{start}}, A^{\text{end}}]$  and  $B = [B^{\text{start}}, B^{\text{end}}]$ , we mean  $A^{\text{end}} \leq B^{\text{end}}$  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}



Figure 13: Temporal entity A ends before or with the end of temporal entity B. Here A is longer than B



Figure 14: Temporal entity A ends before or with the end of temporal entity B. Here A is shorter than B

### 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 }

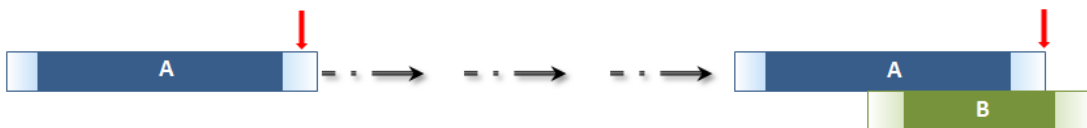


Figure 15: Temporal entity A ends before the end of temporal entity B. Here A is longer than B



Figure 16: Temporal entity A ends before the end of temporal entity B. Here A is shorter than B

### 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).

### **P187 has production plan (is production plan for)**

Domain: E99 Product Type  
Range: E29 Design or Procedure

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

Scope note: This property associates an instance of E99 Product Type with an instance of E29 Design or Procedure that completely determines the production of instances of E18 Physical Thing. The resulting instances of E18 Physical Thing are considered exemplars of this instance of E99 Product Type when the process specified is correctly executed. Note that the respective instance of E29 Design or Procedure may not necessarily be fixed in a written/graphical form, and may require the use of tools or models unique to the product type. The same E99 Product Type may be associated with several variant plans.

Examples:

- the production plans (E29) for Volkswagen Type 11 (Beetle) (E99)

### **P188 requires production tool (is production tool for)**

Domain: E99 Product Type  
Range: E19 Physical Object

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

Scope note: This property associates an instance of E99 Product Type with an instance of E19 Physical Object that is needed for the production of an instance of E18 Physical Thing. When the process of production is correctly executed in accordance with the plan and using the specified instance of E19 Physical Object, the resulting instance of E18 Physical Thing is considered an exemplar of this instance of E99 Product Type. The instance of E19 Physical Object may bear distinct features that are transformed into characteristic features of the resulting instance of E18 Physical Thing. Examples include models and moulds.

Examples:

- the luggage compartment lid mould (E19) for the Volkswagen Type 11 (Beetle) (E99) ([https://upload.wikimedia.org/wikipedia/commons/thumb/b/b5/Volkswagen\\_Type\\_1\\_\(Auto\\_classique\\_St.\\_Lazare\\_%2710\).jpg/220px-Volkswagen\\_Type\\_1\\_\(Auto\\_classique\\_St.\\_Lazare\\_%2710\).jpg](https://upload.wikimedia.org/wikipedia/commons/thumb/b/b5/Volkswagen_Type_1_(Auto_classique_St._Lazare_%2710).jpg/220px-Volkswagen_Type_1_(Auto_classique_St._Lazare_%2710).jpg))

### **P189 approximates**

Domain: E53 Place  
Range: E53 Place  
Quantification: many to one (0,1:0,n)

Scope note: This property associates an instance of E53 Place with another instance of E53 Place, which is defined in the same reference space, and which is used to approximate the former. The property does not necessarily state the quality or accuracy of this approximation, but rather indicates the use of the first instance of place to approximate the second.

In common documentation practice, find or encounter spots e.g. in archaeology, botany or zoology are often related to the closest village, river or other named place without detailing the relation, e.g. if it is

located within the village or in a certain distance of the specified place. In this case the stated “phenomenal” place found in the documentation can be seen as approximation of the actual encounter spot without more specific knowledge.

In more recent documentation often point coordinate information is provided that originates from GPS measurements or georeferencing from a map. This point coordinate information does not state the actual place of the encounter spot but tries to approximate it with a “declarative” place. The accuracy depends on the methodology used when creating the coordinates. It may be dependent on technical limitations like GPS accuracy but also on the method where the GPS location is taken in relation to the measured feature. If the methodology is known a maximum deviation from the measured point can be calculated and the encounter or feature may be related to the resulting circle using the P171 at some place within property.

Examples:

In First Order Logic:

$P189(x,y) \supset E53(x)$

$P189(x,y) \supset E53(y)$

$P189(x,y,z) \supset [P189(x,y) \wedge E55(z)]$

Properties: P189.1 has type: [E55](#) Type

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# APPENDIX

## Editorial notes

Editors:	Nick Crofts City of Geneva, Geneva, Switzerland	Martin Doerr, ICS-FORTH, Heraklion-Crete, Greece	Tony Gill RLG, Mountain View, CA, USA	Stephen Stead, Paveprime Ltd, London UK	Matthew Stiff English Heritage Swindon, UK
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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 Joint 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 subproperty 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 as signs (is assigned by): E42 Object identifier

has been renamed to :

E15 Identifier Assignment. P37 as signed (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 occurred 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 took place in Zagreb Croatia on May 25<sup>th</sup> and 27<sup>th</sup>, 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 took 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 took 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 4<sup>th</sup> 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 17<sup>th</sup> 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 17<sup>th</sup> century lament cloth at the Museum Benaki, Athens
- Assigning the author-uniform title heading “Goethe, Johann Wolfgang von, 1749-1832. Faust. 1. Teil.” 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 **can**not 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.I 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 Sergeyeovich Gorbachev as leader of the Union of Soviet Socialist Republics (USSR) in 1985 *joined* Mikhail Sergeyeovich 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 Sergeyeovich 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 16<sup>th</sup> 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**

The 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 17<sup>th</sup> century lament cloth at the Museum Benaki, Athens

AFTER

- Replacement of the inventory number TA959a by GE34604 for a 17<sup>th</sup> 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 comprises 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 17<sup>th</sup> 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. *P21 had 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 17<sup>th</sup> 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. 2<sup>nd</sup> 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 foreseen 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.

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	- - - - - - <i>Production</i>
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	- - - - - <i>Physical Man-Made Thing</i>

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	- - <i>has produced (was produced by)</i>	<i>E12 Production</i>	<i>E24 Physical Man-Made Thing</i>
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	- <i>used specific object (was used for)</i>	<i>E7 Activity</i>	<i>E70 Thing</i>
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 Assignment	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.

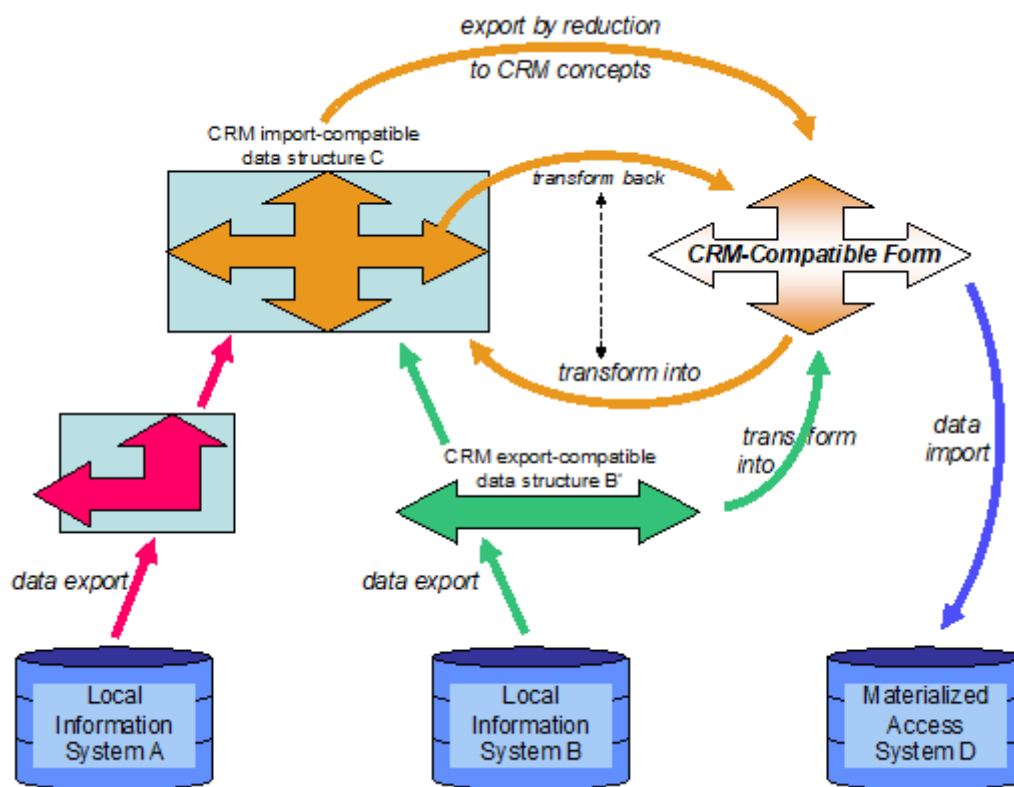
Some local information systems are likely to focus on specialized subject areas, such as inscriptions. For these

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", "ObjectName", 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 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".

