Autodesk® Revit® software products

How Autodesk Supports Open Data Exchange Standards to Improve Project Collaboration

Building Information Modeling (BIM) is changing the way project data is organised and the way teams work together. Cross-functional project teams use BIM software solutions to create intelligent 3D digital models that give all stakeholders a clearer vision of the project and increase their ability to make faster, more informed decisions.

These BIM models are supplementing (and may someday replace) construction documents as a new standard for sharing and delivering building design data. Data exchange standards help project teams move these models and information from one 3D modeling software application to another, facilitating more efficient, collaborative workflows.

Industry Foundation Classes (IFC)

Industry Foundation Classes (IFC) is an important standard for the exchange of BIM data. The IFC data model contains both geometry and properties of 'intelligent' building elements and their relationships to other elements in a building model—central concepts of BIM.

The IFC standard is developed and maintained by buildingSMART International (formerly the International Alliance for Interoperability or IAI), which is a non-profit industry-led organisation. As such, IFC is a neutral standard, and independent of any particular vendor's software development plans.

The IAI was started in 1994, when Autodesk invited a group of organisations to examine the potential for making different software applications work together. Autodesk holds a board level position in buildingSMART's North American chapter and participates in international buildingSMART chapters as well.

Government agencies, commercial firms, and project owners around the world are increasingly mandating the IFC data exchange format, and Autodesk is continuously working on the quality of IFC data exchanges. Examples include:

- Full stage certification of Autodesk® Revit® software products for IFC 2x3 Coordination View. [See endnote for full details.]
- Support of the U.S General Services Administration (GSA) IFC model view.
- Singapore IFC Code-checking view certification by Building Construction Authority (BCA), which regulates Singapore's building and construction industry.
- The release of IFC Export for Autodesk® Revit® software as an Autodesk-sponsored open source project at http://sourceforge.net/p/ifcexporter/home/Home/.

Autodesk® Architectural Desktop (now Autodesk® AutoCAD® Architecture) software also has a long history of support for IFC starting in 2006, through a plug-in provided by G.E.M. Team Solutions GbR. As of AutoCAD Architecture 2008, IFC export and import based on the buildingSMART IFC 2x3 data exchange standard are implemented directly into the product.
AutoCAD Architecture 2008 received stage-1 certification by the IAI in November 2006 and full stage-2 certification for the IFC 2X3 Coordination View for both import and export in May 2007.

In July 2012, at the 9th European Conference for Product and Process Modeling (ECPPM), a team of Dutch researchers presented an instructive paper on the use of IFC for project collaboration. The paper (entitled "Collaborative engineering with IFC: new insights and technology" and available at www.bimserver.org/service/scientific/) outlines a successful application of IFC information for project teams.

The paper concluded that IFC is effective for collaboration and for referencing and verifying original data sources (on projects that feature multiple BIM software applications as well as projects where one BIM platform is predominant). The IFC reference model approach described in the paper meets the fluid project team demands of today's AEC projects, and provides a framework for more aggressive application of IFC information in the future.

Data Exchange Standards Development

The AEC industry has many contributing disciplines and building professionals generating information to meet the various demands of a building project, ranging from architects and engineers, to contractors, fabricators, and owners. Each of these professionals creates specific project deliverables that demand specific, and sometimes unique data inputs. This creates a complex environment of multiple exchanges between people, disciplines, and project phases — where each activity is built for a specific purpose to complete the project. Autodesk has cooperated in defining many of these standards, including IFC (see fig. 1).

Project Data	File Type
Architectural Model	IFC, RVT, DWG, DGN, PLN, NWD
Structural Model	IFC,CIS/2
CAD Data	DXF,DWG
GIS Data	SHP,KMZ,WFS,GML
Civil Engineering	LandXML, DWG, DGN
Cost Estimating	XLSX,ODBC
Visualisation Models	FBX,SKP,NWD
COBie Data	IFC,XLSX
Scheduling Data	P3,MPP
Energy Analysis	IFC,gbXML
Site Imagery	JPG,PNG

Figure 1. On a single building project, many software applications and data formats may be required, such as those shown here.

Autodesk also supports cross-vendor data exchange, as evidenced by its joint efforts with Bentley to expand interoperability between their AEC software portfolios. This effort is making it easier for Autodesk and Bentley customers to exchange the companies' respective DWG and DGN file types with greater fidelity.

In addition, Autodesk is actively involved in the U.S National BIM Standard (NBIMS) and the related efforts of Construction and Operations Building Information Exchange (COBie) and National CAD Standard (NCS). The goal of these efforts is to improve the performance of facilities by defining standards for the building information needed by owners for operations, and streamlining the exchange of that building data, from project development and construction to handover. Autodesk also actively participates in similar standards and efforts internationally, such as the UK Government BIM initiative, the Bavarian Government FM Handover IFC Model View Definition, and others.

Support for Other Data Exchanges

In addition to IFC and the standards mentioned above, Autodesk provides support for many other data exchange mechanisms and file translations to assist project teams, based on the specific need of the project. For example, Autodesk BIM applications create and export COBie building handover information directly to a spreadsheet or via an IFC pathway. Autodesk applications write CIS/2 data for structural steel collaboration as well as Standard ACIS Text (SAT) files for transporting geometry from one 3D application to another. Autodesk supports a data exchange protocol for energy analysis by sponsoring and providing active support for the gbXML open schema (http://www.gbxml.org/).

Autodesk® Navisworks® products and Autodesk® BIM 360™ Glue® web service also play a role by supporting the overlay, clash detection, and referencing of dozens of 3D model file formats for project teams to work more effectively regardless of the select BIM authoring tool. In addition, Autodesk provides support for data exchange mechanisms through open, published Application Programming Interfaces (APIs) for its software.

Conclusion

IFC data exchanges play an important role in AEC project team collaboration and will increasingly do so as more IFC model view definitions are introduced. In addition, many different types of data are used on AEC projects.

Autodesk continues to support open standards, and we are continually working with IFC data exchange methods and other exchanges for improved project execution. For example, Autodesk was the first major CAD company to run on open systems and non-proprietary hardware, and the first major CAD vendor to publish an open standard DXF™ for transferring data to and from our flagship CAD product, Autodesk® AutoCAD® software. We were a founding member of IAI (now referred to as buildingSMART), and we continue to provide leadership in open standards by providing support of IFC Export in Revit® as open source technology.

In this manner, Autodesk is working to help meet the needs of project team members, today and in the future. Autodesk's data exchange development efforts underscore its ongoing commitment to support industry BIM interoperability efforts and open source development methodologies.

Note: Autodesk® Revit® Architecture software provides certified IFC export and import based on the buildingSMART IFC 2x3 Coordination View data exchange standard. Autodesk® Revit® Architecture and Autodesk® Revit® Structure software provide certified IFC export based on the buildingSMART IFC 2x3 Coordination View 2.0 data exchange standard, as of March 2013 and April 2013, respectively. Revit Architecture (formerly Revit Building 9.1) received stage-1 IFC 2x3 Coordination View Certification in June 2006, and full stage-2 certification for Coordination View in May 2007.

Revit Architecture software (formerly called Revit® Building) received full buildingSMART certification for its export of IFC data in November 2005. Revit Architecture continues to support the IFC2x2 Code Checking View that expands the IFC Coordination View for architectural code checking in Singapore. Revit Architecture (formerly Revit Building 9.1) received stage-1 IFC 2x3 Coordination View Certification in June 2006, and full stage-2 certification for Coordination View in May 2007. These certifications constitute the full set of certifications currently available from buildingSMART for architectural design software.