

Main Entities

The top level classes of CIDOC CRM provide the basic equipment and embody the event-oriented data integration strategy around which the standard is modeled. The event oriented logic of CRM arises from the observation that, in conducting research over material evidence, scholars are interested in following a historical progression of items and in reconstructing historical evolutions of events. This can be done through discovering and documenting the origins, transformations and endings of items and their temporary interrelation in temporally and spatially confined moments in history. Supporting this form of discourse in a semantic model means that items must be described in terms of the events causal to their being or having certain properties or characteristics at different temporal junctures.

In this diagram we see the main mechanics for modeling with CIDOC CRM.

An essential element of discourse in general is the naming and classifying of items. Items can be named and classified infinitely according to the historical needs and understanding of different actors. Therefore, the properties p1 is identified by and p2 has type are declared at the top level of the model, allowing all entities described in the model to bear multiple names and types.

The logic of the temporal classes branch of CIDOC CRM for representing time and enabling the interconnection of items in space and time is represented in these few top level classes. E2 Temporal Entity is the top most class of this branch and allows for the documentation of items which are temporal in nature, that is to say items about which you would ask questions such as when did that occur, at what point was that on-going. It offers the property p4 has time span, in order to connect to temporal data (e.g. dates, durations). It is equivalent to the philosophical notion of a perdurant. The E4 Period class specializes this branch further offering the property p7 took place at, connecting temporal phenomena to spatial extents (E53 Place). This class is used to document large scale temporal phenomena of an identifiable cultural, social, or physical nature. With regard to these phenomena we are interested and able to speak both of the temporal duration of the event and its spread over a geographic area, geometrically defined. E5 Event further specializes the temporal classes by offering the property p12 occurred in the presence of. Instances of E5 Event relate identifiable cultural, social, or physical temporal phenomena for which we have knowledge of to items for which we have knowledge that they were involved in the event. This class begins to allow the crucial interconnection and interrelation between E77 Persistent Items through time. Deploying the property p12 allows the documentation of the meeting in time of the different major branches of persistent item: E18 Physical Thing, E28 Conceptual Object and E39 Actor. Finally the classes E63 Beginning of Existence and E64 End of Existence introduce respectively the properties necessary to model the coming into being and passing out of existence of items. Modelling with these classes allows for the representation of the creation of an idea, the production of an object, the birth of a person and their respective loss from memory, physical dissipation and death. Since E63 and E64 are specializations of E5 Event, one can therefore also model the other items present in an

instance of beginning or end, an influencing idea, a tool, a mother, in addition to using the other properties from the temporal entities branch to temporally and geographically identify the particular characteristics of a beginning or ending event.

Deploying these top classes and their relations provides the basic toolset for modelling a historically focused discourse using CRM.

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Spatial Relations

A major area of documentation and historical research centres around spatial relations and reasoning. The key class CIDOC CRM provides for modeling this information is E53 Place. E53 Place is used to document geometric extents defined over some real space. The higher level properties and classes of CRM that centre around E53 Place allow for the documentation of: relations between places, recording the geometric expressions of place and their semantic function, tracing the history of locations of a physical object, identifying the places where an individual or group have been located, identifying places on a physical object and the spatial extent of certain temporal entities.

Relations between places: The cluster of relations P89 falls within (contains), P122 borders with, P121 overlaps with and P189 approximates offer relations in order to record the relationships holding between places relatively. These properties hold between instances of E53 Place and allow the interordering of places using common mereotopological concepts.

Geometric Expressions of Place: Contemporary documentation of spatial information has access to advanced equipment for accurately recording location and libraries of georeferenced place information. For this reason, documentation of place now often includes the recording of precise coordinates for a referenced place. Of great importance semantically, is to understand the manner in which such a geometric place expression actually relates to a referenced place. The cluster of relations p168 place is defined by, p171 at some place within, and p172 contains allows the user to link to geometric place expressions while also accurately indicating how this expression relates to the documented place. Geometric place expressions are instances of E94 Space Primitive, a primitive class for expressing values in data systems not further analyzed in the CRM.