## **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 Sergeevich 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

## **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 first 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 subproperty 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 17<sup>th</sup> century lament cloth at the Museum Benaki, Athens

AFTER

replacement of the inventory number TA959a by GE34604 for a 17<sup>th</sup> century lament cloth at the Museum Benaki, Athens:

It was corrected to

BEFORE

replacement of the inventory number TA959a by GE34604 for a 17<sup>th</sup> century lament cloth at the Museum Benaki, Athens

AFTER

Replacement of the inventory number TA959a by GE34604 for a 17<sup>th</sup> century lament cloth at the Museum Benaki, Athens

Page 112: P105 has been superclass 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 from:

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”

Page 14: 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.

<i>Page no.</i>	<i>Entity / Property code</i>
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 fourth paragraph of the scope note of E11 Modification has been changed

**From:** “If the instance of the E29 Design or Procedure utilized 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](http://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 changes were 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) is A 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: [ESS 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 foreseen 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 xv: 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:**

## 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 *P62 depicts (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 *P62 depicts (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](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-Bohømen” 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-Bohømen” 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 6<sup>th</sup> and 9<sup>th</sup> 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 Is A 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 occupies*’, ‘*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 paragraph 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 paragraph 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 'E21 Person' through 'P98i was born', 'E67 Birth', 'P96 by mother' to 'E21 Person', and from 'E21 Person' 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 scope note 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 33<sup>rd</sup> 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 33<sup>rd</sup> 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 33<sup>rd</sup> 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 33<sup>rd</sup> 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 33<sup>rd</sup> 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 33<sup>rd</sup> 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

**To:** [P161](#) has spatial projection: [E53](#) Place

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 33<sup>rd</sup> 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 constituting 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:  $E93(x) \supset E92(x)$

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 constituting 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:  $E93(x) \supset E92(x)$

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 33<sup>rd</sup> 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">  
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:  $E94(x) \supset E59(x)$

## P7 took place at (witnessed)

In 33<sup>rd</sup> 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:  $P7(x,y) \supset E4(x)$

$P7(x,y) \supset E53(y)$



**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. *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 (contains)* to E53 Place. **Describe in words.**

Examples:

- the period “Révolution française” (E4) *took place at* France (E53)

In First Order Logic:  $P7(x,y) \supset E4(x)$   
 $P7(x,y) \supset E53(y)$

## ***P8 took place on or within (witnessed)***

In 33<sup>rd</sup> 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 33<sup>rd</sup> 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:  $P9(x,y) \supset E4(x)$

$P9(x,y) \supset E4(y)$

$P9(x,y) \supset P10(y,x)$

**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 33<sup>rd</sup> 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:  $P10(x,y) \supset E4(x)$

$P10(x,y) \supset E4(y)$

**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:  $P10(x,y) \supset E92(x)$   
 $P10(x,y) \supset E92(y)$

### ***P25 moved (moved by)***

In 33<sup>rd</sup> 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 33<sup>rd</sup> 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:  $P26(x,y) \supset E9(x)$   
 $P26(x,y) \supset E53(y)$   
 $P26(x,y) \supset P7(x,y)$

#### **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:

$P26(x,y) \supset E9(x)$   
 $P26(x,y) \supset E53(y)$   
 $P26(x,y) \supset (\exists z)[E53(z) \wedge P7(x,z) \wedge P89(y,z)]$

### ***P27 moved from (was origin of)***

In 33<sup>rd</sup> 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:  $P27(x,y) \supset E9(x)$   
 $P27(x,y) \supset E53(y)$   
 $P27(x,y) \supset P7(x,y)$

#### **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:

$P27(x,y) \supset E9(x)$   
 $P27(x,y) \supset E53(y)$   
 $P27(x,y) \supset (\exists z)[E53(z) \wedge P7(x,z) \wedge P89(y,z)]$

### ***P46 is composed of (forms part of)***

In 33<sup>rd</sup> 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 33<sup>rd</sup> 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 E1 CRM 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 33<sup>rd</sup> 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 33<sup>rd</sup> 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:  $P132(x,y) \supset E4(x)$

$P132(x,y) \supset E4(y)$

$P132(x,y) \supset P132(y,x)$

**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:

$P132(x,y) \supset E92(x)$   
 $P132(x,y) \supset E92(y)$   
 $P132(x,y) \supset P132(y,x)$

## ***P133 is separated from***

In 33<sup>rd</sup> 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:  $P133(x,y) \supset E4(x)$   
 $P133(x,y) \supset E4(y)$   
 $P133(x,y) \supset P133(y,x)$

### **To:**

Domain: [E92 Spacetime Volume](#)  
Range: [E92 Spacetime Volume](#)

In First Order Logic:

$P133(x,y) \supset E92(x)$   
 $P133(x,y) \supset E92(y)$   
 $P133(x,y) \supset P133(y,x)$

## ***P156 occupies***

In 33<sup>rd</sup> 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 '~~P150 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:  $P156(x,y) \supset E18(x)$   
 $P156(x,y) \supset E53(y)$

**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 Is A 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:  $P156(x,y) = [E18(x) \wedge E53(y) \wedge P161(x,y) \wedge P157(y,x)]$

### ***P160 has temporal projection***

In 33<sup>rd</sup> 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 33<sup>rd</sup> 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**

Superproperty 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:  $P161(x,y) \supset E92(x)$   
 $P161(x,y) \supset E53(y)$

**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 33<sup>rd</sup> 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:  $P164(x,y) \supset E93(x)$   
 $P164(x,y) \supset E52(y)$

**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:  $P164(x,y) \supset E93(x)$   
 $P164(x,y) \supset E52(y)$

### **P166 was a presence of (had presence)**

In 33<sup>rd</sup> 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 33<sup>rd</sup> 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 33<sup>rd</sup> 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 occupys(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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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:

$P130(x,y) \supset E70(x)$   
 $P130(x,y) \supset E70(y)$   
 $P130(x,y,z) \supset [P130(x,y) \wedge E55(z)]$   
 $P130(x,y) \supset P130(y,x)$

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:

$P130(x,y) \supset E70(x)$   
 $P130(x,y) \supset E70(y)$   
 $P130(x,y,z) \supset [P130(x,y) \wedge E55(z)]$   
 **$P130(x,y) \supset P130(y,x)$**

## Transitive properties

In 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 transitive.”

## P132 overlaps with

In 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 34<sup>th</sup> CRM-SIG and 27<sup>th</sup> 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 administering 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 it 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 through 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 be 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

Resolving the issue 276 the scope note of E10 has been changed. This change was left out of the amendments of the affected version 6.2.1. while the scope note of E10 has been changed in the text of version 6.2.1.

#### P130 shows features of (features are also found on)

Resolving the issue 276 the definition of P130 has been changed.

FROM:

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:

$P130(x,y) \supset E70(x)$

$P130(x,y) \supset E70(y)$

$P130(x,y,z) \supset [P130(x,y) \wedge E55(z)]$

**$P130(x,y) \supset P130(y,x)$**

Properties: P130.1 kind of similarity: [E55](#) Type

TO:

Superproperty of: [E33](#) Linguistic Object. [P73i](#) 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.

