# Issue 613 55th SIG Meeting

The SIG reviewed HW by CEO & MD concerning

1. the [definitions](#_definitions_of_shortcut) of shortcut related terms,
2. [revising weak inverse shortcuts](#_revising_weak_inverse) that had been previously identified
3. [redrafting scope notes of properties](#_redrafting_scope_notes) that form part of a fully articulated path (which is, in turn, shortcut by some other property), in order to reference that fully articulated path.

Details of the discussions and decisions reached can be found below:

## definitions of shortcut related terms

**Decisions:**

* substitute the [new](#_NEW) definitions in CIDOC CRM v7.2.3 for the previously existing definitions.
* **HW**: CEO to redraft the last paragraph (path created by E13) –take into account the proposal by SdS.
  + **Motivation**: **the last clause** seems like a non-sequitur. But it serves to indicate that the path through E13 Attribute Assignment forms a way to establish a property, just as shortcuts do.
    - 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”.
* **HW**: CEO to provide examples for all kinds of shortcut listed in the document (shortcut proper, inverse, strong) --to immediately follow each definition

### NEW

***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. We distinguish the following terms:

**Shortcut:** An instance of the fully-articulated path always implies an instance of the shortcut property. However, the converse may not be true; an instance of the fully-articulated path cannot always be inferred from an instance of the shortcut property.

**Inverse shortcut:** An instance of the shortcut property always implies an instance of the fully-articulated path. However, the converse may not be true; an instance of the shortcut property cannot always be inferred from an instance of the fully-articulated path.

**Strong shortcut:** An instance of the fully-articulated path always implies an instance of the strong shortcut property and an instance of the fully-articulated path can always be inferred from an instance of the strong 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 characterised as “shortcuts”.

#### Alternative wording for last paragraph by SdS:

Contrary to this, E13 Attribute Assignment (and the properties it makes use of) does not form a long path over the path that is being described by the E13 Attribute Assignment, in cases where the property being so described is actually a shortcut.

### OLD

***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 inside the frame of the actual knowledge base.

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”.

## revising weak inverse shortcuts that had been previously identified

CEO walked the SIG through the candidates for inverse shortcuts (i.e., shortcut properties that imply an instance of the fully-articulated path that they shortcut over):

1. [P125](#_NEW_1) used object of type (was object of type used in),
2. [P167](#_NEW_2) was within (includes)
3. [P171](#_NEW_3) at some time within
4. [P172](#_NEW_4) contains
5. [P195](#_NEW_5) was a presence of (had presence)
6. [P199](#_NEW_6) represents instance of type
7. P156 occupies (is occupied by)
8. P7 took place at (witnessed)

**Decisions:**

* update the scope note of **P125, P167, P171, P172, P195,** and **P199** to reflect the fact that they form strong shortcuts.
* Start a new issue for **P156** & **P7** where to discuss the relation of the fully articulated paths that P156 and P7 shortcut over.
  + **HW**: CEO to properly formulate and coordinate work in the new issue
  + **Motivation**: **P156 and P7** form inverse shortcuts as long as the reference space remains constant.
    - The statement found in P7, namely: “Therefore, this property implies the more fully developed path from E4 Period through *P161 has spatial projection*, E53 Place, *P89 falls within* to E53 Place, where the intermediate place is also defined in the same geometric system. Both places are defined in the same geometric reference system.” can serve as a blueprint for P156.
    - AG shared with the SIG a model on spatial relations and how it overlaps with the CRM –the document can be found [here](https://cidoc-crm.org/Resources/audit-topologie-graphe-ag). And it must be considered for issue [492](https://cidoc-crm.org/Issue/ID-492-spatiotemporal-formalization-about-the-presence-of-parts) as well.

### P125 used object of type (was object of type used in)

#### NEW

**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 associates an instance of E7 Activity to an instance of E55 Type, which classifies an instance of E70 Thing used in an instance of E7 Activity, when the specific instance is either unknown or not of interest, such as use of "a hammer".

This property is a strong shortcut of the more fully developed path from E7 Activity through *P16 used specific object*, E70 Thing, *P2 has type,* to E55 Type

Examples:

* The English archers’ activity in the Battle of Agincourt (E7) *used object of type* long bow (E55). (Curry, 2015)

In first-order logic:

P125(x,y) ⇒ E7(x)

P125(x,y) ⇒ E55(y)

P125(x,y) ⇔ (∃z) [E70(z) ∧ P16(x,z) ∧ P2(z,y)]

#### OLD

**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 associates an instance of E7 Activity to an instance of E55 Type, which classifies an instance of E70 Thing used in an instance of E7 Activity, when the specific instance is either unknown or not of interest, such as use of "a hammer".

