Best practices for publishing and linking BIM data: Scoping of IFC models

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The use of Linked Data in Architecture and Construction is still faced with a set of challenging questions. Besides identification of business cases the development of best practices is urgently needed to get started with publication of building data. This presentation is focusing on the step of extracting relevant data from an existing BIM data set. We will clarify the use of existing technologies and, as a possible alternative, will examine how similar results can be achieved based on semantic web technologies. Both approaches will be compared and evaluated.

IFC is an international open standard for sharing building data and is being a main driver of the BIM approach. The aim of BIM is to collect all relevant data of a building in a consistant and redundant free manner. However, working with IFC typically means to use a subset of all BIM data. For instance, when an architect communicates information from his Building Information Model (BIM) to an HVAC system designer, then this HVAC system designer typically does not require the full BIM model, but only parts of the data. Thus, IFC data exchange is scoped according to the purpose of its use. Scoping of BIM data is not only interesting to reduce the file size, it is also used to control the data flow. Similarly, when publishing a BIM model in the web, such a technique will become useful to avoid privacy and security issues, to improve performance or to anonymize the BIM model.

The objective of scoping BIM and IFC has been a key objective for standardization efforts by buildingSMART that have been put in the concepts of Information Delivery Manuals (IDMs) and Model View Definitions (MVDs). With mvdXML a formal schema exists that enables to specify required IFC subsets and therefore can be used for scoping of BIM data. Also, a tool called IFC Documentation Generator is provided by buildingSMART free of charge, which supports mvdXML developments. All this is a sound foundation that can be used in a data publication scenario.

Alternatively, there is an option that semantic web technologies can improve this process. Two kinds of improvements might be available. First, semantic web technologies might allow to define MVDs in a much more intuitive and faster manner, both at schema level (TBox) and at instance level (ABox), mainly because of the standard functionalities provided by these technologies, such as the SPARQL query language and inference support. Second, using the logical basis of semantic web technologies (Description Logics – DL), it might be possible to rapidly and trustworthy check the validity of an MVD model. If a generated MVD subset is compliant with the MVD ontology defined in the Web Ontology Language (OWL), which can be checked automatically, more reliable MVD subsets might be within reach.

The presentation first introduces the existing buildingSMART technologies for IFC scoping. As an example we will use the data requirements that have been defined for the Indoor Navigation use case. A main aspect is to explain the structure of mvdXML and the idea of having functional units that can be reused in different application contexts. We will show how such mvdXML specification can be used to create a valid IFC subset containing required data only. Finally, this subset data can be mapped to ifcOWL RDF for data publication purposes.

The same will be done with help of semantic web technology. In that scenario, the entire IFC file will be converted into an ifcOWL RDF graph first. According to the mvdXML scope specification a number of transformation rules is then generated and applied that reformulate the required concepts from the entire RDF graph and generate a distinctly scoped graph. The usage of SPARQL queries is also explored as an alternative.

We will discuss our experiences and results about the two approaches during a joint presentation at the LDAC workshop.