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 of (E55)

In First Order Logic:

$E55(z)$        $P130(x,y) \supset E70(x)$ ,       $P130(x,y) \supset E70(y)$ ,       $P130(x,y,z) \supset [P130(x,y) \wedge$

Properties:      P130.1 kind of similarity: [E55](#) Type

## **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/EPSSG/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/EPSSG/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: E98 Currency with the following definition

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 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:

$P130(x,y) \supset E70(x)$   
 $P130(x,y) \supset E70(y)$   
 $P130(x,y,z) \supset [P130(x,y) \wedge E55(z)]$   
 **$P130(x,y) \supset P130(y,x)$**

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:

$$P130(x,y) \supset E70(x),$$
$$P130(x,y) \supset E70(y),$$
$$P130(x,y,z) \supset [P130(x,y) \wedge E55(z)]$$

### **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:

$$P132(x,y) \supset E92(x)$$
$$P132(x,y) \supset E92(y)$$
$$P132(x,y) \supset P132(y,x)$$

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:

$$P132(x,y) \supset E92(x)$$
$$P132(x,y) \supset E92(y)$$
$$P132(x,y) \supset P132(y,x)$$

$P132(x,y) \supset \neg P133(x,y)$

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:

$P161(x,y) \supset E92(x)$

$P161(x,y) \supset E53(y)$

**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.

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:

$P161(x,y) \supset E92(x)$ ,

$P161(x,y) \supset E53(y)$

#### **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:

$P166(x,y) \supset E93(x)$

$P166(x,y) \supset E92(y)$

## 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:

$P166(x,y) \supset E93(x), \quad P166(x,y) \supset E92(y), \quad P166(x,y) \supset P10(x,y)$

## 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:

$P167(x,y) \supset E93(x)$

$P167(x,y) \supset E53(y)$

### 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:  $P167(x,y) \supset E93(x)$ ,  $P167(x,y) \supset E53(y)$ ,  $P167(x,y) \supset (\exists z)[ E53(z) \wedge P161(x,z) \wedge P89(z,y)]$

### **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)

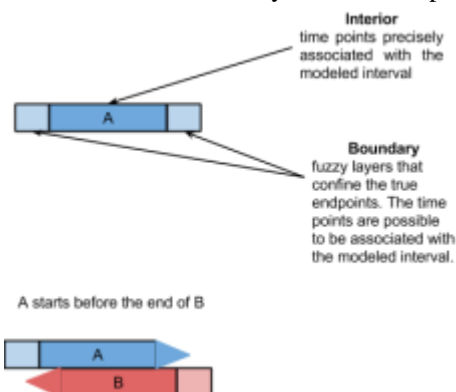
Scope note:

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 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

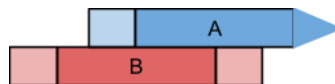
Domain: E2 Temporal Entity  
 Range: E2 Temporal Entity  
 Subproperty of: E7 Activity. P173 starts before the end of (ends after the start of): E7 Activity  
 Quantification: many to many (0,n;0,n)  
 Scope note:

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

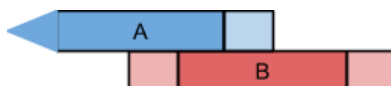
Quantification: many to many (0,n;0,n)

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** ( $A^{\text{end}} < B^{\text{end}}$  &  $A^{\text{end}} > B^{\text{start}}$ )

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 by P 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.

### 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 14<sup>th</sup> 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 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.

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 in 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 in 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: ???

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*)

## **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.”

### 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 Dimension 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

### **E81 Transformation**

The sig resolving the issue 287 made changes to the first paragraph of the scope note E81.

FROM:

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

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 or identity

### **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 administrative 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

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)

### **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 14<sup>th</sup> 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. *P7 took 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 14<sup>th</sup> 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.

### **P165 incorporates (is incorporated in)**

Resolving the *issue 227*, the scope note of P165 has been changed

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.

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

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**

“An incorporation is a media representation as the term is defined in Elleström (2014). The representation can be more or less altered, but central aspects must be clearly distinguishable in the incorporation. Aspects seen as less central can be altered or removed altogether. In the case of a photograph of a manuscript page, the visual form of the strokes making up letters are clearly visible, while the smell and weight of the manuscript page is not reproduced. In the normal use of facsimiles where the visual form is seen as a central aspect while smell and weight are not, this photograph represents an incorporation of the manuscript page.”

### **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 Place'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)) (E<sub>xx</sub>)

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 Place'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)) (E<sub>94</sub>)

### **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 Volks wagen factory during 1949-1953 (E12) *produced thing of product type* Volks wagen Type 11 (Beetle) (E99).

### P173 starts before the end of (ends after the start of)

The sig, resolving the *issue 309*, changed the property P173 starts before the end of (ends after the start of)

**From:**

#### *P173 starts before the end of (ends after the start of)*

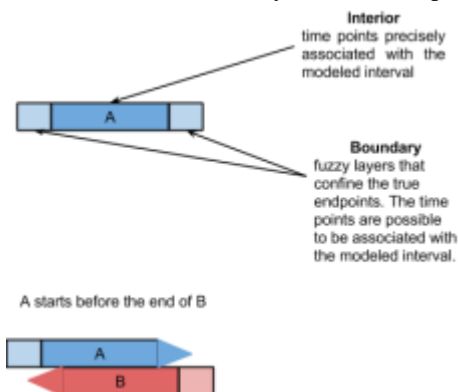
**From:**

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 equality operator does not violate the initial temporal condition of continuation in time, since it refers to fuzzy zones overlap.



**To:**

**P173 starts before or at the end of (ends after or with 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)

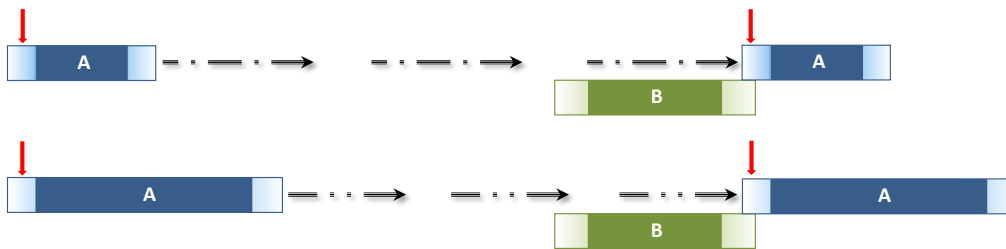
Scope note:

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 (starts after the start of)**

The sig, resolving the *issue 309*, changed the property P174 starts before (starts after the start of)

From:

**P174 starts before (starts after the start of)**

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.



To:

**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:

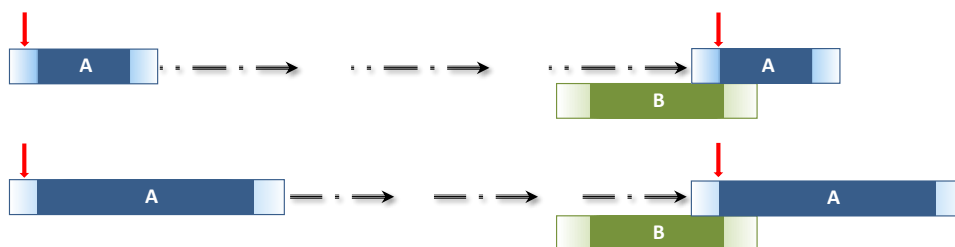
This property specifies that the temporal extent of the domain instance A of E2 Temporal Entity starts definitely before the end of the temporal extent of the range instance B of E2 Temporal Entity.

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 is continued by someone else, or the knowledge of a defeat on a distant battlefield causes people end their ongoing activities.



### **P175 starts within (includes the start of)**

The sig, resolving the *issue 309*, changed the property P175 starts within (includes the start of)

**From :**

### **P175 starts within (includes the start of)**

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

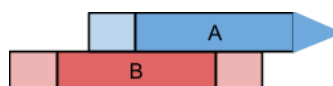
Subproperty of: E7 Activity. P173 starts before the end of (ends after the start of): E7 Activity

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.



**TO:**



**P175 starts before or with the start of (starts after or with 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)

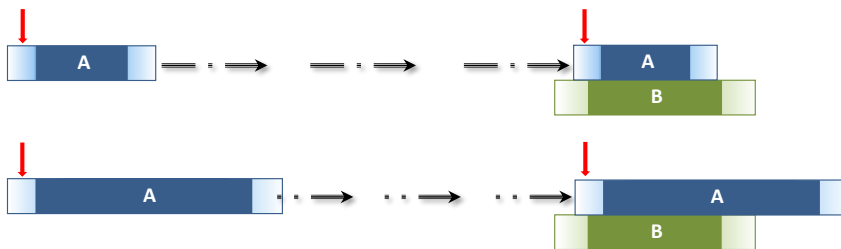
Scope note:

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 ends before (starts after the end of)**

The sig, resolving the *issue 309*, changed the property P176 ends before (starts after the end of)  
From:

**P176 ends before (starts after the end of)**

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.