This property is a shortcut of the more fully developed path from E7 Activity through *P16 used specific object*, E70 Thing, *P2 has type,* to E55 Type

Examples:

* The English archers’ activity in the Battle of Agincourt (E7) *used object of type* long bow (E55). (Curry, 2015)

In first-order logic:

P125(x,y) ⇒ E7(x)

P125(x,y) ⇒ E55(y)

P125(x,y) ⇔ (∃z) [E70(z) ∧ P16(x,z) ∧ P2(z,y)]

### P167 was within (includes)

#### NEW

**P167 was within (includes)**

Domain:

E93 Presence

Range:

E53 Place

Quantification:

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

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. This property is a shortcut of the more fully developed path from E7 Activity through *P16 used specific object*, E70 Thing, *P2 has type,* to E55 Type

This property is a strong shortcut of the more fully developed path from E93 Presence through *P161 has spatial projection,* E53 Place, *P89 falls within (contains)* to E53 Place.

Examples:

* Johann Joachim Winckelmann’s whereabouts in December 1755 (E93) *was within* Rome (E53). (Leppmann, 1970)
* Johann Joachim Winckelmann’s whereabouts from 19th November 1755 until 9th April 1768 (E93) *was within* Italy (E53). (Leppmann, 1970)

In first-order logic:

P167(x,y) ⇒ E93(x)

P167(x,y) ⇒ E53(y)

P167(x,y) ⇔ (∃z) [E53(z) ∧ P161(x,z) ∧ P89(z,y)

#### OLD

**P167 was within (includes)**

Domain:

E93 Presence

Range:

E53 Place

Quantification:

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

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. This property is a shortcut of the more fully developed path from E7 Activity through *P16 used specific object*, E70 Thing, *P2 has type,* to E55 Type

This property 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.

Examples:

* Johann Joachim Winckelmann’s whereabouts in December 1755 (E93) *was within* Rome (E53). (Leppmann, 1970)
* Johann Joachim Winckelmann’s whereabouts from 19th November 1755 until 9th April 1768 (E93) *was within* Italy (E53). (Leppmann, 1970)

In first-order logic:

P167(x,y) ⇒ E93(x)

P167(x,y) ⇒ E53(y)

P167(x,y) ⇔ (∃z) [E53(z) ∧ P161(x,z) ∧ P89(z,y)

### P171 at some place within

#### NEW

**P171 at some place within**

Domain:

E53 Place

Range:

E94 Space Primitive

Quantification:

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

Scope note:

This property describes the maximum spatial extent within which an instance of E53 Place falls. Since instances of E53 Places may not have precisely known spatial extents, the CIDOC CRM supports statements about maximum spatial extents of instances of E53 Place. This property allows an instance of E53 Place’s maximum spatial extent (i.e., its outer boundary) to be assigned an instance of E94 Space Primitive value.

This property is a strong shortcut of the fully developed path from E53 Place*, P89 falls within,* E53 Place*, P168 place is defined by* to E94 Space Primitive through a declarative Place that is not explicitly documented, to a Space Primitive: declarative places are defined in CRMgeo (Doerr and Hiebel 2013).

Examples:

* The spatial extent of the Acropolis of Athens (E53) *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).

In first-order logic:

P171(x,y) ⇒ E53(x)

P171(x,y) ⇒ E94(y)

P171(x,y) ⇔ (∃z) [E53(z) ∧ P89(x,z) ∧ P168(z,y)]

#### OLD

**P171 at some place within**

Domain:

E53 Place

Range:

E94 Space Primitive

Quantification:

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

Scope note:

This property describes the maximum spatial extent within which an instance of E53 Place falls. Since instances of E53 Places may not have precisely known spatial extents, the CIDOC CRM supports statements about maximum spatial extents of instances of E53 Place. This property allows an instance of E53 Place’s maximum spatial extent (i.e., its outer boundary) to be assigned an instance of E94 Space Primitive value.

