Interoperability
between IFC's (ISO 16739) and ISO 15926

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Overview

This paper discusses how interoperability between building models using the Industry Foundation Classes (IFC's) and process plant models using ISO 15926 can be achieved. For building models (IFC's – now ISO 16739) have been developed over the last 30 years under the organisation International Alliance for Interoperability (IAI) – now buildingSMART, and for process plant, ISO 15926 has evolved from the European initiative EPISTLE over a similar period of time. To date there has been little communication between these groups but the requirement for interoperability is now increasing.

Background

There is the same requirement for interoperability in the building and the process plant industries (as well as others). For each of these, a massive amount of effort has been deployed to develop a solution. The solutions are different but have a similar basic concept. That is, that the classes of objects that represent the artefacts used in each of the industries are standardised as well as the key structure of information they contain.

For the building industry, these classes have been defined for some time and the major vendors of AEC systems have embraced them and implemented these in their applications. Whilst each system can extend the attributes of the objects, the key aspects are common and the geometry is taken from ISO 10303-42. Exchange between systems is being achieved either with ISO 10103-21 files conforming to an EXPRESS schema or with XML files conforming to the ifcXML Schema. Because ifcXML is in effect an ISO 10303-28 file, it follows the same structure of the ISO 10303-21 file. This is flat using entity references rather than the more usual use of XML with nested Elements. The current version implemented by most vendors is version 2x3, 2x4 has been published but is not widely implemented. Along with IFC there are also Information Delivery Manuals (IDM) each of which defines a scenario and objects for exchange purposes.

There are around 800 IFC classes defined and considerable success has been achieved on major projects. Classes are explicitly defined and interoperability is by file exchange.

For the process plant industry, efforts have been concentrated on defining a flexible data model which has some very low level core classes (ISO 15926-2), which will enable the sharing of any information. The key to ISO 15926 is the Reference Data Library (RDL –ISO 15926-4) which holds the name, description and a URI for all

classes. This is now supported by the PCA Reference Data System (PCA RDS) which has been established by the Fiatech / PCA JORD (Joint Operational Reference Data) project. These classes can be readily extended using ‘sandboxes’ which are also supported by the PCA RDS. The base service provides a GUI or programmatic access to the RDL. The classes currently held are focussed on the process plant industry, but there is no restriction in relation to industry. There are currently around 60,000 classes in the RDL.

There are also higher level constructs (Templates) being developed which enable arrangements of the core classes into building blocks called Templates and Template Information Patterns (TIPs) which are arrangements of Templates.

ISO 15926 is designed for information sharing, rather than just exchange. There is an overlap between the IFC and ISO 15926 approaches in respect of class names.

For ISO 15926, information transfer can be using conventional XML files conforming to an approved XSD Schema - currently the XMpLant Schema version 3.3.3 published by the Proteus project in March 2009. This is being superseded by version 3.6.0 which will be published by the Fiatech project ISO 15926 Information Model and Proteus Mapping (IIMM) in October 2013. The new version has been reviewed by the German Data Exchange for the Process Industry (DEXPI) and the Oil and Gas Initiative (OGI) projects and is out for wider industry review. The Schema uses the classes of ISO 15926-4 and ISO 15926-3 (which is taken from ISO 10303-42). These files reflect the structure of process plant and use nested Elements to express hierarchy structure.

ISO 15926-8 defines a format for the use of RDF /OWL XML to represent the Templates defined in accordance with ISO 15926-7 (referenced by URI of the RDL).

The opportunity

The major benefit for interoperability is along the lifecycle, where information can be shared that will greatly smooth the planning and reduce errors. There are issues to be resolved regarding the scope and level of detail for each industry, but those can be resolved through pilots to determine what works today and what needs further fine tuning.

IFCs have the ability for the export to use generic objects to represent business objects along with custom metadata to hold the original information. This flexibility is valuable as there is no loss of information. However, it is not standardised nor can a direct reference be made to the meaning of the information makeing transfer harder. Mapping can be used to resolve this and where the PCA RDS RDL can be of use.

Benefit can be gained for

- Suppliers
- Designers
- Fabricators

For the suppliers, their products are used in both industries and the ability to enable the details of standard components, steel sections etc to be available for use in either form will streamline their information systems.

For the designers the ability to import models or subsections of models into their design systems will facilitate the correct design and interaction between those designing the buildings and those designing the plant.

For fabricators the ability to load the design information and create the fabrication models / details / drawings from the information will save time and errors.

XMpLant

XMpLant technology uses a flexible data model core and hence can operate on any model. It can load an IFC or ifcXML file, as it can any other. Once loaded, the model can be processed to convert the geometry into ISO 15926-3 object form (without loss of fidelity), enabling the building objects to be operated on as any other class. The mapping subsystem can be used as necessary to map the IFC classes to those of ISO 15926.Note that there is not a one to one mapping here as the concept of the IFC entities do not directly relate to a specific object whereas ISO 15926 classes in general do.

XMpLant supports the concept of "user defined attributes" allowing all extensions used by a given application or project to be handled. The mapping subsystem enables these to be mapped to the relevant class of ISO 15926. In this way the full structure and intelligence of a building model or process plant can be accessed through the neutral model or converted to another system. It also allows information to be filtered which could be used to reduce the level of detail in the exchange file when working between building and process plant models.

XMpLant also enables concurrent access to any number of systems for read and write enabling information to be merged from building systems and process plant systems for a given purpose.

Conclusions

There is now considerable deployment of both ISO 16739 (IFC / BIM) and ISO 15926 (iRING) but little in the way of interoperability between these two standards. There are mounting business pressures to make this happen and Fiatech have some focussed initiatives(eg. with AISC for Structural Steel and others) to help.

There are pilots in progress and all interested are encouraged to join these efforts to ensure that the evolving methodologies, mappings and tools being developed meet the industry requirements.

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