TO:

**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

## 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)

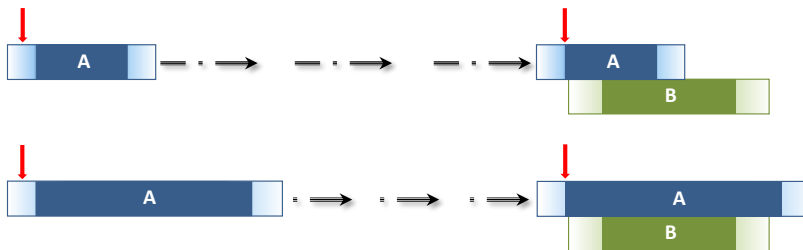
### Scope note:

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 }



### **P177 ends within (includes the end of)**

The sig, resolving the *issue 309*, deprecated the property P177

### **P178 ends after or with (ends before or at the end of)**

The sig, resolving the *issue 309*, deprecated the property P178

### **P182 ends before or at the start of (starts after or with the end of)**

The sig, resolving the *issue 309*, added the following property

### ***P182 ends before or at the start of (starts after or with 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)

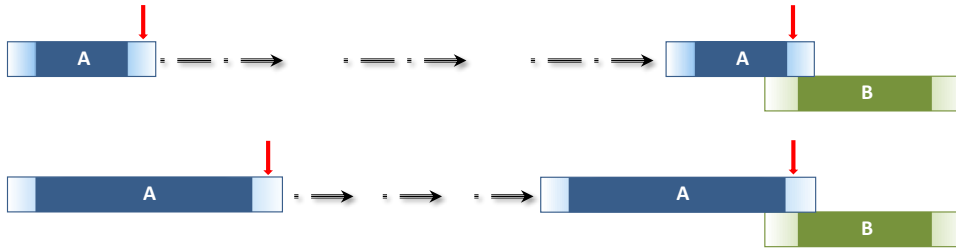
### Scope note:

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)**

The sig, resolving the *issue 309*, added the following property

**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)

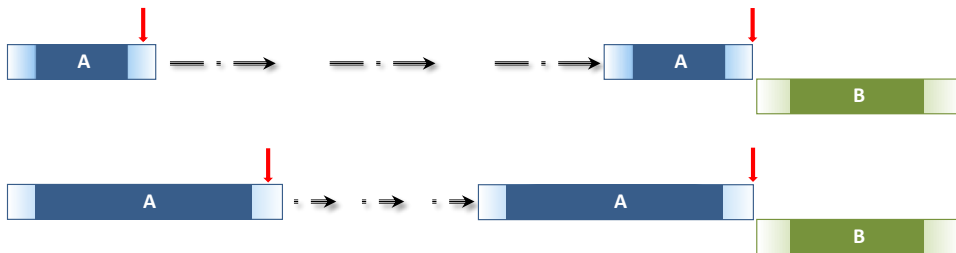
Scope note:

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)**

The sig, resolving the *issue 309*, added the following property

**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)

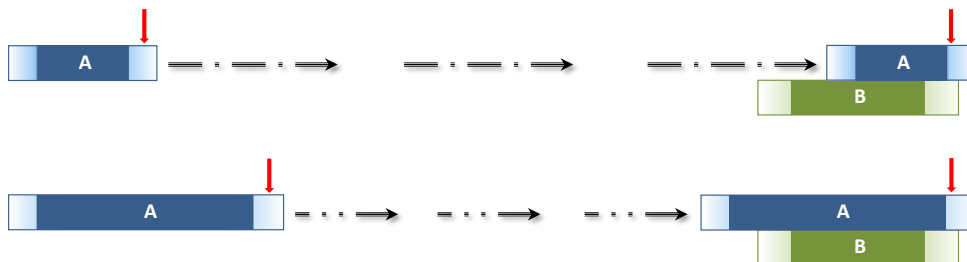
Scope note:

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)**

The sig, resolving the *issue 309*, added the following property

**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)

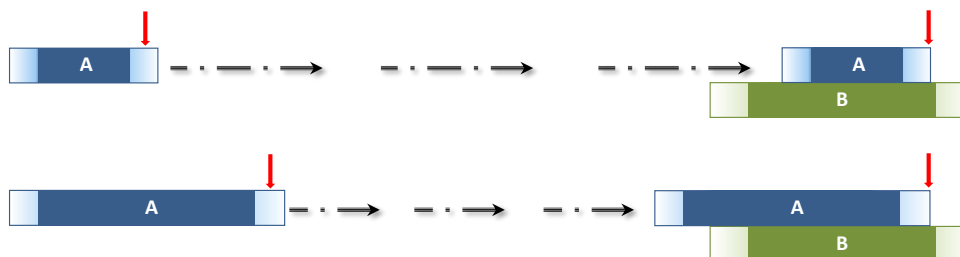
Scope note:

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 }



## Proofreading:

P132 spatiotemporally overlaps with: the property labels in the first two examples are corrected

## **38th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 30th FRBR - CIDOC CRM Harmonization meeting**

### **E16 Measurement**

The crm-sig resolving the issue 307 added the following examples:

- The pixel size of the jpeg version of Titian's painting Bacchus and Ariadne from 1520–3, as freely downloadable from the National Gallery in London's web page  [<https://www.nationalgallery.org.uk/paintings/titian-bacchus-and-ariadne>](https://www.nationalgallery.org.uk/paintings/titian-bacchus-and-ariadne) is 581600 pixels.
- The scope note of E21 Person in the Definition of the CIDOC Conceptual Reference Model Version 5.0.4 as downloaded from  [<http://www.cidoc-crm.org/sites/default/files/cidoc\\_crm\\_version\\_5.0.4.pdf>](http://www.cidoc-crm.org/sites/default/files/cidoc_crm_version_5.0.4.pdf) consists of 77 words.

### **E49 Time Appellation**

The crm-sig resolving the *issue 260* changed the definition of E49

FROM:

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]
- "1<sup>st</sup> half of the XX century"
- "Quaternary"
- "1215 Hegira" [a date in the Islamic calendar]
- "Last century"

TO:

Subclass of: E41 Appellation

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”
- “2013-10-05”
- “Mon May 19 22:39:23 CET 2014”

### **E50 Date**

The crm-sig resolving the *issue 260* marked obsolete the E50.

### **E61 Time Primitive**

The crm-sig resolving the *issue 275* changed the scope note of E61

From

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 as 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.

To:

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 Entity, 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 temporal entity.  
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 as 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.

### **E99 Product Type**

The crm-sig resolving the *issue 278* changed the scope note of E99

FROM:

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.

TO:

Subclass of: E55 Type

Superclass of:

Scope note: This class comprises types that stand as the models for instances of E22 Man-Made Object that are produced as the result of production activities using plans exact enough to result in one or more series of uniform, functionally and aesthetically identical and interchangeable items. The product type is the intended ideal form of the manufacture process. It is typical of instances of E22 that conform to an instance of E99 Product Type that its component parts are interchangeable with component parts of other instances of E22 made after the model of the same instance of E99. Frequently, the uniform production according to a set E99 Product Type is achieved by creating individual tools, such as moulds 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 uniformity. The product type itself, i.e., the potentially unlimited series of aesthetically 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 which was only triggered once. 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.

## E100 Activity Plan

The crm-sig resolving the issue 333, added the following class to the model

## E100 Activity Plan

Subclass of: E29 Design or Procedure

Superclass of:

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

Examples:

- The disaster plan of Tate Archives in case of the Thames flooding.
- The proposal for conservation work for MS Greek 418 at the Saint Catherine library.

Properties: P? requires event of type (is required by) E55 Type  
P? is assessed by (assesses) I4 Proposition Set

### **E101 Intention to Apply**

The crm-sig resolving the issue 333, added the following class to the model

### **E101 Intention to Apply**

Subclass of: S16 State

Superclass of:

Scope note: This class comprises the mental state of intention or wanting to apply a particular instance of Activity Plan by a particular E39 Actor. This can be understood as the period of time that an individual or a group holds a particular will. It binds the activity plan to the actor. The intention to apply may be abandoned before the realization of the plan. When the plan is realized, the intention to apply must still exist. Characteristically, the passing of a law initiates the intention of a parliament to apply a law. In many cases, the creation of the plan initiates the intention to apply it, and in case of "active plans" the realization ends the intention. Often, the existence of the intention to apply cannot be determined other by the realization of the plan.