This property is a shortcut of the fully developed path from E53 Place*, P89 falls within,* E53 Place*, P168 place is defined by* to E94 Space Primitive through a declarative Place that is not explicitly documented, to a Space Primitive: declarative places are defined in CRMgeo (Doerr and Hiebel 2013).

Examples:

* The spatial extent of the Acropolis of Athens (E53) *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).

In first-order logic:

P171(x,y) ⇒ E53(x)

P171(x,y) ⇒ E94(y)

P171(x,y) ⇔ (∃z) [E53(z) ∧ P89(x,z) ∧ P168(z,y)]

### P172 contains

#### NEW

**P172 contains**

Domain:

E53 Place

Range:

E94 Space Primitive

Quantification:

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

Scope note:

This property describes a minimum spatial extent which is contained within an instance of E53 Place. Since instances of E53 Place may not have precisely known spatial extents, the CIDOC 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 instance of E94 Space Primitive value.

This property is a strong shortcut of the fully developed path from E53 Place*, P89i contains,* E53 Place*, P168 place is defined by* toE94 Space Primitive.

Examples:

* The spatial extent of the Acropolis of Athens (E53) *contains* POINT (37.971431 23.725947) (E94).

In first-order logic:

P172(x,y) ⇒ E53(x)

P172(x,y) ⇒ E94(y)

P172(x,y) ⇔ (∃z) [E53(z) ∧ P89i(x,z) ∧ P168(z,y)]

#### OLD

**P172 contains**

Domain:

E53 Place

Range:

E94 Space Primitive

Quantification:

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

Scope note:

This property describes a minimum spatial extent which is contained within an instance of E53 Place. Since instances of E53 Place may not have precisely known spatial extents, the CIDOC 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 instance of E94 Space Primitive value.

This property is a shortcut of the fully developed path from E53 Place*, P89i contains,* E53 Place*, P168 place is defined by* toE94 Space Primitive.

Examples:

* The spatial extent of the Acropolis of Athens (E53) *contains* POINT (37.971431 23.725947) (E94).

In first-order logic:

P172(x,y) ⇒ E53(x)

P172(x,y) ⇒ E94(y)

P172(x,y) ⇔ (∃z) [E53(z) ∧ P89i(x,z) ∧ P168(z,y)]

### P195 was a presence of (had presence)

#### NEW

**P195 was a presence of (had presence)**

Domain:

E93 Presence

Range:

E18 Physical Thing

Quantification:

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

Scope note:

This property associates an instance of E93 Presence with the instance of E18 Physical Thing of which it represents a temporal restriction (i.e. a time-slice) of the thing’s trajectory through spacetime. In other words, it describes where the instance of E18 Physical Thing was or moved around within a given time-span. Instantiating this property constitutes a necessary part of the identity of the respective instance of E93 Presence.

This property is a strong shortcut of the fully developed path from E18 Physical Thing through *P196 defines*, E92 Spacetime Volume, *P166 was a presence of (had presence)* to E93 Presence.

This property is a part of the fully developed path from E18 Physical Thing through *P196 defines*, E92 Spacetime Volume, *P166 was a presence of (had presence)* to E93 Presence.

Examples:

* Johann Joachim Winckelmann’s whereabouts in December 1755 (E93) *was a presence of* Johann Joachim Winckelmann (E21). (Wiencke, 1998)
* Johann Joachim Winckelmann’s whereabouts from 19th November 1755 until 9th April 1768 (E93) *was a presence of* Johann Joachim Winckelmann (E21). (Wiencke, 1998)

In first-order logic:

P195(x,y) ⇒ E93(x)

P195(x,y) ⇒ E18(y)

P195(x,y) ⇔ (∃z)[E92(z) ∧ P166(z,x) ∧ P196i(z,y)]

#### OLD

**P195 was a presence of (had presence)**

Domain:

E93 Presence

Range:

E18 Physical Thing

Quantification:

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

Scope note:

This property associates an instance of E93 Presence with the instance of E18 Physical Thing of which it represents a temporal restriction (i.e. a time-slice) of the thing’s trajectory through spacetime. In other words, it describes where the instance of E18 Physical Thing was or moved around within a given time-span. Instantiating this property constitutes a necessary part of the identity of the respective instance of E93 Presence.

This property is a shortcut of the fully developed path from E18 Physical Thing through *P196 defines*, E92 Spacetime Volume, *P166 was a presence of (had presence)* to E93 Presence.

