

AP242 ed2

Electrical Wiring Harness (EWH)

Tutorial – Slides

part 3

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This document is based on material provided in the document
AP242_Electrical_Harness_Tutorial_XML.pdf

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Topics for this Part 3

MIM implementation of the topological structure of an EWH
(Electrical Wire Harness) in p21 files:

- Goal is an alternative approach to ExternalElementReference (see Part 2) where the EWH XML file refers to elements in a p21 file.

The ExternalElementReference approach requires either

- the use of p21 anchors
- or the tool that is generating the XML file needs to have detailed knowledge of the specific p21 file; i.a. the instance-IDs, e.g. #1234

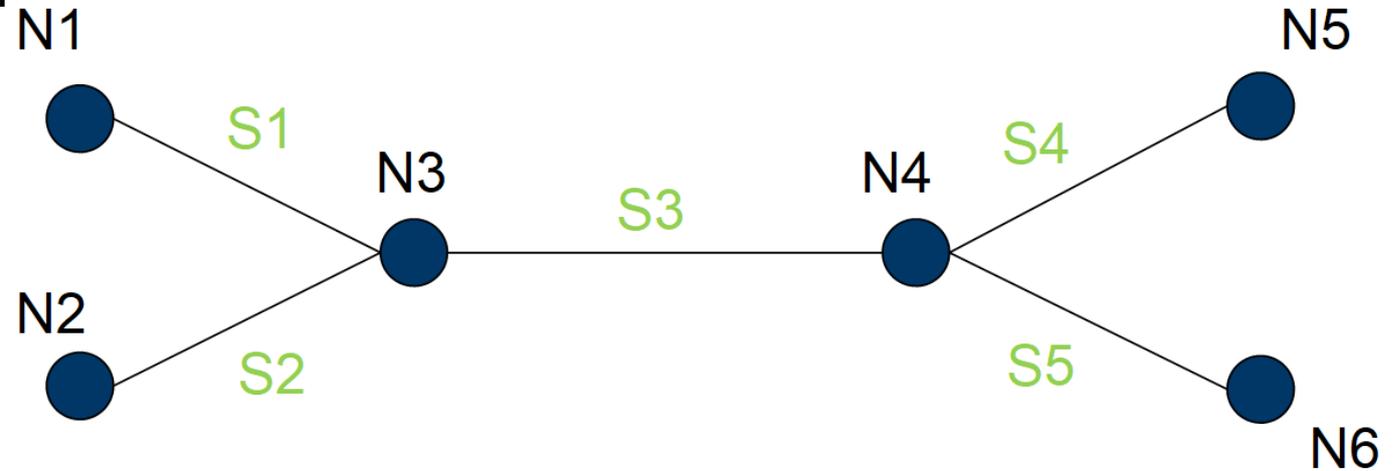
New proposal: “**topological XML - p21 mapping**” approach:

- The traditional p21 file with geometry of, e.g. the 3D model of the harness, is extended for the topological EWH structure
- Background is that some M-CAD system explicitly knows about EWH **segment/bundle** and **nodes**
- As a result both,
 - the EWH XML file with the product structure, connectivity information, ... typically generated by an E-CAD system and
 - the EWH p21 file with the geometry typically generated by an M-CAD systemcontain the same topological harness model
- A receiver of both files, EWH XML and EWH p21, can then easily determine the mapping between the files by comparing the common topological elements
- ...

