The use of BCF as a communication format to achieve Lean BIM coordination management.

This project was chosen as a case study of open BIM for the following reasons:

- It provides an excellent example of open BIM use for coordination.
- It illustrates the usefulness of geo-referenced BIM data and integrated in an issue management/tracking platform.
- It demonstrates a variety of reasons why open BIM standards lead to Lean management.
- It demonstrates the value of using Open BIM standards like BCF to provide a software- independent solution for working with BIM.
- It provides an innovative approach to support communication using BIM.

Project overview

Owner/developer:
Aéroport de Québec Inc.

BIM manager:
Virtual Construction and Technology BIM One Inc.

Architect:
GLCRM

Structural Engineer:
Stantec

Mechanical/electrical Engineer:
SNC Lavalin

Civil Engineer:
WSP

Construction manager:
Pomerleau

Figure 1 Building information model of the project, courtesy of BIM One Inc.

Software used:
Solibri©, BIM Track™, Revit©, Navisworks©, BCFier©, Tekla.

Open BIM Standard discussed:
BCF

Project description

This case study focuses on the application of BCF for BIM coordination for the 225M$ extension of the Québec city Jean-Lessage international airport terminal spanning 183m north of the existing building. The fast track project is executed in construction management project delivery approach with the help of the BIM manager working for the owner . In order to complete the project within budget and on schedule, The BIM manager oversees the building information modeling process for the owner and manages BIM deliverables of all stakeholders involved on the project. The owner's initial request related to this case study was to use clash detection BIM software on the project to reduce potential cost overruns during construction.

The challenges

Coordination format issue

After a few weeks of exchanging standard clash detection reports, the project team quickly realized that the format of clash detection reports would vary a lot according to how users configure it. They noticed the lack of compatibility of BIM software to exchange clash and quality control information, but the biggest challenge was finding clashes in their original context (in the modeling software where it needs to be solved). The BIM manager estimated that the average time required to find and open the model views required to fix an issue using a standard pdf clash report was 2 minutes. Considering there is an average 100 new issues opened per month, this process can become really time consuming.

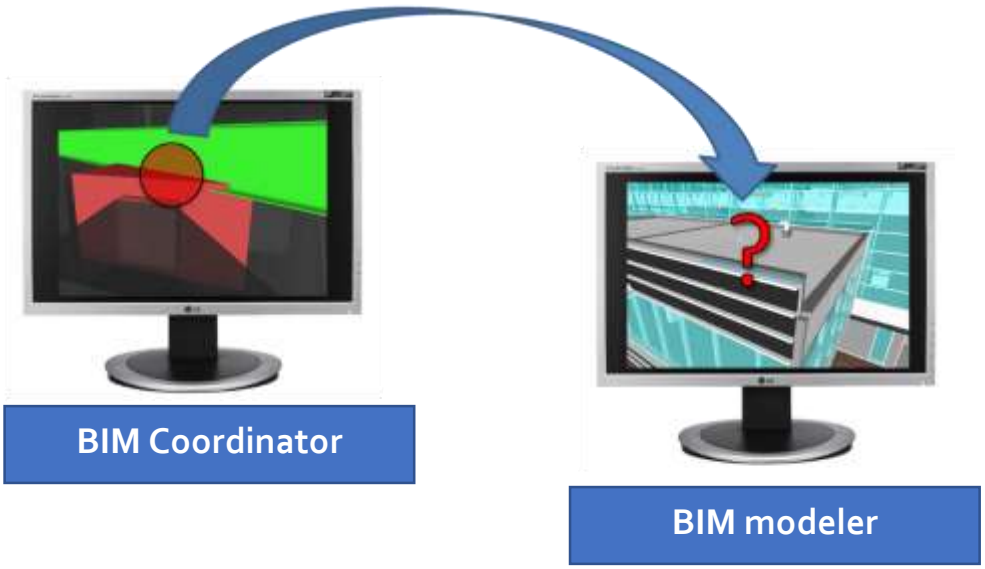

Figure 2 BIM coordination interoperability issue courtesy of BIM One Inc.

Communication channel issue

The project manager noticed the lack of issue traceability, no control during data exchange process, inaccessible current issue solving status, the lack of issue identification information (number, disciplines etc.), and inexistent notification system to ensure accountability and timely reactivity. The BIM manager estimated the time required to track issues to 64h per month. They also noticed that different versions of issues were exchanged by different decentralized methods (email, file server, paper, etc) which resulted in communication fragmentation.