Examples:

* Johann Joachim Winckelmann’s whereabouts in December 1755 (E93) *was a presence of* Johann Joachim Winckelmann (E21). (Wiencke, 1998)
* Johann Joachim Winckelmann’s whereabouts from 19th November 1755 until 9th April 1768 (E93) *was a presence of* Johann Joachim Winckelmann (E21). (Wiencke, 1998)

In first-order logic:

P195(x,y) ⇒ E93(x)

P195(x,y) ⇒ E18(y)

P195(x,y) ⇔ (∃z)[E92(z) ∧ P166(z,x) ∧ P196i(z,y)]

### P199 represents instance of type

#### NEW

**P199 represents instance of type**

Domain:

E36 Visual Item

Range:

E55 Type

Superproperty of:

E36 Visual Item. P138 represents (has representation): E1 CRM Entity

Quantification:

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

Scope note:

This property establishes the relationship between an instance of E36 Visual Item and an instance of E55 Type that characterises the thing depicted. This property is used when the identity of the thing depicted is unknown or unrecorded, but is clearly a particular thing of that type. If the instance of E36 Visual Item directly depicts the concept of the E55 Type rather than an instance of a thing of that type, then this should be represented using E36 Visual Item *P138 represents* E55 Type.

This property is a strong shortcut of the more fully developed path from E36 Visual Item through *P138 represents*, E1 CRM Entity, *P2 has type* to E55 Type.

Examples:

* The visual content of photograph gri\_2012\_m\_2\_b001\_f001\_d01\_e005\_0148 (E36) *represents instance of type* automobile (E55)   
  [Reference: <https://www.getty.edu/research/collections/object/10062J>]
* The top right image on page 87 in the book ‘Pharaoh’s Birds’ by John Miles (E36*) represents instance of type* hoopoe (Upupa epops) (E55).   
  [This image is a reproduction of a photograph. The same book shows at the top of page 35 an image representing an unnamed ancient Egyptian relief depicting a hoopoe and other ‘Birds of the Marshes’. In contrast to the photograph, the latter image of the ancient Egyptian depiction shows intentionally typical rather than individual characteristics of the respective species, and should therefore be associated with the property *P138* represents with the species name hoopoe (Upupa epops)]. (Miles, 1998)
* The visual content of Monet’s painting from 1868-1869 held by Musée d'Orsay, Paris, under inventory number RF 1984 164 (E36) *represents instance of type* magpie (Pica pica) (E55). [The editors give this example under the assumption that Claude Monet, as impressionist, created the painting following a real impression of a particular magpie. It was clearly not meant as a prototypical representation of this bird] (Musée d'Orsay, 2020)
* The top image on page 44 in the book ‘Wildblumen Kretas’ by Vangelis Papiomytoglou (E36) *represents instance of type* Cistus creticus L. (E55). [This image is a reproduction of a photograph. The plant produces an aromatic resin that has been exported from Crete to Egypt and other areas since the Bronze Age] (Papiomytoglou, 2006)

In first-order logic:

P199(x,y) ⇒ E36(x)

P199(x,y) ⇒ E55(y)

P199(x,y) ⇐ (∃z)[E1(z) ∧ P138(x,z) ∧ P2(z,y)]

#### OLD

**P199 represents instance of type**

Domain:

E36 Visual Item

Range:

E55 Type

Superproperty of:

E36 Visual Item. P138 represents (has representation): E1 CRM Entity

Quantification:

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

Scope note:

This property establishes the relationship between an instance of E36 Visual Item and an instance of E55 Type that characterises the thing depicted. This property is used when the identity of the thing depicted is unknown or unrecorded, but is clearly a particular thing of that type. If the instance of E36 Visual Item directly depicts the concept of the E55 Type rather than an instance of a thing of that type, then this should be represented using E36 Visual Item *P138 represents* E55 Type.

This property is a shortcut of the more fully developed path from E36 Visual Item through *P138 represents*, E1 CRM Entity, *P2 has type* to E55 Type.