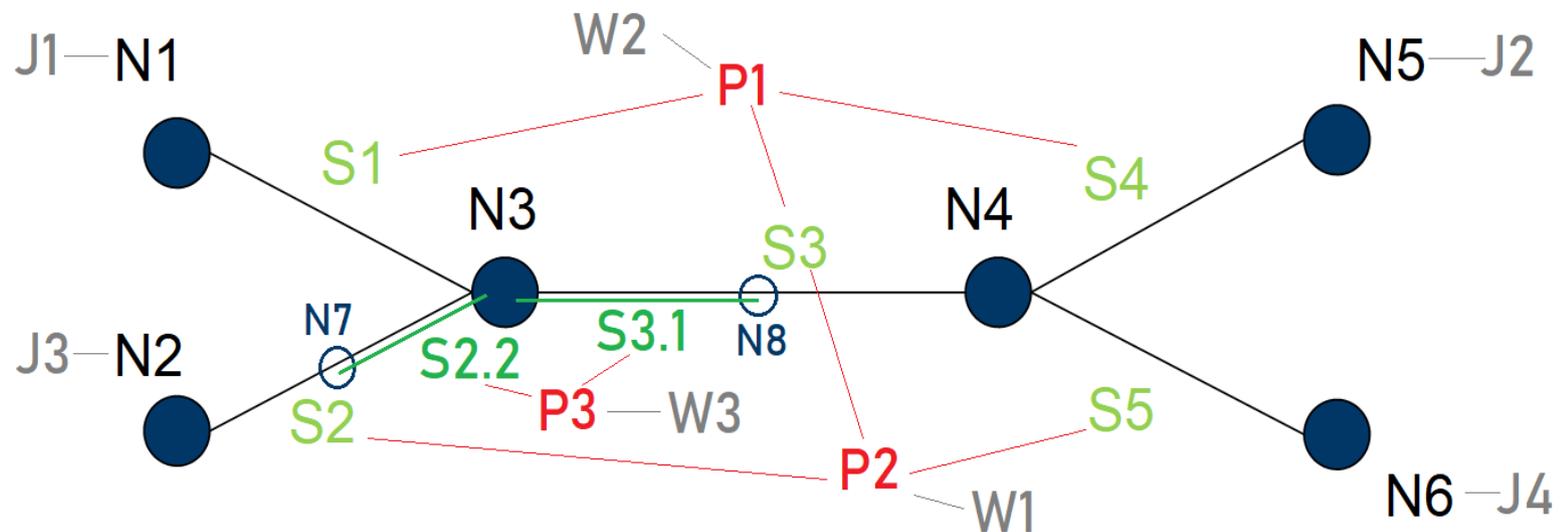
Formal test cases for upcoming Test Suite v5.0

Reuse of previous topological XML models for MIM/p21 implementation:

- EWH-Topology1.stp



- EWH-Topology2a/b.stp
 - a) the pure topological structure
 - b) extend for the assembly structure (later)