Examples:

- The intention of Nicholas Pickwood to undertake conservation work on MS Greek 418 at the Saint Catherine's Library.

Properties:

is intention of: E39 Actor  
is expressed in (expresses): E31 Document  
to apply within : E61 Time Primitive  
initiated by: E7 Activity  
ended by: E7 Activity  
intends to apply: Activity Plan



## ***E102 Expression of Intention (may be not necessary)***

The crm-sig resolving the issue 333, added the following class to the model

### **E102 Expression of Intention**

Subclass of: E31 Document

Superclass of:

Scope note: This class comprises the externalisation, the expression of the Intention to Apply in the form of identifiable immaterial objects, such as texts, that make propositions about these intentions. These are kind of formal texts, legal documents, proceedings, minutes etc. that document the will, the intentions of the actor.

Examples:

Properties:

### **P7 took place at (witnessed)**

Resolving *the issue 234*, the crm-sig changed the second paragraph of the scope note of P7

FROM

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.

TO:

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 from 1837-1901” 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.

### **P165 incorporates (is incorporated in)**

The crm-sig resolved the issue 227 and 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.

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

“An incorporation is a media representation as the term is defined in Elleström (2014). The representation can be more or less altered, but central aspects must be clearly distinguishable in the incorporation. Aspects seen as less central can be altered or removed altogether. In the case of a photograph of a manuscript page, the visual form of the strokes making up letters are clearly visible, while the smell and weight of the manuscript page is not reproduced. In the normal use of facsimiles where the visual form is seen as a central aspect while smell and weight are not, this photograph represents an incorporation of the manuscript page.”

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 a manuscript page, if the respective text is defined as a sequence of symbols of a particular type, such as Latin characters, and the resolution and quality of the digital image is sufficient to resolve these symbols so they are readable on the digital image.

### **P169 defines spacetime volume (spacetime volume is defined by)**

The crm-sig resolving the *issue 275* changed the scope note of P169

FROM:

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 }

TO:

Scope note: This property associates an instance of E95 Spacetime Primitive with the instance of E92 Spacetime Volume it defines.

### **P173 starts before or at the end of (ends with or after the start of)**

Resolving the issue 309, the crm-sig changed the title of the property to:

P173 starts before or with the end of (ends after or with the start of)

### **P175 starts before or with the start of (starts with or after the start of)**

Resolving the issue 309, the crm-sig changed the title of the property to:

P175 starts before or with the start of (starts after or with the start of)

### **P182 ends before or at the start of (starts with or after the end of)**

Resolving the issue 309, the crm-sig changed the title of the property to:

P182 ends before or with the start of (starts after or with the end of)

### **P187 has production plan (is production plan for)**

The crm-sig resolving the issue 278 changed added the P187

#### **P187 has production plan (is production plan for)**

Domain: E99 Product Type  
Range: E29 Design or Procedure

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

Scope note: This property associates an instance of E99 Product Type with an instance of E29 Design or Procedure that completely determines the production of instances of E18 Physical Thing. The resulting instances of E18 Physical Thing are considered exemplars of this instance of E99 Product Type when the process specified is correctly executed. Note that the respective instance of E29 Design or Procedure may not necessarily be fixed in a written/graphical form, and may require the use of tools or models unique to the product type. The same E99 Product Type may be associated with several variant plans.

Examples:

- the production plans (E29) for Volkswagen Type 11 (Beetle) (E99)

### **P188 requires production tool (is production tool for)**

The crm-sig resolving the issue 278 changed added the P188

#### **P188 requires production tool (is production tool for)**

Domain: E99 Product Type  
Range: E19 Physical Object

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

Scope note: This property associates an instance of E99 Product Type with an instance of E19 Physical Object that is needed for the production of an instance of E18 Physical Thing. When the process of production is correctly executed in accordance with the plan and using the specified instance of E19 Physical Object, the resulting instance of E18 Physical Thing is considered an exemplar of this instance of E99 Product Type. The instance of E19 Physical Object may bear distinct features that are transformed into characteristic features of the resulting instance of E18 Physical Thing. Examples include models and moulds.

Examples:

- the luggage compartment lid mould (E19) for the Volkswagen Type 11 (Beetle) (E99)  
([https://upload.wikimedia.org/wikipedia/commons/thumb/b/b5/Volkswagen\\_Type\\_1\\_\(Auto\\_classique\\_St.\\_Lazare\\_%2710\).jpg/220px-Volkswagen\\_Type\\_1\\_\(Auto\\_classique\\_St.\\_Lazare\\_%2710\).jpg](https://upload.wikimedia.org/wikipedia/commons/thumb/b/b5/Volkswagen_Type_1_(Auto_classique_St._Lazare_%2710).jpg/220px-Volkswagen_Type_1_(Auto_classique_St._Lazare_%2710).jpg))

### **P189 is intention of (has intention)**

The crm-sig resolving the issue 333, added the following property to the model

#### **P189 is intention of (has intention)**

Domain: Intention to Apply

Range: E39 Actor

Quantification: (1,n:0,n)

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

Examples: "A Parliament regarding a law as being decided"

### **P190 is expressed in (expresses)**

The crm-sig resolving the issue 333, added the following property to the model

#### **P190 is expressed in (expresses)**

Domain: Intention to Apply

Range: E31 Document

Quantification:

Scope note: This property associates an Intention to Apply with the externalisation of this intention (Expression) in a document.

Examples:

- The Tate Archives disaster planning document (E31 Document) expresses the intention of undertaking certain actions (E?? Intention to Apply) to save the collection in case of the Thames flooding.

### **P191 to apply within**

The crm-sig resolving the issue 333, added the following property to the model

### **P191 to apply within**

Domain: Intention to Apply

Range: E61 Time Primitive

Quantification: (0,n:0,n)

Scope note: This property associates an instance of EXX Intention to Apply with the time constraint foreseen by the intending party for the actual application of the planned activities. The intending party may vary the time constraint over time. In case a newly set time constraint narrows down a previously set time constraint, one may regard both constraints as being simultaneously true and consistent. In case the newly set time constraint exceeds the previous one (typically delaying the foreseen time of application), we may talk about a modification of the overall intention to apply. This modification should be regarded as an intention in its own right, but being part of an overall instance of EXX Intention to Apply, which continues to be maintained.

Examples: "Law XXX to be in force from 1.1.2018"

To add to scope note: the nature of the time use as declarative

### **P192 initiated by (initiates)**

The crm-sig resolving the issue 333, added the following property to the model

### **P192 initiated by (initiates)**

Domain: Intention to Apply

Range: E7 Activity

Quantification: (0,1:0,n)

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

Examples: "Parliament XX deciding law YY"

### **P193 ended by (ends)**

The crm-sig resolving the issue 333, added the following property to the model

### **P193 ended by (ends)**

Domain: Intention to Apply

Range: E5 Event

Quantification: (0,1:0,n)

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

Examples: Storing MS Greek 418 into its new phase box (E7 Activity) ends the intention to conserve it (E?? Intention to Apply)

Suggestion: add to scope note how an event or an activity could bring about an end to the intention. For instance earthquake or volcanic eruption makes possibility fo realization impossible.

Potentially add example form architecture and city planning Anais

### **P194 realized (is realised by)**

The crm-sig resolving the issue 333, added the following property to the model

### **P194 realized (is realised by)**

Domain: E7 Activity

Range: Activity Plan

Quantification: (0,n:0,n)

Scope note: This property associates a particular instance of E7 Activity which realized an Activity Plan in a way regarded as valid by the actors intending it. (Should we require that a realization falls within the period of intending it?)

Examples:

- "Getting a fine following paragraph XXX." "I have built my house according to the agreed design (not me alone..)"
- The conservation of MS Greek 418 (E7 Activity) realised the proposals for its conservation (Activity Plan)

## **Amendments 6.2.3**

### ***The 39th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 32nd FRBR - CIDOC CRM Harmonization meeting***

#### **E84 Information Carrier**

The sig resolving the issue 340 decided to delete the class E84

E84 Information Carrier

Subclass of: [E22](#) Man-Made Object

Scope note: This class comprises all instances of E22 Man-Made Object that are explicitly designed to act as persistent physical carriers for instances of E73 Information Object.

