

The background of the slide is a composite image. The top half shows a realistic aerial photograph of a city, likely Stockholm, with its characteristic islands and water. The bottom half shows a 3D architectural model of a city, with buildings represented as simple geometric blocks in various shades of gray and brown. The model is overlaid on the photograph, showing how digital data can be integrated with real-world geography.

**BIM Alliance Sweden – November 24<sup>th</sup>, 2016**

# **“Interoperability & openBIM, the future of construction »**

**Emmanuel Di Giacomo**

EMEA - AEC Ecosystem Business Development Manager

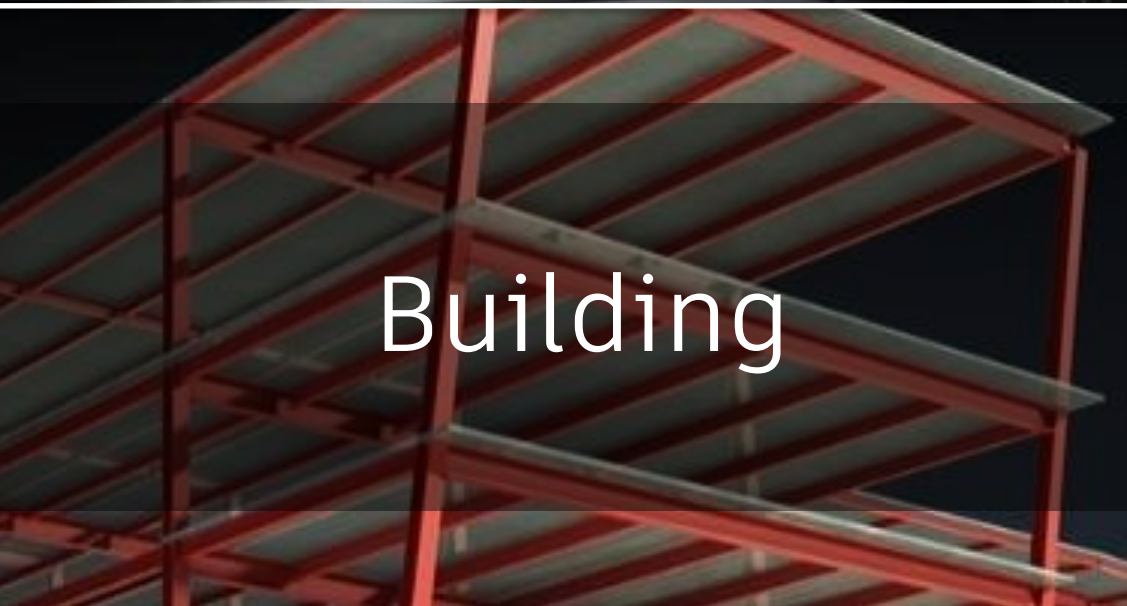
Autodesk

Architect D.P.L.G.