Examples:

* The visual content of photograph gri\_2012\_m\_2\_b001\_f001\_d01\_e005\_0148 (E36) *represents instance of type* automobile (E55)   
  [Reference: <https://www.getty.edu/research/collections/object/10062J>]
* The top right image on page 87 in the book ‘Pharaoh’s Birds’ by John Miles (E36*) represents instance of type* hoopoe (Upupa epops) (E55).   
  [This image is a reproduction of a photograph. The same book shows at the top of page 35 an image representing an unnamed ancient Egyptian relief depicting a hoopoe and other ‘Birds of the Marshes’. In contrast to the photograph, the latter image of the ancient Egyptian depiction shows intentionally typical rather than individual characteristics of the respective species, and should therefore be associated with the property *P138* represents with the species name hoopoe (Upupa epops)]. (Miles, 1998)
* The visual content of Monet’s painting from 1868-1869 held by Musée d'Orsay, Paris, under inventory number RF 1984 164 (E36) *represents instance of type* magpie (Pica pica) (E55). [The editors give this example under the assumption that Claude Monet, as impressionist, created the painting following a real impression of a particular magpie. It was clearly not meant as a prototypical representation of this bird] (Musée d'Orsay, 2020)
* The top image on page 44 in the book ‘Wildblumen Kretas’ by Vangelis Papiomytoglou (E36) *represents instance of type* Cistus creticus L. (E55). [This image is a reproduction of a photograph. The plant produces an aromatic resin that has been exported from Crete to Egypt and other areas since the Bronze Age] (Papiomytoglou, 2006)

In first-order logic:

## redrafting scope notes of properties to reference the a fully articulated paths that they form part of

CEO walked the SIG through the set of properties whose scope notes need redrafting, in order for them to reference the fully articulated paths that they appear in. Said properties are:

1. [P89](#_NEW_7) falls within (contains)
2. [P161](#_NEW_8) has spatial projection (is spatial projection of)
3. [P168](#_NEW_9) place is defined by (defines place)
4. [P195](#_NEW_10) was a presence of (had presence)

Details of the redrafted scope notes listed per property below.

**Decisions**:

* Update the scope notes accordingly
* Update the templates for shortcut-fully articulated paths in the documents. See if it actually helps rather than distract readers/users. To be determined in a [new issue](#_[NEW_ISSUE]:_Update).   
  **HW**: TV & ETz in collaboration
* **HW**: PF to update **CRMtex** in accordance to the practice of referencing the fully articulated paths that a property appears in, in the scope note of said property.

### P89 falls within (contains)

#### NEW

**P89 falls within (contains)**

Domain:

E53 Place

Range:

E53 Place

Quantification:

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

Scope note:

This property identifies an instance of E53 Place that falls wholly within the extent of another instance of E53 Place.

It addresses spatial containment only and does not imply any relationship between things or phenomena occupying these places.

This property is a part of the fully developed path from E93 Presence through *P161 has spatial projection,* E53 Place, *P89 falls within (contains)* to E53 Place.

This property is a part of the fully developed path from E53 Place*, P89 falls within,* E53 Place*, P168 place is defined by* to E94 Space Primitive through a declarative Place that is not explicitly documented, to a Space Primitive: declarative places are defined in CRMgeo (Doerr and Hiebel 2013).

This property is a part of the fully developed path from E53 Place*, P89i contains,* E53 Place*, P168 place is defined by* toE94 Space Primitive.

This property is transitive and reflexive.

Examples:

* The area covered by the World Heritage Site of Stonehenge (E53) *falls within* the area of Salisbury Plain (E53). (Pryor, 2016)

In first-order logic:

P89(x,y) ⇒ E53(x)

P89(x,y) ⇒ E53(y)

[P89(x,y) ∧ P89(y,z)] ⇒ P89(x,z)

P89(x,x)

#### OLD

**P89 falls within (contains)**

Domain:

E53 Place

Range:

E53 Place

Quantification:

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

Scope note:

This property identifies an instance of E53 Place that falls wholly within the extent of another instance of E53 Place.

It addresses spatial containment only and does not imply any relationship between things or phenomena occupying these places.

This property is transitive and reflexive.

Examples:

* The area covered by the World Heritage Site of Stonehenge (E53) *falls within* the area of Salisbury Plain (E53). (Pryor, 2016)

In first-order logic:

P89(x,y) ⇒ E53(x)

P89(x,y) ⇒ E53(y)

[P89(x,y) ∧ P89(y,z)] ⇒ P89(x,z)

P89(x,x)

### P161 has spatial projection (is spatial projection of)

#### NEW

**P161 has spatial projection (is spatial projection of)**

Domain:

[E92](#_toc8670) Spacetime Volume

Range:

[E53](#_toc8104) Place

Quantification:

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

Scope note:

This property associates an instance of 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 for instances of E92 Spacetime Volume 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.