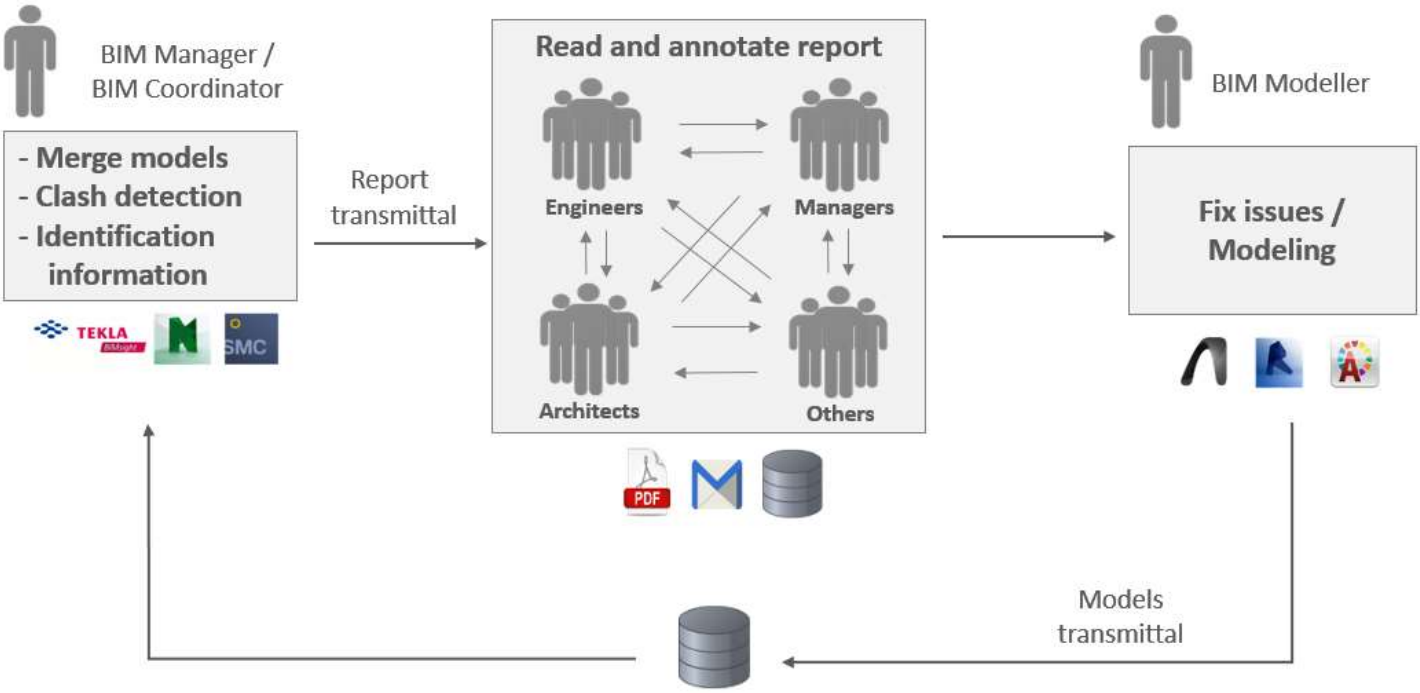

Figure 3 Traditional BIM coordination process, courtesy of BIM One Inc.

The solutions

BCF format

Building SMART's BCF (BIM Collaboration format) is a standard and neutral file format use to exchange coordination information.

The format structure of the BCF open format allows to attach screenshots, comments, location and many other attributes used to identify parties involved in solving issues. The current version of the BCF file is 2.0 released in November 2014. It is not controlled by any software manufacturer and is object oriented.