History of Object Locations: Instances of place are often referenced in order to record the location of some object. When the movement of the object to different locations through time is of interest, it is also important to be able to analytically record the different locations at which an object was and at what point. CRM offers two top level mechanisms for tracing the relation of objects to places. If the aspect of time is unknown or not of interest, then an object can be related to a place through the properties p53 has former or current location and p55 has current location. The former property is the conservatively appropriate choice for documenting the

object-to-place relation when time elements are not known. If one is actively tracking current location, the latter property is also of use. When an accurate history of the temporal aspect of location should be provided, the user should take advantage of the E9 Move class, a temporal entity class. Instantiating E9 Move allows the user to document the origin, destination and concerned object of a move event using the collection of properties p27 moved from, p26 moved to, p25 moved. Being a temporal class, E9 Move further allows the tracing of time, and agency etc.

Actor Locations: Related to the history of object location is the history of the location of actors in the sense of CRM. Since an actor is defined distinctly from an object as a point of free agency, it is not a physical entity. Not being physical, it cannot be the subject of E9 Move which documents actual physical relocations. CRM thus offers the notion of p74 has current or former residence in order to document the relation of a person or group to a location as residing there at some time.

Places on a Physical Object: In the recording of CH data the need arises to identify where on an object a certain feature is located or certain phenomenon is to be observed. For this CRM offers the relation p59 has section relating the object to the places which are defined upon it.

Spatial Extent of Temporal Entities: In order to spatially define the extent of temporal phenomena, CRM offers two properties that apply to all instances of temporal entity under the class E4 Period: p7 took place at and p8 took place on or within. The former is used to relate a temporal phenomenon directly to an instance of E53 Place which provides the geometric context in which that phenomenon took place. The latter property allows the documentation of a temporal phenomenon taking place in relation to a physical object. This is useful for recording information such as the occurrence of an event on a moving ship or within a particular storage container, where the geometric location is not known or indirectly relevant.

Temporal Relations

An event oriented ontology requires a robust set of top level relations in order to enable users to express the basic properties and interrelations amongst temporal entities themselves. Historical discourse has to deal with different levels of knowledge regarding temporal events and their ordering. It is important to be able to document temporality both with regards to known dates but also according to relative positioning within a historical time line. The top level properties of CRM relating to temporal entities support the documentation of: dates as time spans or dimensions, mereological relations between temporal entities as well as a complete suite of topological relations.

Dates and Durations: When date information is known for a temporal entity, this can be documented by instantiating the p4 has time-span property and creating an instance of E52

Time-span. Dates should then be recorded as instances of E61 Time Primitive and related to the Time-span through the properties of p81 ongoing throughout or p82 at some time within. Time is recorded as a span and not an instant in CRM. The choice of p81 allows the documentation of knowledge that a temporal phenomenon was occurring at all points in a time span. The property p82 allows the weaker claim that the phenomenon must have occurred within a particular time span without further knowledge as to when. The actual mode of representation of the documented date is outside the scope of CRM, which defines this with a primitive class, E61 Time Primitive. Finally, the property p191 had duration can be deployed in order to document the fact that a temporal phenomenon for which we do not know its temporal positioning but for which we do know its length.

Mereological relations: The documentation of the part-whole relationship of temporal phenomena is crucial for historical reasoning. At a high level CIDOC CRM temporal entities break into two different categories broadly aligning to process and state. E4 Period allows the documentation of temporal phenomena of change, while E3 Condition State is a high level class for the documentation of static temporal phenomena - states. For this reason two different sets of mereological relations are articulated at this high level for processes and states. The properties p9 consists of and p10 falls within are used to document respectively proper parthood and general temporal inclusion for instances of E4 Period and its subclasses. The property p5 consists of indicates proper parthood between instances of E3 Condition State.

Topological Relations: CIDOC CRM introduces a theory of fuzzy boundaries in time that enables the accurate interpositioning of temporal entities between themselves taking into account the inherent fuzziness of temporal boundaries. This model subsumes the earlier introduced Allen temporal relations which are moved to the archaeological extension. You can read in full on the temporal topological relations in section ____ of this text.