An E84 Information Carrier may or may not contain information, e.g., a diskette. Note that any E18 Physical Thing may carry information, such as an E34 Inscription. However, unless it was specifically designed for this purpose, it is not an Information Carrier. Therefore the property *P128 carries (is carried by)* applies to E18 Physical Thing in general.

Examples:

- the Rosetta Stone
- my paperback copy of Crime & Punishment
- the computer disk at ICS-FORTH that stores the canonical Definition of the CIDOC CRM

In First Order Logic:

$$E84(x) \supset E22(x)$$

**P173 starts before or with the end of (ends after or with the start of)**

The sig resolving the **issue 309** added captions to the figures of this property, the following ones:



Figure 17: Temporal entity A starts before or with the end of temporal entity B. Here A is longer than B



Figure 18: Temporal entity A starts before or with the end of temporal entity B. Here A is shorter than B

**P174 starts before the end of (ends after the start of)**

The sig resolving the **issue 309** added captions to the figures of this property, the following ones:



Figure 19: Temporal entity A starts before the end of temporal entity B. Here A is longer than B



Figure 20: Temporal entity A starts before the end of temporal entity B. Here A is shorter than B

**P175 starts before or with the start of (starts after or with the start of)**

The sig resolving the **issue 309** added captions to the figures of this property, the following ones:



Figure 21: Temporal entity A starts before or with the start of temporal entity B. Here A is longer than B



Figure 22: Temporal entity A starts before or with the start of temporal entity B. Here A is shorter

than B

**P176 starts before the start of (starts after the start of)**

The sig resolving the **issue 309** added captions to the figures of this property, the following ones:



Figure 23: Temporal entity A starts before the start of temporal entity B. Here A is longer than B



Figure 24: Temporal entity A starts before the start of temporal entity B. Here A is shorter than B

**P182 ends before or with the start of (starts after or with the end of)**

The sig resolving the **issue 309** added captions to the figures of this property, the following ones:



Figure 25: Temporal entity A ends before or with the start of temporal entity B. Here A is longer than B



Figure 26: Temporal entity A ends before or with the start of temporal entity B. Here A is shorter

than B

**P183 ends before the start of (starts after the end of)**

The sig resolving the **issue 309** added captions to the figures of this property, the following ones:

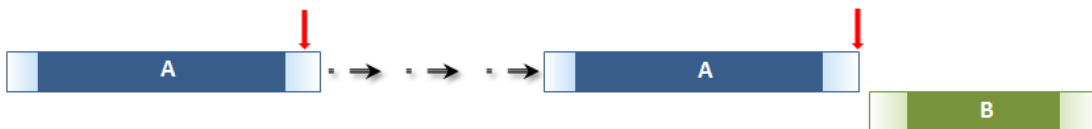


Figure 27: Temporal entity A ends before the start of temporal entity B. Here A is longer than B



Figure 28: Temporal entity A ends before the start of temporal entity B. Here A is shorter than B

**P184 ends before or with the end of (ends with or after the end of)**

The sig resolving the **issue 309** added captions to the figures of this property, the following ones:



Figure 29: Temporal entity A ends before or with the end of temporal entity B. Here A is longer than B



Figure 30: Temporal entity A ends before or with the end of temporal entity B. Here A is shorter than B

### P185 ends before the end of (ends after the end of)

The sig resolving the [issue 309](#) added captions to the figures of this property, the following ones:

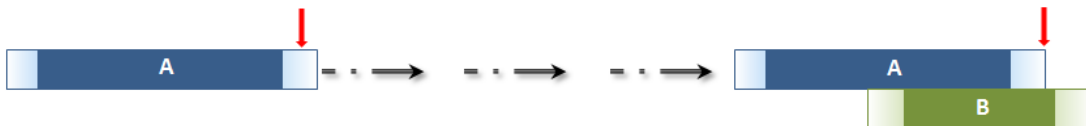


Figure 31: Temporal entity A ends before the end of temporal entity B. Here A is longer than B



Figure 32: Temporal entity A ends before the end of temporal entity B. Here A is shorter than B

### E28 Conceptual Object

The sig resolving the [issue 346](#) changed the examples of E28

FROM:

- 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://lcn.loc.gov/sh85082387>, as of 19 November 2012]
- 'Equations, Maxwell' [variant subject access point, from the same source]

TO:

- Beethoven's "Ode an die Freude" (Ode to Joy) (E73)
- the definition of "ontology" in the Oxford English Dictionary (E73)
- the knowledge about the victory at Marathon carried by the famous runner (E89)
- 'Maxwell equations' [preferred subject access point from LCSH] (E41)
- <http://lcn.loc.gov/sh85082387> [5], as of 19 November 2012]
- 'Equations, Maxwell' [variant subject access point, from the same source] (E41)
- Maxwell's equations (E89)
- The encoding of Maxwells equations as in <https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Maxwell> [6]'s Equations.svg/500px-Maxwell'sEquations.svg.png (E73)

### P138 represents (has representation)

The sig resolved the [issue 342](#) changed the first example

FROM

- the digital file found at [http://www.emunch.no/N/full/No-MM\\_N0001-01.jpg](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)



TO

- the digital file found at [http://www.emunch.no/N/full/No-MM\\_N0001-01.jpg](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 (E22) mode of representation Digitisation(E55)

### **E100 Activity Plan**

The sig resolved the issue 333 changed the scope note of the class E100

FROM:

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

TO:

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

### **E101 Intention to Apply**

The sig resolving the issue 333 changed the class E101

FROM:

Subclass of: S16 State

Superclass of:

Scope note: This class comprises the mental state of intention or wanting to apply a particular instance of Activity Plan by a particular E39 Actor. This can be understood as the period of time that an individual or a group holds a particular will. It binds the activity plan to the actor. The intention to apply may be abandoned before the realization of the plan. When the plan is realized, the intention to apply must still exist. Characteristically, the passing of a law initiates the intention of a parliament to apply a law. In many cases, the creation of the plan initiates the intention to apply it, and in case of "active plans" the realization ends the intention. Often, the existence of the intention to apply cannot be determined other by the realization of the plan.

Examples:

- The intention of Nicholas Pickwood to undertake conservation work on MS Greek 418 at the Saint Catherine's Library.

Properties:

is intention of: E39 Actor  
is expressed in (expresses): E31 Document  
to apply within : E61 Time Primitive  
initiated by: E7 Activity  
ended by: E7 Activity  
intends to apply: Activity Plan

TO:

Subclass of: E2 Temporal Entity

Superclass of:

Scope note:

This class comprises the mental states of individual instances of E39 Actor that intend to or want to apply a particular instance of Activity Plan. This can be understood as the period of time when an individual or group holds a particular will. It binds the activity plan to the actor. The ‘intention to apply’ may be abandoned before the realization of the plan. When the plan is actually realized, the ‘intention to apply’ must necessarily still exist. Characteristically, the passing of a law initiates the intention of a parliament to apply the law. In many cases, the creation of the plan initiates the intention to apply it, and in the case of “active plans” the completed realization of the plan ends the intention. Often, the existence of the ‘intention to apply’ cannot be determined other than by the realization of the plan.

Examples:

- The intention of Nicholas Pickwood to undertake conservation work on MS Greek 418 at the Saint Catherine's Library.

Properties:

P189 is intention of (has intention): E39 Actor  
P190 is expressed in (expresses): E31 Document  
P191 to apply within: E61 Time Primitive  
P192 initiated by (initiates): E5 Event  
P193 ended by (ends): E5 Event  
**intends to apply: E100 Activity Plan**

### **E102 Expression of Intention (may be not necessary)**

The crm-sig resolving the issue 333, deleted this class.

### **P189 is intention of (has intention)**

The sig reviewing the issue 333 changed the scope note of the class

FROM:

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

TO:

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

### **P190 is expressed in (expresses)**

The sig reviewing the issue 333 changed the scope note and the example of the property

FROM:

Scope note: This property associates an Intention to Apply with the externalisation of this intention (Expression) in a document.

Examples:

- The Tate Archives disaster planning document (E31 Document) expresses the intention of undertaking certain actions (E?? Intention to Apply) to save the collection in case of the Thames flooding.

TO:

Scope note: This property associates an instance of E101 Intention to Apply with an instance of E31 Document that captures the externalisation of this intention.