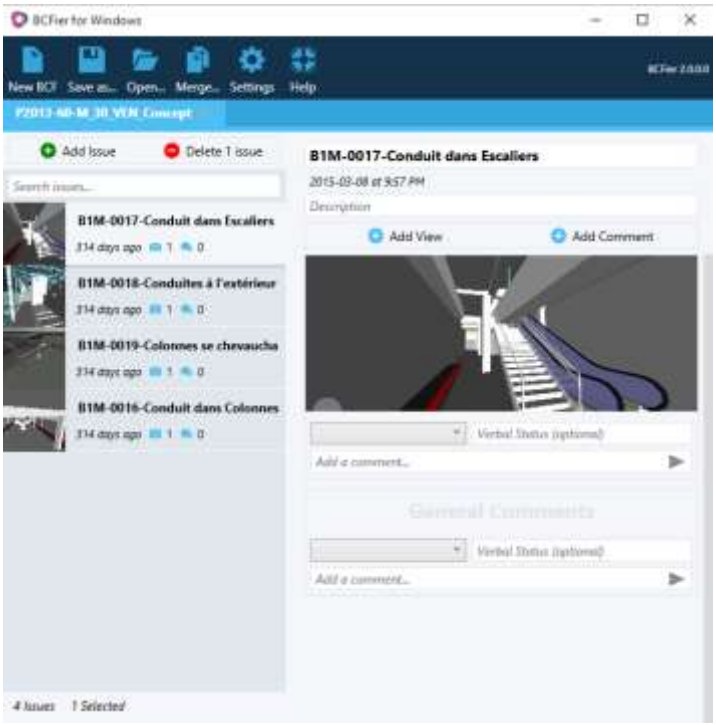

Figure 4 A BCF file opened in BCFier for Windows, courtesy of BIM One Inc.

BCF based issue tracking platform

After the initial BCF format deployment, BIM Track™ a web based collaboration platform was introduced to track and manage issues created as BCF in a central hub. Charts and graphics, generated from the BCF, were used to inform project managers about coordination management performance through precise metrics. The platform promotes open BIM workflow solutions by supporting IFC (Industry Foundation Classes) and BCF (BIM Collaboration Format).