# Mission: Lead the Industry's business process transformation to BIM

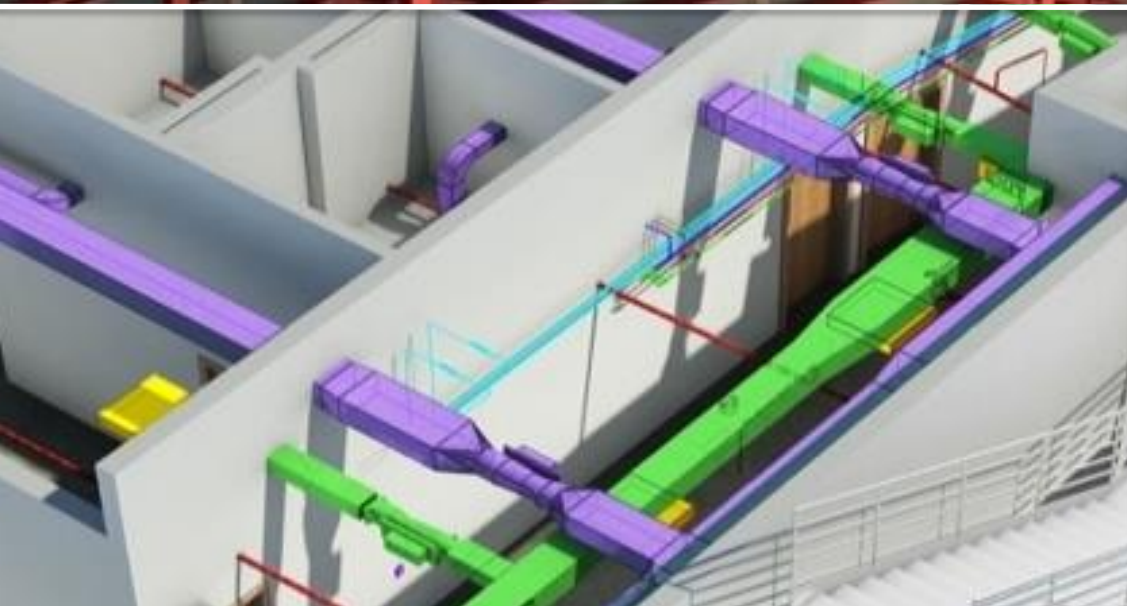




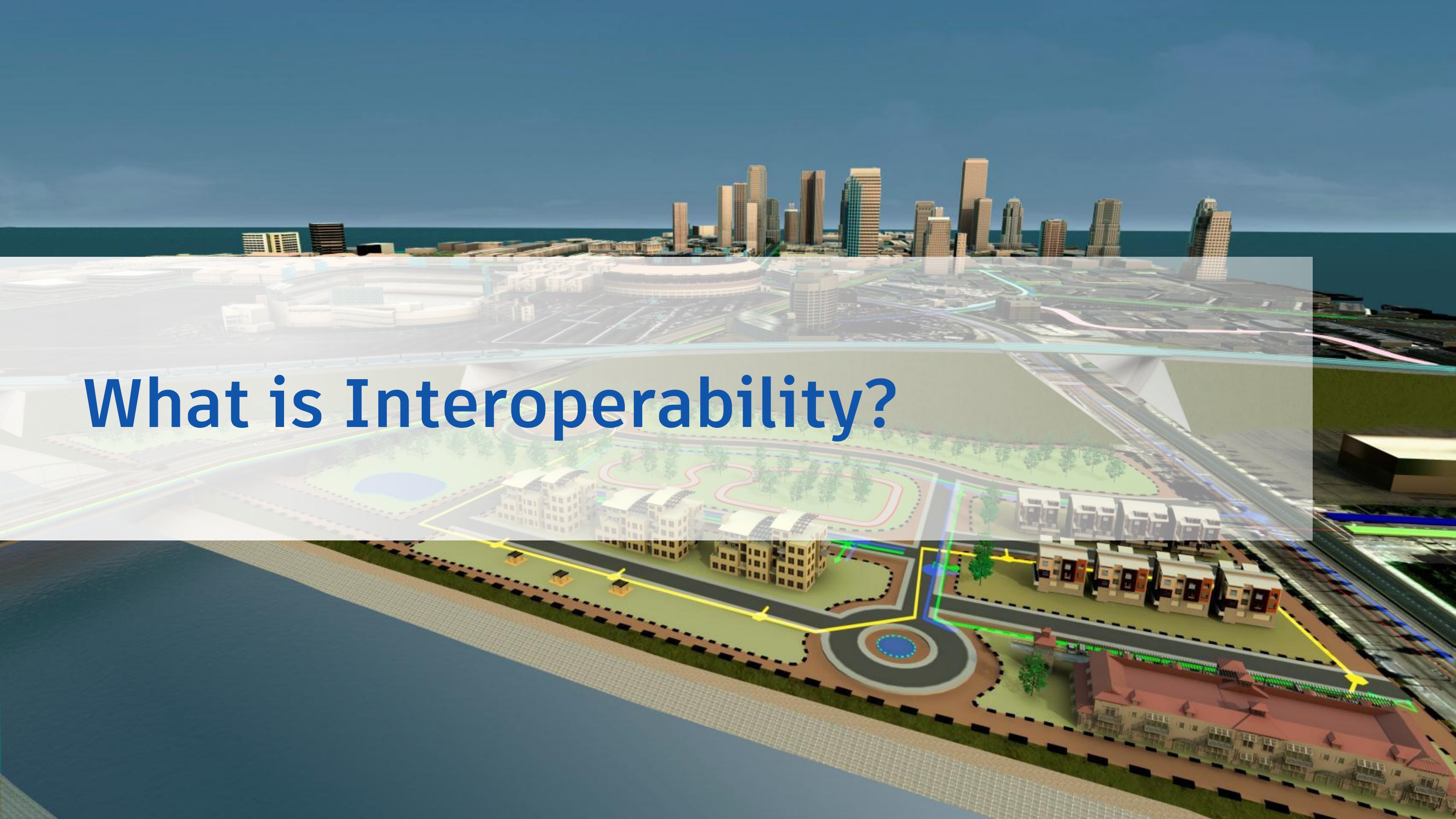
Building

Infrastructure

Energy & Utilities



# What is Interoperability?



# What is Interoperability?

*Working Together* to exchange data...