The spatial projection is unique with respect to the reference system. For instance, there is exactly one spatial projection of Lord Nelson's dying relative to the ship HMS Victory, i.e., the location of his body relative to the ship HMS Victory at time of his death.

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.

This property is part of the fully developed path from E18 Physical Thing through *P196 defines,* E92 Spacetime Volume, *P161 has spatial projection* to E53 Place, which in turn is implied by *P156 occupies (is occupied by)*.

This property is a part of the fully developed path from E93 Presence through *P161 has spatial projection,* E53 Place, *P89 falls within (contains)* to E53 Place

Example:

* The Roman Empire (E4) *has spatial projection* all areas ever claimed by Rome (E53). (Clare & Edwards, 1992)

In first-order logic:

P161(x,y) ⇒ E92(x)

P161(x,y) ⇒ E53(y)

(∃u) [E92(x) ∧ P157(x,u) ∧ E53(y) ∧ E53(z) ∧ E18(u) ∧ P157(y,u) ∧ P157(z,u) ∧ P161(x,y) ∧ P161(x,z) ] ⇒ (z = y)

P161(x,y) ∧ E4(x) ⇒ P7(x,y)

#### OLD

**P161 has spatial projection (is spatial projection of)**

Domain:

[E92](#_toc8670) Spacetime Volume

Range:

[E53](#_toc8104) Place

Quantification:

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

Scope note:

This property associates an instance of 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 for instances of E92 Spacetime Volume 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.

The spatial projection is unique with respect to the reference system. For instance, there is exactly one spatial projection of Lord Nelson's dying relative to the ship HMS Victory, i.e., the location of his body relative to the ship HMS Victory at time of his death.

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.

This property is part of the fully developed path from E18 Physical Thing trough *P196 defines*, E92 Spacetime Volume, *P161 has spatial projection* to E53 Place, which in turn is implied by *P156 occupies (is occupied by)*.

Example:

* The Roman Empire (E4) *has spatial projection* all areas ever claimed by Rome (E53). (Clare & Edwards, 1992)

In first-order logic:

P161(x,y) ⇒ E92(x)

P161(x,y) ⇒ E53(y)

(∃u) [E92(x) ∧ P157(x,u) ∧ E53(y) ∧ E53(z) ∧ E18(u) ∧ P157(y,u) ∧ P157(z,u) ∧ P161(x,y) ∧ P161(x,z) ] ⇒ (z = y)

P161(x,y) ∧ E4(x) ⇒ P7(x,y)

### P168 place is defined by (defines place)

#### NEW

**P168 place is defined by (defines place)**

Domain:

[E53](#_toc8104) Place

Range:

[E94](#_toc8709) Space Primitive

Subproperty of:

[E1](#_toc7281) CRM Entity. [P1](#_toc8819) is identified by: [E41](#_toc8039) Appellation

Quantification:

one to many, dependent (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.

This property is a part of the fully developed path from E53 Place*, P89 falls within,* E53 Place*, P168 place is defined by* to E94 Space Primitive through a declarative Place that is not explicitly documented, to a Space Primitive: declarative places are defined in CRMgeo (Doerr and Hiebel 2013).

This property is a part of the fully developed path from E53 Place*, P89i contains,* E53 Place*, P168 place is defined by* toE94 Space Primitive.

Examples:

* The centroid from https://sws.geonames.org/735927 (E53) place *is defined by* 40°31'17.9"N 21°15'48.3"E (E94). [A single point for approximating the centre of the city of Kastoria, Greece]
* Martin’s coordinates for Kastoria (E53) place *is defined by* 40°30'23"N 21°14'53"E, 40°31'40"N 21°16'43"E (E94). [A square covering the built settlement structure of Kastoria, Greece]
* Martin’s centroid for Kastoria (E53) place *is defined by* 40°31'01.5"N 21°15'48"E (E94). [A point in the lake of Kastoria in the centre of the area covered by the city]
* The position measured by Alexander von Humboldt for the Plaza Mayor in Cumaná, Sucre, Venezuela 1799-1800AD (E53) *place* *is defined by* 10°27'52"N 66°30'02"W (E94). [West of the Observatory of Paris = 64°09'51"W of Greenwich, actually 1,1km east of today’s Plaza Andrés Eloy Blanco of Cumaná] (Humboldt, 1859)

In first-order logic:

P168(x,y) ⇒ E53(x)

P168(x,y) ⇒ E94(y)

#### OLD

**P168 place is defined by (defines place)**

Domain:

[E53](#_toc8104) Place

Range:

[E94](#_toc8709) Space Primitive

Subproperty of:

[E1](#_toc7281) CRM Entity. [P1](#_toc8819) is identified by: [E41](#_toc8039) Appellation

Quantification:

one to many, dependent (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.

