

## Flow of Events for Use Case – Define Map Space

Change Log	
17/10/2004	Renamed from UC-DefineMap Change in focus of use case so that map information is handled as being within a map space.

### Overview

Defines the spatial extents within which geographical information captured within IFC is appropriate. This is to determine equivalence with the concept of a map in geographic terms.

In particular, specifying the spatial extents of a map space enables identification of information to be related to a base map, situation map or situation plan in a planning context.

Using the space provision of the IFC model enables elements related to a particular map space to be identified using the `IfcRelContainedInSpatialStructure` relationship whilst specific land use, property and other spaces within the map space can be captured using `IfcRelAggregates`.

General context information can be captured through existing representation context capabilities in IFC

Note that it is assumed that all coordinates within a map space defined by IFC are Cartesian coordinates. References to other coordinate systems may be made through map projection and annotated point (where used as a ground control point) entities defined through other use cases.

### Process

#### Preconditions

None

#### Actors

Authority

#### Main Flow

Flow	Entity
1. Determine the placement origin for the map space (used as the datum of the local coordinate system for all geometric representation items used to represent the space).	<code>IfcPoint</code> <code>IfcAnnotationPoint</code>
2. Place the extents of the map using the use case 'Place 2D Spatial Shape'	<code>IfcShapeRepresentation</code>
3. The representation identifier is set to '<type>Map' where type is a name specifying a particular type of map e.g. base map, situation map, situation plan or local equivalents.	<code>IfcShapeRepresentation.RepresentationIdentifier</code>
4. Create an instance of <code>IfcSpace</code> to designate the map space and ensure attribute values are set appropriately to an external space.	<code>IfcSpace</code>
5. Set the <code>ObjectType</code> attribute value for the entity to 'Map'	<code>IfcSpace.ObjectType</code>
6. Create a relationship for all elements that are contained within the map space using <code>IfcRelContainedInSpatialStructure</code> (note that this may be generated specifically, as entities	<code>IfcRelContainedInSpatialStructure</code>

are placed or by some operation within an appropriate software environment using the boundary of the map space as the polygonal extents of a selection set)	
7. Create a relationship for all spaces, sites and buildings that are contained within the map space using IfcRelAggregates	IfcElementType, IfcElement (subtypes) IfcSite, IfcSpace IfcRelAggregates

### Post Conditions

Map space is defined.

## IFC Usage and Extension Requirements

### Existing Entity/Class Usage

<i>Entity Class Name</i>	<i>Usage</i>
IfcBuilding	Buildings that are contained within the map space. Buildings or other constructions having a particular status may be related to a particular type of map space.
IfcElement <subtypes>	Elements that are contained within the map space. Elements having a particular status may be related to a particular type of map space.
IfcPoint	Point at which datum is located
IfcRelAggregates	Used to aggregate spatial structure elements (spaces, sites, buildings) with a map space
IfcRelContainedInSpatialStructure	Used to aggregate elements with a map space
IfcSite	Site spaces that are contained within the map space.
IfcSpace	Used to define a space that is typed as a map. Also used to identify spaces of other types that may be aggregated within a map space.

### Existing Entity/Class with Proposed Modification

<i>Entity Class Name</i>	<i>Usage</i>

<i>A R M</i>	<i>Attribute</i>	<i>Cardinality</i>	<i>Datatype</i>	<i>Definition</i>

<i>A R M</i>	<i>#</i>	<i>Type (DER, U, WHERE)</i>	<i>Proposition</i>

### New Entity/Class Requirement

<i>Entity Class Name</i>	<i>Usage</i>
IfcAnnotationPoint	Qualified point with identity at which a datum point may be located.

<i>Attribute</i>	<i>Cardinality</i>	<i>Datatype</i>	<i>Definition</i>

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#	Type (DER, U, WHERE)	Proposition

### Existing Property Set Usage

Property Set Name	Usage

### Existing Property Set with Proposed Modification

Property Set Name	Usage

A R M	Property	Type	Datatype	Unit	Definition

### New Property Set Requirement

<b>Name:</b>	Pset_SpaceMapSpace
<b>Applicability:</b>	IfcSpace entity
<b>Applicable Classes:</b>	IfcSpace
<b>Applicable Type Value:</b>	
<b>IFC Version:</b>	2x3
<b>Definition:</b>	Definition from IAI: A space that represents the extents within which information is contained on an equivalent geographical map.

Property	Type	Datatype	Unit	Definition
MapSpaceType	IfcPropertySingleValue	IfcLabel		Sets the type of map space information for which the map space is to be used. Typical choices might be BaseMap, SituationMap, SituationPlan, LandUseMap, LandUsePlan etc. Value is not specified as an enumeration as the naming of different types of map may be subject to local usage. Guidance on naming of map space types should be in the context of any local usage.
MapSpaceName	IfcPropertySingleValue	IfcLabel		A particular name that may be associated with this map space
MapSpaceIdentifier	IfcPropertySingleValue	IfcIdentifier		A particular identifier that may be associated with this map space

### Issue List

Question	Answer
Should an IFC file be allowed to contain only one map (as equivalent to IfcProject) or should provision be made for it to contain more than one map noting that if more than one map is contained, each map must work to the same geometric	[JDW 17.10.2004] By referencing a map as a type of space in IFC, multiple maps could be contained. For a specific file or a specific query relating to a single map, this information could be extracted by relationship of information to a single map space.

representation context so that all positional data is consistent..	
The IFC definitions depend on the general question of whether “defining a map” is in scope or not.	[JDW 17.10.2004] Now determined that defining a map as a specific idea in IFC is not in scope (since a ‘map’ is effectively a document). However, defining the space within which a particular map might show information is in scope and this can be handled by existing space concepts.
[TL 17.5.2004] General question: Is this use case part of the IFG scope? Provision of a map is part of the work of the municipality usually done in a GIS system. It does not (yet) relate to the situation plan work	[JDW 17.10.2004] Yes; refinements to handle maps as ‘map spaces’ adds credibility to the concept.
[TL 17.5.2004] Clearly in scope is the hand-over of a map (or a part thereof) as the situation map to the developer/architect. This hand-over includes a transformation (or often simply translation) of the geodetical coordinate system into the Cartesian coordinate system of the building design (see use case ‘Define Coordinate System’)	[JDW 17.10.2004] Map space enables this to occur.
[TL 17.5.2004] If only the hand-over is in scope (to me the preferred option), the map information would become part of the IfcProject information, stored within the Cartesian coordinate system, as defined by the IfcGeometricRepresentationContext. It could relate to a single site (IfcSite.CompositionType=ELEMENT), or to a series of sites (IfcSite.CompositionType=COMPLEX).	[JDW 17.10.2004] Agreed. Modifications to the use case enable the representation context as identified. But, relation is to a space and not to a site.
[TL 17.5.2004] The addition of an IfcMap (and the neighbourhood relationships to adjacent maps) would then remain the responsibility of the municipality and done in the GIS system (and thereby not part of the IFC model).	[JDW 17.10.2004] Concept of IfcMap removed from the use case in favour of IfcSpace of type ‘Map’
[TL 17.5.2004] NOTE: adding this use case (same as adding the use case ‘Define Coordinate System’ in its original form) would have severe implications on the general scope of IFC and its further development.	[JDW 17.10.2004] Issue resolved by using map space.