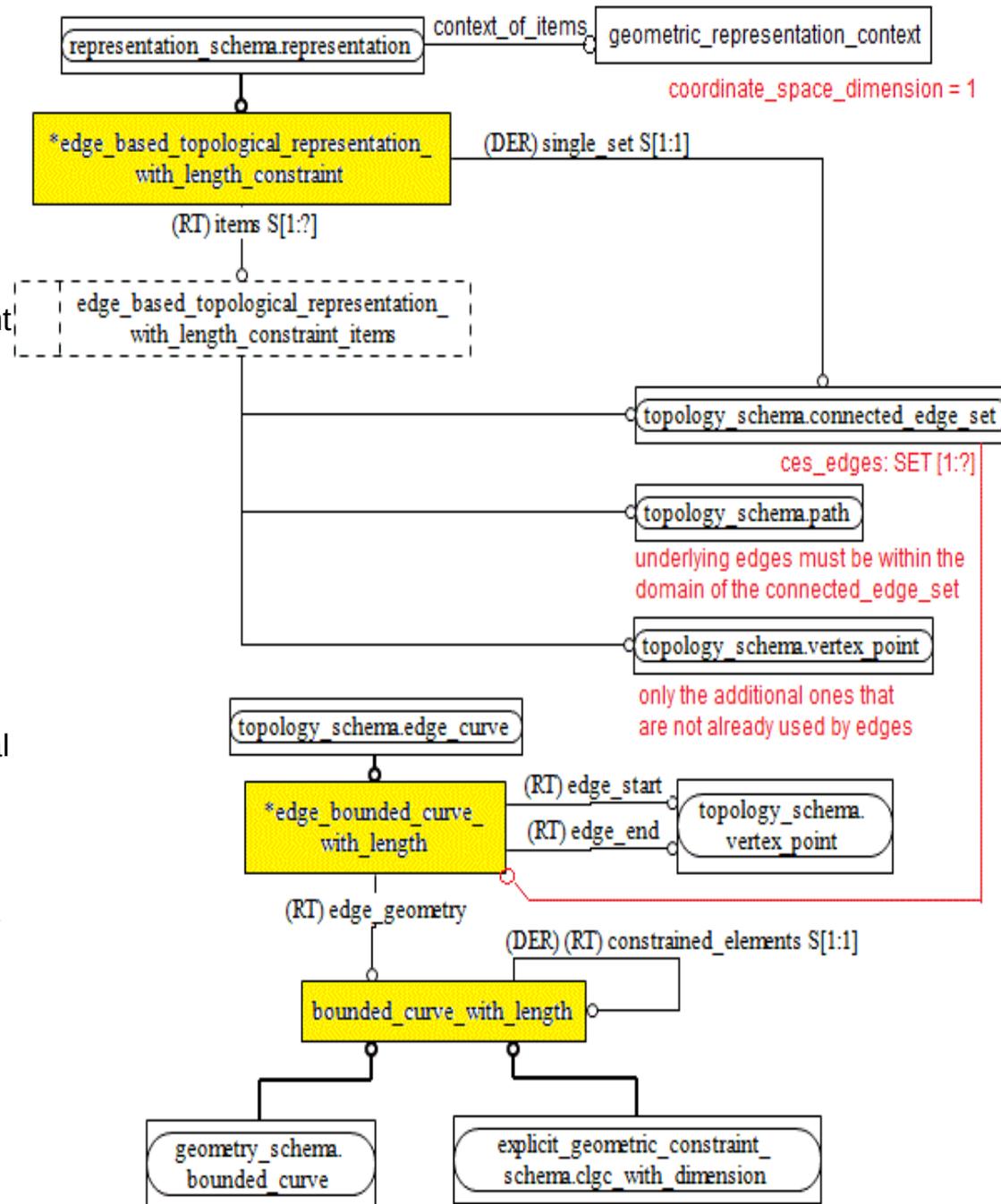
Express schema for the topological structure of an EWH: Edge_based_topological_representation_with_length_constraint_mim

The flexible topological harness representation is a kind of topological bounded wireframe model with points and curves, but without any coordinates (no cartesian_point, no direction)