Examples:

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

### **P191 to apply within**

The sig reviewing the issue 333 changed the scope note and the example of the property

FROM:

Scope note: This property associates an instance of EXX Intention to Apply with the time constraint foreseen by the intending party for the actual application of the planned activities. The intending party may vary the time constraint over time. In case a newly set time constraint narrows down a previously set time constraint, one may regard both constraints as being simultaneously true and consistent. In case the newly set time constraint exceeds the previous one (typically delaying the foreseen time of application), we may talk about a modification of the overall intention to apply. This modification should be regarded as an intention in its own right, but being part of an overall instance of EXX Intention to Apply, which continues to be maintained.

TO:

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

### **P192 initiated by (initiates)**

The sig reviewing the issue 333 changed the scope note and the example of the property

FROM:

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

TO:

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

### **P193 ended by (ends)**

The sig reviewing the issue 333 changed the scope note and the example of the property

FROM:

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

Examples: Storing MS Greek 418 into its new phase box (E7 Activity) ends the intention to conserve it (E?? Intention to Apply)

TO:

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

Examples:

- Storing MS Greek 418 into its new phase box (E7 Activity) ends the intention to conserve it (E101)

Suggestion: add to scope note how an event or an activity could bring about an end to the intention. For instance earthquake or volcanic eruption makes possibility fo realization impossible.

Potentially add example form architecture and city planning Anais

### **P194 realized (is realised by)**

The sig reviewing the issue 333 changed the scope note and the second example of the property

FROM:

Scope note: This property associates a particular instance of E7 Activity which realized an Activity Plan in a way regarded as valid by the actors intending it. (Should we require that a realization falls within the period of intending it?)

Examples:

- The conservation of MS Greek 418 (E7 Activity) realised the proposals for its conservation (Activity Plan)

TO:

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

Examples:

- The conservation of MS Greek 418 (E7 Activity) realised the proposals for its conservation (Activity Plan)

**Proofreading:**

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

### **E4 Period**

The crm-sig resolving the issue 312 added a note about geopolitical unit in the scope note of E4 Period. In addition added some examples. The two last paragraphs and the examples of the definition of E4 Period changed

FROM:

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

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 instance of E4 Period, and the second defines morphological object types that fall under E55 Type.

A geopolitical unit as a specific case of an E4 Period is the set of activities and phenomena related to the claim of power, the consequences of belonging to a jurisdictional area and an administrative system that establishes a geopolitical unit. Examples from the modern period are countries or administrative areas of countries such as districts whose actions and structures define activities and phenomena in the area that they intend to govern. The borders of geopolitical units are often defined in contracts or treaties although they may deviate from the actual practice. The spatiotemporal properties of Geopolitical units can be modelled through the properties inherited from E92 Spacetime volume.

Another specific case of an E4 Period is the actual extent of the set of activities and phenomena as evidenced by their physical traces that define a settlement, such as the populated period of Nineveh.

Examples:

- Jurassic
- Populated Period of Nineveh
- Imperial Rome under Marcus Aurelius
- European Bronze Age
- Italian Renaissance
- Thirty Years War
- Sturm und Drang
- Cubism
- 

### **E35 Title**

The sig resolving the issue 260 revised the scope note of E35 Title

FROM:

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.

TO:

Scope note: This class comprises textual strings that within a cultural context can be clearly identified as titles due to their form. Being a subclass of E41 Appellation, E35 Title can only be used when such a string is actually used as a title of a work, such as a text, an artwork, or a piece of music.

Titles are proper noun phrases or verbal phrases, and should not be confused with generic object names such as “chair”, “painting” or “book” (the latter are common nouns that stand for instances of E55 Type). Titles may be assigned by the creator of the work itself, or by a social group.

This class also comprises the translations of titles that are used as surrogates for the original titles in different social contexts.

### **E78 Curated Holding**

The sig resolving the issue 295 added the following example in E78.

- The Digital Collections of the Munich Digitization Center (MDZ) accessible via <https://www.digitale-sammlungen.de/> at least in January 2018.

### **E24 Physical Man-Made Thing**

The sig resolving the issue 295 added a reference to the scope note and moved the examples of E84 to E24. The scope note and the examples of E24 changed

FROM:

Scope Note: This class comprises all persistent physical items that are purposely created by human activity.

This class comprises man-made objects, such as 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)

TO:

Scope Note: This class comprises all persistent physical items that are purposely created by human activity.

This class comprises man-made objects, such as swords, and man-made features, such as rock art. No assumptions are made as to the extent of modification required to justify regarding an object as man-made. For example, a “cup and ring” carving on bedrock is regarded as instance of E24 Physical Man-Made Thing.

Instances of this class may act as carriers of instances of E73 Information Object.

Examples:

- the Forth Railway Bridge (E22)
- the Channel Tunnel (E25)
- the Historical Collection of the Museum Benaki in Athens (E78)
- the Rosetta Stone (E22)
- my paperback copy of *Crime & Punishment* (E22) (fictitious)
- the computer disk at ICS-FORTH that stores the canonical Definition of the CIDOC CRM v.3.2 (E22)
- my empty DVD disk (E22) (fictitious)

### **E25 Man-Made Feature**

The sig resolving the issue 295 extended the scope note and added two examples. The scope note and the examples of E25 changed

FROM:

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 are regarded as types of E25 Man-Made Feature.

Examples:

- the Manchester Ship Canal
- Michael Jackson’s nose following plastic surgery

TO:

Scope Note: This class comprises physical features that are purposely created by human activity, such as scratches, artificial caves, artificial water channels, etc. In particular, it includes the information encoding features on mechanical or digital carriers.

No assumptions are made as to the extent of modification required to justify regarding a feature as man-made. For example, rock art or even “cup and ring” carvings on bedrock are regarded as types of E25 Man-Made Feature.

Examples:

- the Manchester Ship Canal
- Michael Jackson’s nose following plastic surgery
- The laser-readable “pits” engraved June 2014 on Martin Doerr’s CD-R, copying songs of Edith Piaf’s.
- The carved letters on the Rosetta Stone

## E28 Conceptual Object

The sig resolving the issue 346 added the following explanations to some examples of E28. Thus, the examples changed

FROM:

- Beethoven’s “Ode an die Freude” (Ode to Joy) (E73)
- the definition of “ontology” in the Oxford English Dictionary (E73)
- the knowledge about the victory at Marathon carried by the famous runner (E89)
- ‘Maxwell equations’ [preferred subject access point from LCSH] (E41)  
<http://lcn.loc.gov/sh85082387> [5], as of 19 November 2012
- ‘Equations, Maxwell’ [variant subject access point, from the same source] (E41)
- Maxwell's equations (E89)
- The encoding of Maxwells equations as in  
[https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Maxwell \[6\]'s Equations.svg/500px-Maxwell'sEquations.svg.png](https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Maxwell%20Equations.svg/500px-Maxwell'sEquations.svg.png) (E73)

TO:

Examples:

- Beethoven’s “Ode an die Freude” (Ode to Joy) (E73)
- 62. (Kershaw, 1999)
- the definition of “ontology” in the Oxford English Dictionary (E73)
- the knowledge about the victory at Marathon carried by the famous runner (E89)

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

- ‘Maxwell equations’ [preferred subject access point from LCSH] (E41)  
<http://lcn.loc.gov/sh85082387> [5], as of 19 November 2012]

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

- ‘Equations, Maxwell’ [variant subject access point, from the same source] (E41)

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

- Maxwell's equations (E89)

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

- The encoding of Maxwells equations as in [https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Maxwell \[6\]'s Equations.svg/500px-Maxwell'sEquations.svg.png](https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Maxwell%20%5B6%5D%27s%20Equations.svg/500px-Maxwell%27sEquations.svg.png) (E73)

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

### **E100 Activity Plan**

The sig resolving the 333 decided to delete this class from CRMbase and move this to CRMsoc.

### **E101 Intention to Apply**

The sig resolving the 333 decided to delete this class from CRMbase and move this to CRMsoc.

### **E102 Expression of Intention**

The sig resolving the 333 decided to delete this class from CRMbase and move this to CRMsoc.

### **P189 is intention of (has intention)**

The sig resolving the 333 decided to delete this property from CRMbase and move this to CRMsoc.

### **P190 is expressed in (expresses)**

The sig resolving the 333 decided to delete this property from CRMbase and move this to CRMsoc.

### **P191 to apply within**

The sig resolving the 333 decided to delete this property from CRMbase and move this to CRMsoc.