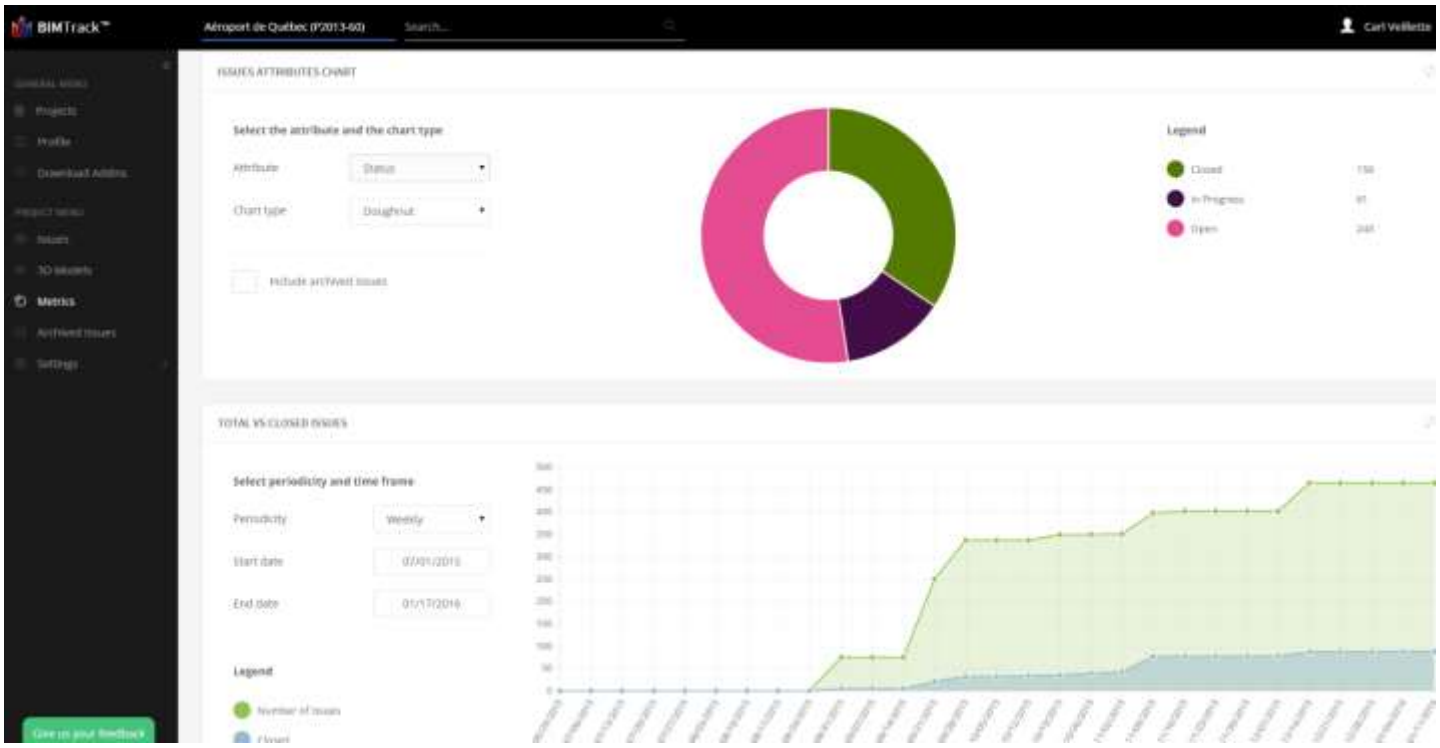

Figure 5 Issues metrics dashboard, courtesy of BIM Track™

The results

The project performance were improved by the following numbers:

~88% faster access

after BCF was deployed on the project, the time required to find and open the model views required to review and fix an issue was lowered down to 15 seconds instead of 2 minutes.

~9/10 of management time saved

after BIM Track's BCF-based issue tracking platform was deployed, the overall time required to track and manage issues was lowered down to 8h per month instead of 64 hours.

~57K $ in saving per year

using BCF combined with BIM Track's collaborative platform for issue management allowed the project teams to save an average of 88% of the time usually required to access and track an issue.

Use of IFC and MVD to control information shared with BIM during tender

Project overview

Owner/developer:
Aéroport de Québec Inc.

BIM Project manager:
Virtual Construction and Technology BIM One Inc.

Architect:
GLCRM

Structural Engineer:
Stantec

Mechanical/electrical Engineer:
SNC Lavalin

Civil Engineer:
WSP

Construction manager:
Pomerleau

Figure 6 Building information model of the project, courtesy of BIM One Inc.

Software used:
Solibri©, BIM Track™, Revit©, Navisworks©, BCFier©, Tekla.

Open BIM Standard discussed:
IFC and MVD

Project description

This case study focuses on the application of IFC & MVD for the 225M$ extension of the Québec city Jean-Lessage international airport terminal spanning 183m north of the existing building. The fast track project is executed in construction management project delivery approach with the help of the BIM manager working for the owner. In order to complete the project within budget and on schedule, The BIM manager oversees the building information modeling process for the owner and manage BIM deliverables of all stakeholders involved on the project. The owner initial request related to this case study was to use clash detection BIM software on the project to reduce potential cost overrun during construction.

The challenge

Building information models are not typically exchanged during the tender process. Consequently, different bidders must calculate the quantities required to estimate and manually evaluate the scope of the project with 2D documents only. One advantage of building information modelling is to promote understanding of the project by using 3D visualization and rapidly extract quantities. It is not easy to share models in native format for tenders because anyone could obtain these models by purchasing the tender documents and thus benefit of the BIM models configuration work done by the professionals.

A federated model could have been shared in a native format, for cons, it would have favored bidders working with a specific software tool. For the sake of neutrality, we had to find an independent solution that does not restrict the ability of bidders to use these models and the information contained in them. In addition, when awarding the contract,

the bidder should be able to recover the models used in the estimation and further develop them in the detailing and fabrication processes.

The solution

IFC models contain data and building geometries. They include all or a subset of information that is contained in the native BIM files. Processing and exporting native data in an IFC file is a way to transfer data from one application to another. The exchange format is open, free and well documented. By providing an IFC export the client was able to provide interoperability with hundreds of other BIM tools.

MVDs are like filters. The goal of MVD is to describe a common pattern to exchange all data that could be exchanged between BIM tools for a specific deliverable. However, all data must be exchanged whenever two tools must interoperate. The required information depends on the type of exchange required. This subset is called a Model View Definition or MVD.

The use of IFC and MVD limits the liability of parties to a specific scope and recorded in a defined deliverable for example for a digital model for bids. The BIM Management Plan on this project has expressed this by requiring IFC 2x3 Coordination View with MVD 2.0 expressly limiting the information in models produced by the stakeholders.

The result

By providing an IFC export with a specific MVD the client was able to support interoperability with hundreds of other BIM tools allowing to deliver digital models during the bidding process to promote understanding work and scope of entrepreneurs mandates. This led to reduced costs through better understanding of the scope of work.