Examples:

* The centroid from https://sws.geonames.org/735927 (E53) place *is defined by* 40°31'17.9"N 21°15'48.3"E (E94). [A single point for approximating the centre of the city of Kastoria, Greece]
* Martin’s coordinates for Kastoria (E53) place *is defined by* 40°30'23"N 21°14'53"E, 40°31'40"N 21°16'43"E (E94). [A square covering the built settlement structure of Kastoria, Greece]
* Martin’s centroid for Kastoria (E53) place *is defined by* 40°31'01.5"N 21°15'48"E (E94). [A point in the lake of Kastoria in the centre of the area covered by the city]
* The position measured by Alexander von Humboldt for the Plaza Mayor in Cumaná, Sucre, Venezuela 1799-1800AD (E53) *place* *is defined by* 10°27'52"N 66°30'02"W (E94). [West of the Observatory of Paris = 64°09'51"W of Greenwich, actually 1,1km east of today’s Plaza Andrés Eloy Blanco of Cumaná] (Humboldt, 1859)

In first-order logic:

P168(x,y) ⇒ E53(x)

P168(x,y) ⇒ E94(y)

### P195 was a presence of (had presence)

#### NEW

**P195 was a presence of (had presence)**

Domain:

E93 Presence

Range:

E18 Physical Thing

Quantification:

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

Scope note:

This property associates an instance of E93 Presence with the instance of E18 Physical Thing of which it represents a temporal restriction (i.e. a time-slice) of the thing’s trajectory through spacetime. In other words, it describes where the instance of E18 Physical Thing was or moved around within a given time-span. Instantiating this property constitutes a necessary part of the identity of the respective instance of E93 Presence.

This property is a strong shortcut of the fully developed path from E18 Physical Thing through *P196 defines*, E92 Spacetime Volume, *P166 was a presence of (had presence)* to E93 Presence.

This property is a part of the fully developed path from E18 Physical Thing through *P196 defines*, E92 Spacetime Volume, *P166 was a presence of (had presence)* to E93 Presence.

Examples:

* Johann Joachim Winckelmann’s whereabouts in December 1755 (E93) *was a presence of* Johann Joachim Winckelmann (E21). (Wiencke, 1998)
* Johann Joachim Winckelmann’s whereabouts from 19th November 1755 until 9th April 1768 (E93) *was a presence of* Johann Joachim Winckelmann (E21). (Wiencke, 1998)

In first-order logic:

P195(x,y) ⇒ E93(x)

P195(x,y) ⇒ E18(y)

P195(x,y) ⇔ (∃z)[E92(z) ∧ P166(z,x) ∧ P196i(z,y)]

#### OLD

**P195 was a presence of (had presence)**

Domain:

E93 Presence

Range:

E18 Physical Thing

Quantification:

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

Scope note:

This property associates an instance of E93 Presence with the instance of E18 Physical Thing of which it represents a temporal restriction (i.e. a time-slice) of the thing’s trajectory through spacetime. In other words, it describes where the instance of E18 Physical Thing was or moved around within a given time-span. Instantiating this property constitutes a necessary part of the identity of the respective instance of E93 Presence.

This property is a shortcut of the fully developed path from E18 Physical Thing through *P196 defines*, E92 Spacetime Volume, *P166 was a presence of (had presence)* to E93 Presence.

Examples:

* Johann Joachim Winckelmann’s whereabouts in December 1755 (E93) *was a presence of* Johann Joachim Winckelmann (E21). (Wiencke, 1998)
* Johann Joachim Winckelmann’s whereabouts from 19th November 1755 until 9th April 1768 (E93) *was a presence of* Johann Joachim Winckelmann (E21). (Wiencke, 1998)

In first-order logic:

P195(x,y) ⇒ E93(x)

P195(x,y) ⇒ E18(y)

P195(x,y) ⇔ (∃z)[E92(z) ∧ P166(z,x) ∧ P196i(z,y)]