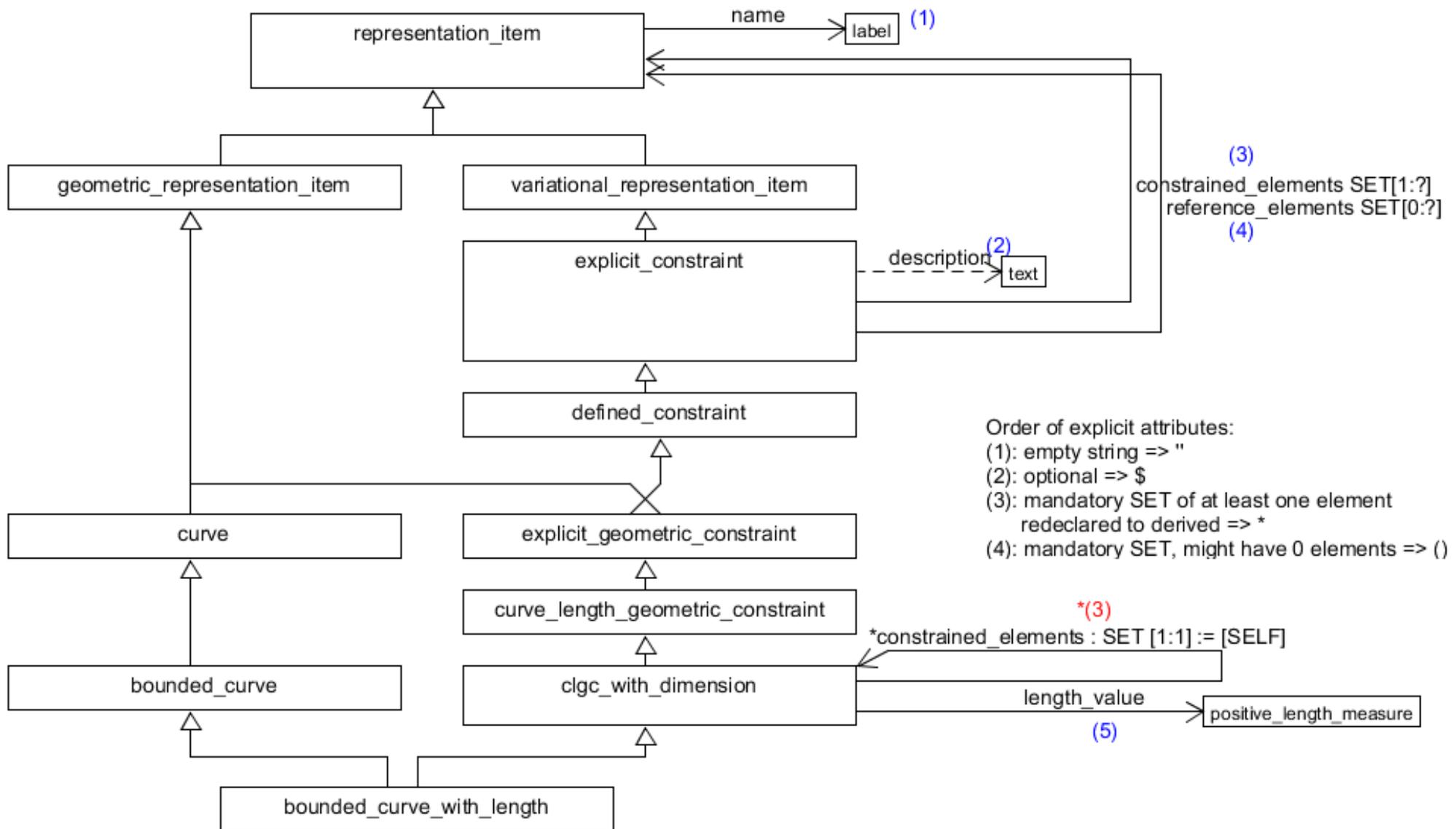
- all curves have undefined geometry with a certain length => bounded_curve_with_length
- all points are just points or point_on_curve with a parameter value in the range 0 to length of the curve

edge_based_topological_representation_with_length_constraint

- is not a shape_representation; so can't be used by product_definition_shape and shape_definition_representation; instead used by property_definition
- points and curves require for the context_of_items a geometric_representation_context with the dimension value 1; even if this does not mean 1D => have to make clear that it is not 2D nor 3D
- the items attribute must contain a single connected_edge_set plus optionally path(s) and additional vertex_point(s) that are within the domain of the set
- the connected_edge_set might be a connected_edge_sub_set => this can be used to define further representations with topological sub-structures but within the same representation_context
- all items of the connected_edge_set must be of type edge_bounded_curve_with_length (or subedge for connected_edge_sub_set)
- an edge_bounded_curve_with_length refers to a bounded_curve_with_length



