# Issue 452

#### P156 occupies (is occupied by)

In the context of the issue 438, the sig discussed and accepted the amendments to the definition of the class, as proposed by MD. The definition changed.

##### From (old)

**P156 occupies (is occupied by)**

Domain: [E18](#_E18_Physical_Thing) Physical Thing

Range: [E53](#_E53_Place) Place

Subproperty of: [E92](#_E92_Spacetime_Volume) Spacetime Volume. [P161](#_P161_has_spatial) has spatial projection: [E53](#_E53_Place) Place

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

Scope note: This property describes the largest volume in space, an instance of E53 Place, 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 instance of 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 Physical Feature IsA E53 Place) may be a practical approach.

For instances of E19 Physical Objects the default reference space is the one which is at rest to the object itself, i.e. which moves together with the object. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

This property is a subproperty of P161 has spatial projection because it refers to its own domain as reference space for its range, whereas P161 has spatial projection may refer to a place in terms of any reference space. For some instances of E18 Physical Object the relative stability of form may not be sufficient to define a useful local reference space, for instance for an amoeba. In such cases the fully developed path to an external reference space and using a temporal validity component may be adequate to determine the place they have occupied.

In contrast to P156 occupies, the property P53 has former or current location identifies an instance of E53 Place at which a thing is or has been for some unspecified time span. Further it does not constrain the reference space of the referred instance of P53 Place.

In First Order Logic:

 P156 (x,y) = [E18(x) ∧ E53(y) ∧ P161(x,y) ∧ P157(y,x)]

##### TO (new)

**P156 occupies (is occupied by)**

Domain: [E18](#_E18_Physical_Thing) Physical Thing

Range: [E53](#_E53_Place) Place

Subproperty of: P157i is at rest relative to (provides reference space for).

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

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

Scope note: This property describes the largest volume in space, an instance of E53 Place, that an instance of E18 Physical Thing has occupied at any time during its existence, with respect to the reference space relative to the physical thing itself. This allows for describing 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. The reference space for the associated place must be the one that is permanently at rest (*P157 is at rest relative to)* relative to the physical thing. For instances of E19 Physical Objects it is the one which is at rest relative to the object itself, i.e. which moves together with the object. For instances of E26 Physical Feature it is one which is at rest relative to the physical feature itself and the surrounding matter immediately connected to it. Therefore there is a 1:1 relation between the instance E18 Physical Thing and the instance of E53 Place it occupies. We include in the occupied space the space filled by the matter of the physical thing and all its inner spaces.

This property implies the fully developed path from E18 Physical Thing through *P196 defines, E92 Spacetime Volume*, *P161 has spatial projection*, E53 Place. However, in contrast to *P156 occupies,* the property *P161 has spatial projection* does not constrain the reference space of the referred instance of E53 Place.

In contrast to *P156 occupies*, for the property *P53 has former or current location* the following holds:

* It does not constrain the reference space of the referred instance of E53 Place.
* It identifies a possibly wider instance of E53 Place at which a thing is or has been for some unspecified time span.
* If the reference space of the referred instance of E53 Place is not at rest with respect to the physical thing found there, the physical thing may move away after some time to another place and/or may have been at some other place before. The same holds for the fully developed path from E18 Physical Thing through *P196 defines, E92 Spacetime Volume*, *P161 has spatial projection*, E53 Place.

In First Order Logic:

P156(x,y) ⊃ E53(y)

 P156(x,y) ⊃ E18(x)

P156 (x,y) = [E18(x) ∧ E53(y) ∧ P196(x,z) ∧ P161(z,y) ∧ P157(y,x)]