BETWEEN  
PROJECT TEAM  
MEMBERS

BETWEEN  
PROJECT  
TASKS

BETWEEN  
DESIGN  
APPLICATIONS

DURING THE  
PROJECT  
LIFECYCLE



# Workflow Solutions

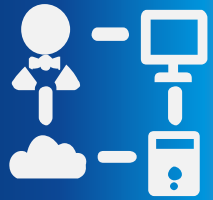
Formats are created to facilitate a particular *workflow*, or solve a particular *business problem*.

|                               |                                 |                             |                |                                 |
|-------------------------------|---------------------------------|-----------------------------|----------------|---------------------------------|
| GIS<br>SHP                    | Scheduling<br>CSV               | CAFM /IWMS /<br>CMMS<br>DWG | BIM<br>IFC     | Automated<br>Fabrication<br>SAT |
| Cost Estimating<br>ODBC / XLS | Civil Design<br>LandXML         | ERP<br>API                  | CAD<br>DWG     | Energy Analysis<br>gbXML        |
| Product Design<br>PRT         | Structural<br>Analysis<br>CIS/2 | Scheduling<br>CSV           | O & M<br>COBie | Visualization<br>FBX            |

# Technology, standards & best practices

*Each inform the other for overall improvement (and working together)*

1



## Software Technologies

### ***Building Information Modeling (BIM)***

- Supports New Business Practices
- Expands business capabilities

1

2

3

## Interoperability Standards



2

### ***IFC, XML, MVD's***

- Support best practices & performance
- Provide formats & standards

### ***Integrated Project Delivery (IPD)***

- Define Requirements
- Drive adoption & enhancement

## Business Practices



3

# What is openBIM® and IFC today?



# What openBIM® does for you...

buildingSMART is the solution

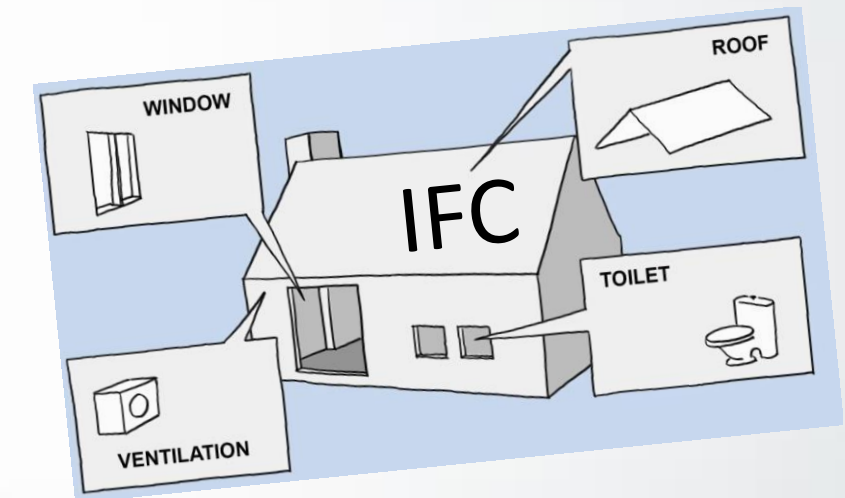
# The real concept of openBIM®



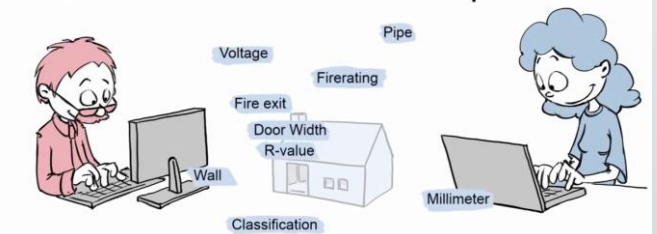
## What is openBIM®?