Inheritance tree and order of explicit attributes of `bounded_curve_with_length`



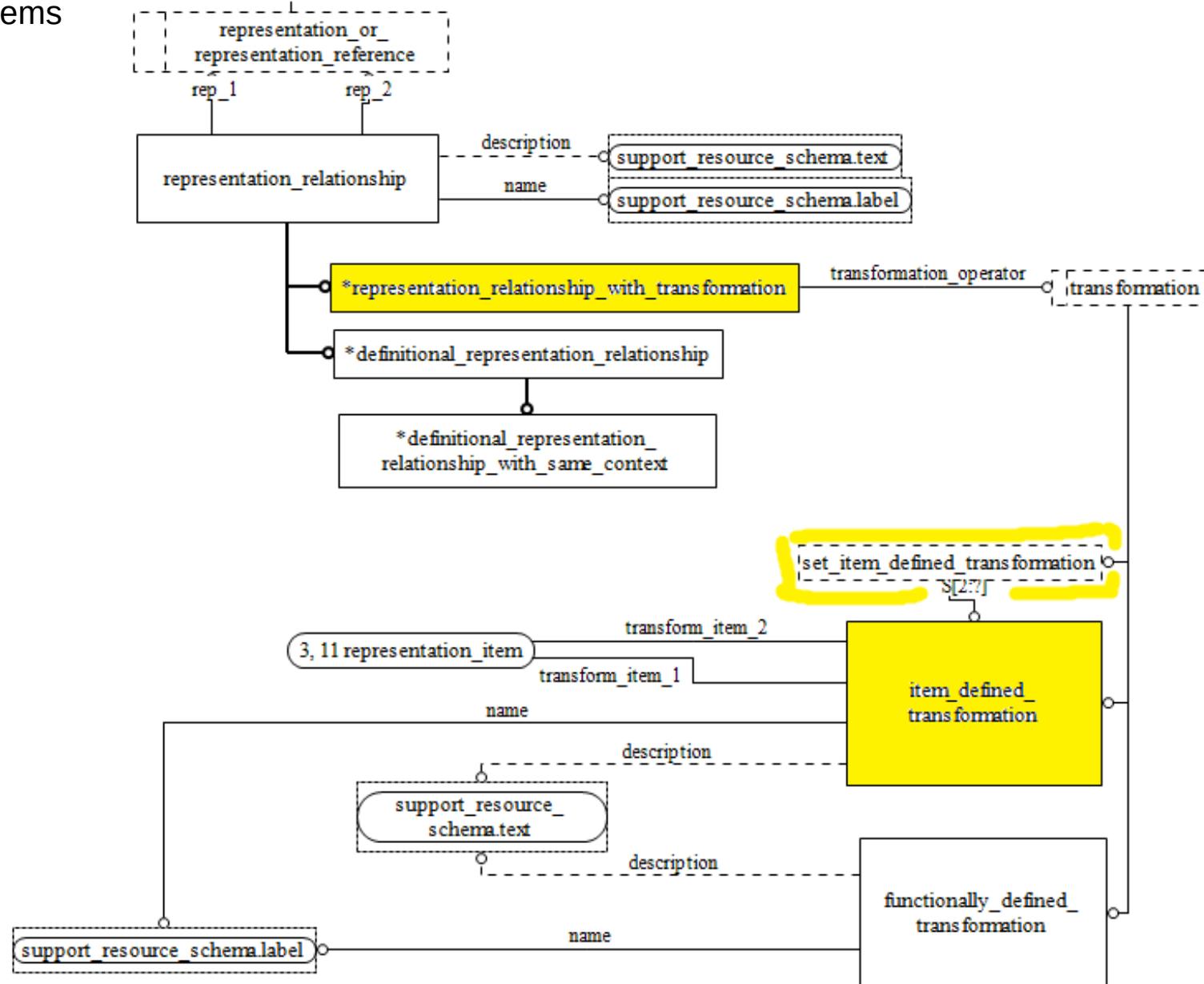
Example

```
#9941=BOUNDED_CURVE_WITH_LENGTH(",$,*,(),2.0);
```