### **P192 initiated by (initiates)**

The sig resolving the 333 decided to delete this property from CRMbase and move this to CRMsoc.

### **P193 ended by (ends)**

The sig resolving the 333 decided to delete this property from CRMbase and move this to CRMsoc.

### **P194 realized (is realised by)**

The sig resolving the 333 decided to delete this property from CRMbase and move this to CRMsoc.

## ***The 41th joined meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9 and the 34th FRBR - CIDOC CRM Harmonization meeting***

Release 6.2.4

### **E11 Modification**

The sig resolving the issue 191 changed the range of P31. Thus the range of P31 at property section of E11 Modification is updated.

### **E13 Attribute Assignment**

The sig resolving the issue 367 changed the scope note

**From**



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.

**To:**

Scope note: This class comprises the actions of making assertions about one property of an object or any single relation between two items or concepts. The type of the property asserted to hold between two items or concepts can be described by the property P2 has type.

For example, the class describes the actions of people making propositions and statements during certain scientific/scholarly 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 whether this information should be accessible by structured queries.

This class allows for the documentation of how the respective assignment came about, and whose opinion it was. Note that all instances of properties described in a knowledge base are the opinion of someone. Per default, they are the opinion of the team maintaining the knowledge base. This fact must not individually be registered for all instances of properties provided by the maintaining team, because it would result in an endless recursion of whose opinion was the description of an opinion. Therefore, the use of E13 Attribute Assignment marks the fact, that the maintaining team is in general neutral to the validity of the respective assertion, but registers someone else's opinion and how it came about.

All properties assigned in such an action can also be seen as directly relating the respective pair of items or concepts. Multiple use of E13 Attribute Assignment may possibly lead to a collection of contradictory values. All cases of properties in this model that are also described indirectly through a subclass of E13 Attribute Assignment are characterised as "short cuts" of a path via this subclass. This redundant modelling of two alternative views is preferred because many implementations may have good reasons to model either the action of assertion or the short cut, and the relation between both alternatives can be captured by simple rules.

**E21 Person**

The sig resolving the issue 372 changed the scope note

**FROM:**

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.

**TO:**

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.

In a bibliographic context, a name presented following the conventions usually employed for personal names will be assumed to correspond to an actual real person (E21 Person), unless evidence is available to indicate that this is not the case. The fact that a persona may erroneously be classified as an instance of E21 Person does not imply that the concept comprises personae. So, we keep this in CRMbase. The E21 Person will be the two paragraphs

### **E38 Image**

The sig resolving the issue 367 decided to deprecate the class

### **E40 Legal Body**

The sig resolving the issue 367 decided to deprecate the class

### **E44 Place Appellation**

The sig resolving the issue 367 decided to deprecate the class

### **E45 Address**

The sig resolving the issue 367 decided to deprecate the class

### **E47 Spatial Coordinates**

The sig resolving the issue 367 decided to deprecate the class

### **E48 Place Name**

The sig resolving the issue 367 decided to deprecate the class

### **E49 Time Appellation**

The sig resolving the issue 367 decided to deprecate the class

### **E51 Contact Point**

The sig resolving the issue 367 decided to deprecate the class

### **E58 Measurement Unit**

The examples in E58 Measurement Unit has been corrected from

GRD [Greek Drachme](Daniel, 2014)

to:

GRD [Greek Drachme](Daniel, 2014) (E98)

### **E94 Space Primitive**

The sig resolving the **issue 374** changed last paragraph of the scope note of E94 from:

"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 is recommended."

To:

"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. E94 Space Primitive is not further elaborated upon within this model. Compatibility with OGC standards is recommended."

### **P8 took place on or within (witnessed)**

The sig resolving the issue 375 decided to change the phrase

From

"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'."

To:

"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', 'P156i is occupied by', to 'E18 Physical Thing'."

### **P12 occurred in the presence of (was present at)**

The sig resolving the issue 191 changed the range of P31. Thus the range of P31 at supeproperty section of P12 is updated.

### **P31 has modified (was modified by)**

The sig resolving the issue 191 changed the range of P31 and marked the scope note obsolete. Thus the definition of P31 changed.

**From:**

#### **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:

$P31(x,y) \supset E11(x)$

$P31(x,y) \supset E24(y)$

$P31(x,y) \supset P12(x,y)$

**To:**

#### **P31 has modified (was modified by)**

Domain: [E11](#) Modification

Range: [E18](#) Physical 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. (OBSOLETE)**

Examples:

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

In First Order Logic:

$P31(x,y) \supset E11(x)$   
 $P31(x,y) \supset E18(y)$   
 $P31(x,y) \supset P12(x,y)$

### **P108 has produced (was produced by)**

The range of P31 at subproperty section is updated

### **P110 augmented (was augmented by)**

The range of P31 at subproperty section is updated

### **P112 diminished (was diminished by)**

The range of P31 at subproperty section is updated

### **P189 approximates**

The sig resolving the issue 275, decided to add the property P189 approximates as follows

Domain            E53 Place  
Range:            E53 Place  
Quantification: many to one (0,1:0,n)

Scope note:        This property associates an instance of E53 Place with another instance of E53 Place, which is defined in the same reference space, and which is used to approximate the former. The property does not necessarily state the quality or accuracy of this approximation, but rather indicates the use of the first instance of place to approximate the second.

In common documentation practice, find or encounter spots e.g. in archaeology, botany or zoology are often related to the closest village, river or other named place without detailing the relation, e.g. if it is located within the village or in a certain distance of the specified place. In this case the stated “phenomenal” place found in the documentation can be seen as approximation of the actual encounter spot without more specific knowledge.

In more recent documentation often point coordinate information is provided that originates from GPS measurements or georeferencing from a map. This point coordinate information does not state the actual place of the encounter spot but tries to approximate it with a “declarative” place. The accuracy depends on the methodology used when creating the coordinates. It may be dependent on technical limitations like GPS accuracy but also on the method where the GPS location is taken in relation to the measured feature. If the methodology is known a maximum deviation from the measured point can be calculated and the encounter or feature may be related to the resulting circle using the P171 at some place within property.

Examples:

In First Order Logic:

$P189(x,y) \supset E53(x)$   
 $P189(x,y) \supset E53(y)$   
 $P189(x,y,z) \supset [P189(x,y) \wedge E55(z)]$

Properties:        P189.1 has type: [E55](#) Type

### **CRM-Compatible Form**

The sig resolving the issue 191 changed the range of P31. Thus the range of P31 at table included in this section is updated.

### **Assistance for reducing to core CRM model**

The sig resolving the issue 336 decided to add the following text at the end of modelling section of the CIDOC CRM document. The text follows:

CRMbase (or an extension of it) may be extended by declaring subclasses of existing classes as well as superclasses. In the former case, all properties of the CRM class will hold for the subclasses. In the latter case, the scope of the CRMbase will be extended and a property of the CRMbase class may hold for the new superclass but not necessarily. In the case a property  $p$  of a class  $A$  also holds for a new superclass  $B$  it should be a conservative extension. That is, when restricted to the original class the extended property,  $p'$ , is identical to the original property  $p$ . In general a superproperty is said to be a conservative extension of a subproperty when it is identical to the sub property when restricted to its domain and range.

Taken on its own, CRMbase is not affected by such a conservative extension of scope, since it is not concerned with  $A$ . This is similar to what in logic is called a conservative extension of a theory. This construct is necessary for an effective modular management of ontologies, but is not possible with the current way RDF/OWL treats it.

In first order logic the conservative extension of a property can be expressed as follows. Assume that  $A$  and  $C$  are subclasses of  $B$  and  $D$  respectively and that  $p, p'$  are properties between  $A, C$  and  $B, D$  respectively:

$$\begin{aligned}A(x) &\supset B(x) \\C(x) &\supset D(x) \\P(x,y) &\supset A(x) \\P(x,y) &\supset C(y) \\P'(x,y) &\supset B(x) \\P'(x,y) &\supset D(y)\end{aligned}$$

If  $p'$  is a conservative extension of  $p$  then

$$A(x) \wedge C(y) \wedge P'(x,y) \equiv P(x,y)$$

### **Proofreading:**

Page 25: It is added the subclass of E54, [E97](#) Monetary Amount

Page 27: the range to the last two properties of E53 Place was corrected.

Page 27: The reference to ISO1000:1992 in the E58 scope note was updated to ISO80000:2009, superseding ISO1000 and in force for some 10 years now