The use of IFC to protect copyright

Key takeaways from the case study :

- It provides an excellent example of open BIM standards used for tender
- It demonstrates a variety of reasons why open BIM standards brings a better understanding of project scope
- It demonstrated the value of open BIM standards such as IFC & MVD to control information sharing
- It provides an innovative approach to support the tender phase using BIM

Project overview

Owner/developer:
Aéroport de Québec Inc.

BIM Project manager:
Virtual Construction and Technology BIM One Inc.

Architect:
GLCRM

Structural Engineer:
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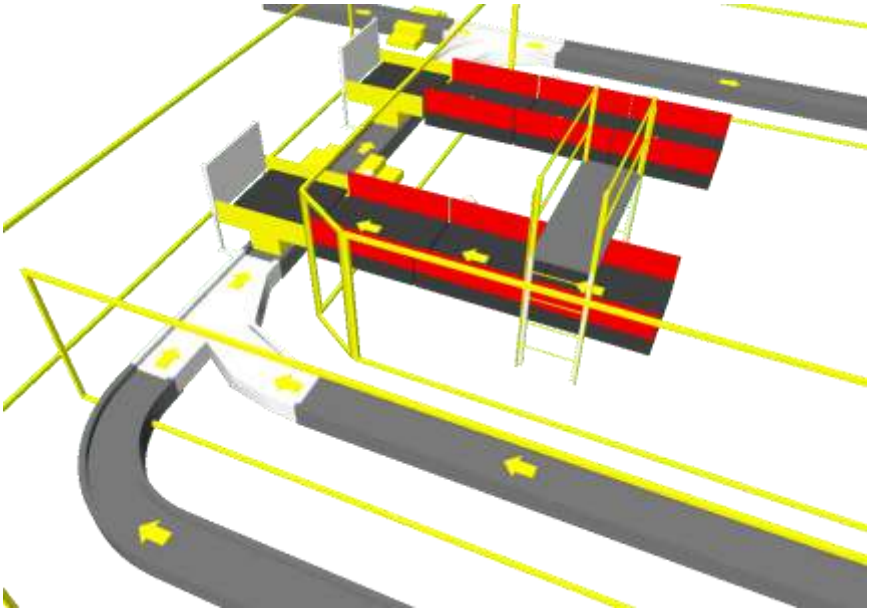

Figure 7 Figure 1 Building information model of the project, courtesy of BIM One Inc.

Software used:
Solibri©, BIM Track™, Revit©, Navisworks©, BCFier©, Tekla.

Open BIM Standard discussed:
IFC

Project description

This case study focuses on the application of IFC for the 225M$ extension of the Québec city Jean-Lessage international airport terminal spanning 183m north of the existing building. The fast track project is executed in construction management project delivery approach with the help of the BIM manager working for the owner. In order to complete the project within budget and on schedule, the BIM manager oversees the building information modeling process for the owner and manage BIM deliverables of all stakeholders involved on the project. The owner initial request related to this case study was to use clash detection BIM software on the project to reduce potential cost overrun during construction.

The challenge

Building a library of smart and parametric objects compatible with a BIM environment can be a laborious task, but once the content is developed the benefits are huge. In the case of special items like those used to design a baggage system, it is sometimes difficult for the professionals involved to share the content with everyone. This is the case of the consultant for conveying systems, SNC Lavalin, who have spent many hours creating a performant library for the

design of this type of system. The goal of the owner was to provide digital models to promote coordination of the project by different stakeholders during the design phase. In some cases, the competitive advantage may lie in the optimized use of BIM. We had to find a method for the project team member to exchange digital models and satisfy the following needs of two parties: protect the interests of the consultant for conveying systems as to the copyrights and meet the owner's need for using the models to their full potential in order to promote coordination in the design process.

The solution

The IFC was developed by buildingSMART to optimize interoperability while exchanging data by using a standardized format. In this project it was used to protect exclusive copyright. The result is a model in which the parametric behavior of objects and libraries is removed in order to share and facilitate collaboration and sharing among different models from project stakeholders.

The result

By using the IFC format, digital models of the baggage system were exchanged thus enabling improved collaboration with other disciplines during the design phase without exchanging any proprietary functionalities of the native parametric objects.