1 2 3 4 5

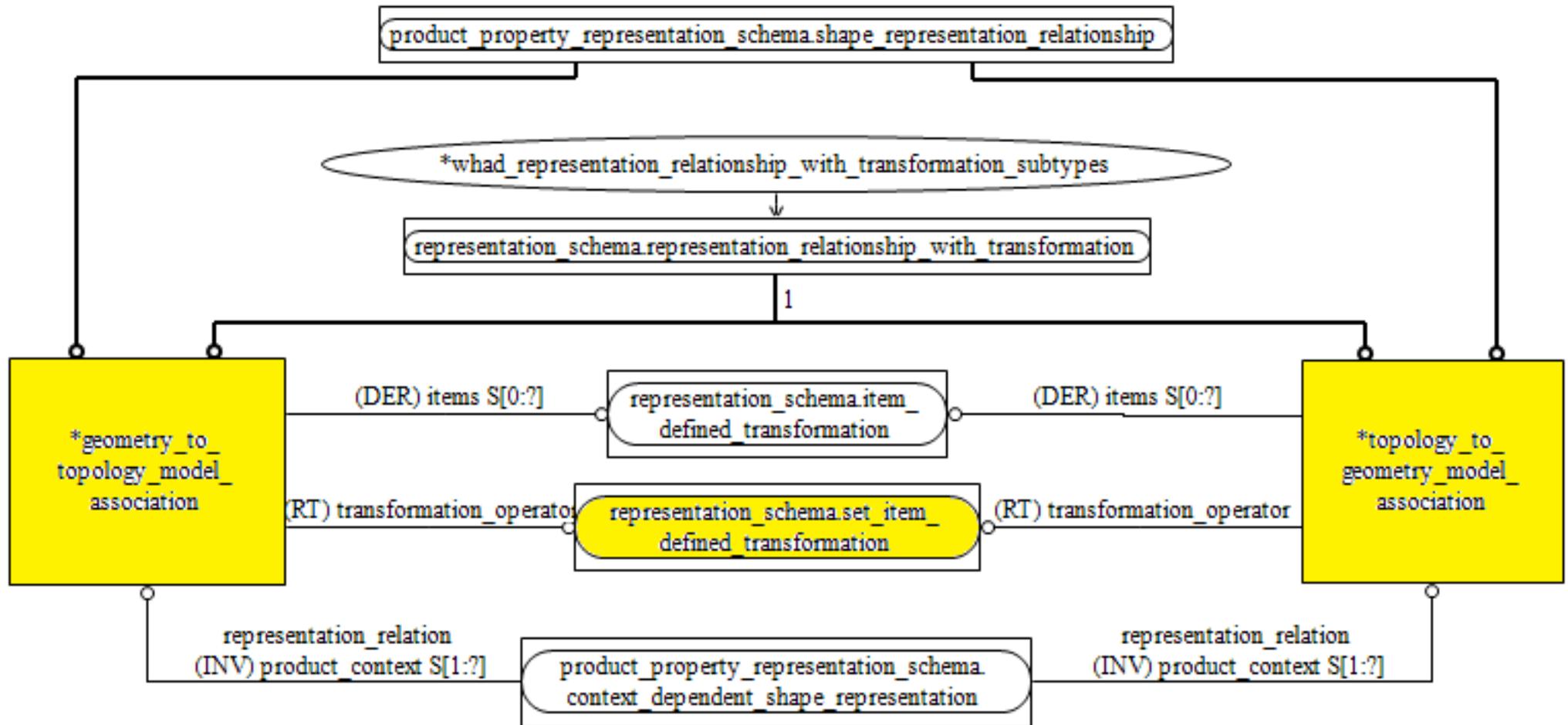
EWH uses representation_relationship_with_transformation with a SET of item_defined_transformation

- In traditional STEP, a representation_relationship_with_transformation is used only with a single item_defined_transformation
- For EWH we need a SET of item_defined_transformation, because the transformation is defined as a set of pairs of representation_items



EWH uses specialized representation_relationship_with_transformation

- **topology_to_geometry_model_association** is needed to associate the topological model of the harness to a corresponding 2D or 3D model
 - Issue detected while working out this test case: There is an error in the Express model in that a context_dependent_shape_representation is required. This is only needed when the 3D model is given for a higher assembly level where one (or several) harnesses are used.
- **geometry_to_topology_model_association** is needed to associate single rigid (e.g. connector) flexible (e.g. wire, cable) assembly components to the topological model of the wiring_harness_assembly_design.
 - They require a context_dependent_shape_representation to link with product assembly structure



Valid items for the geometry <-> topology model associations