- openBIM® is a cooperative approach to collaborative design, realization and operation and maintenance of buildings based on open standards and workflows that allow different stakeholders of a project to share their data, with any BIM compatible software.
- IFC is the technical implementation of openBIM®. Software interoperability is made possible by the implementation of the ISO-IFC standard exchanges, currently the global reference.
- This collaborative approach, defined by buildingSMART International, aims to improve the quality of buildings and infrastructures.

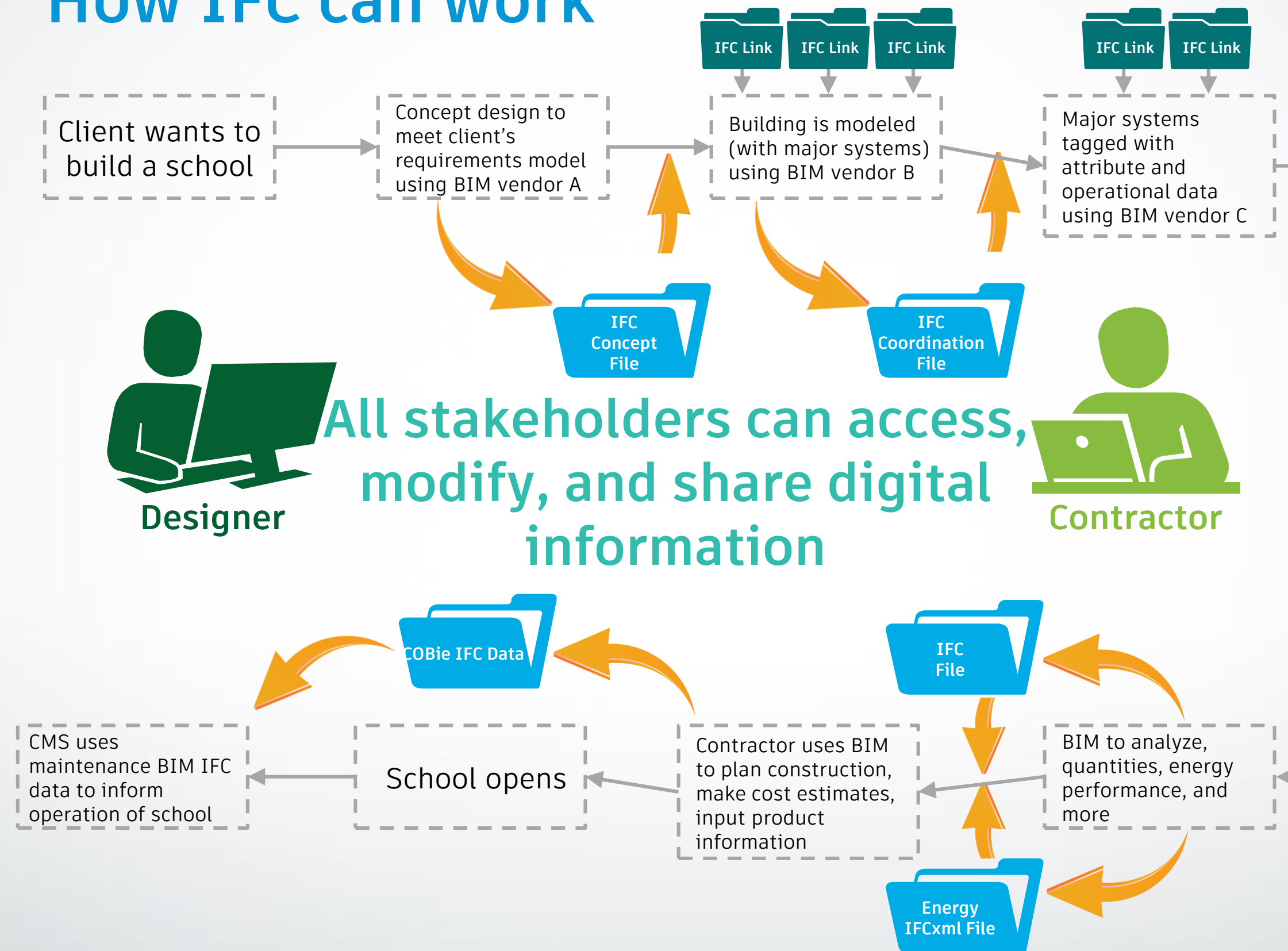
What openBIM does for you



Building Information Model  
IFC + bSDD + Process = openBIM



# How IFC can work

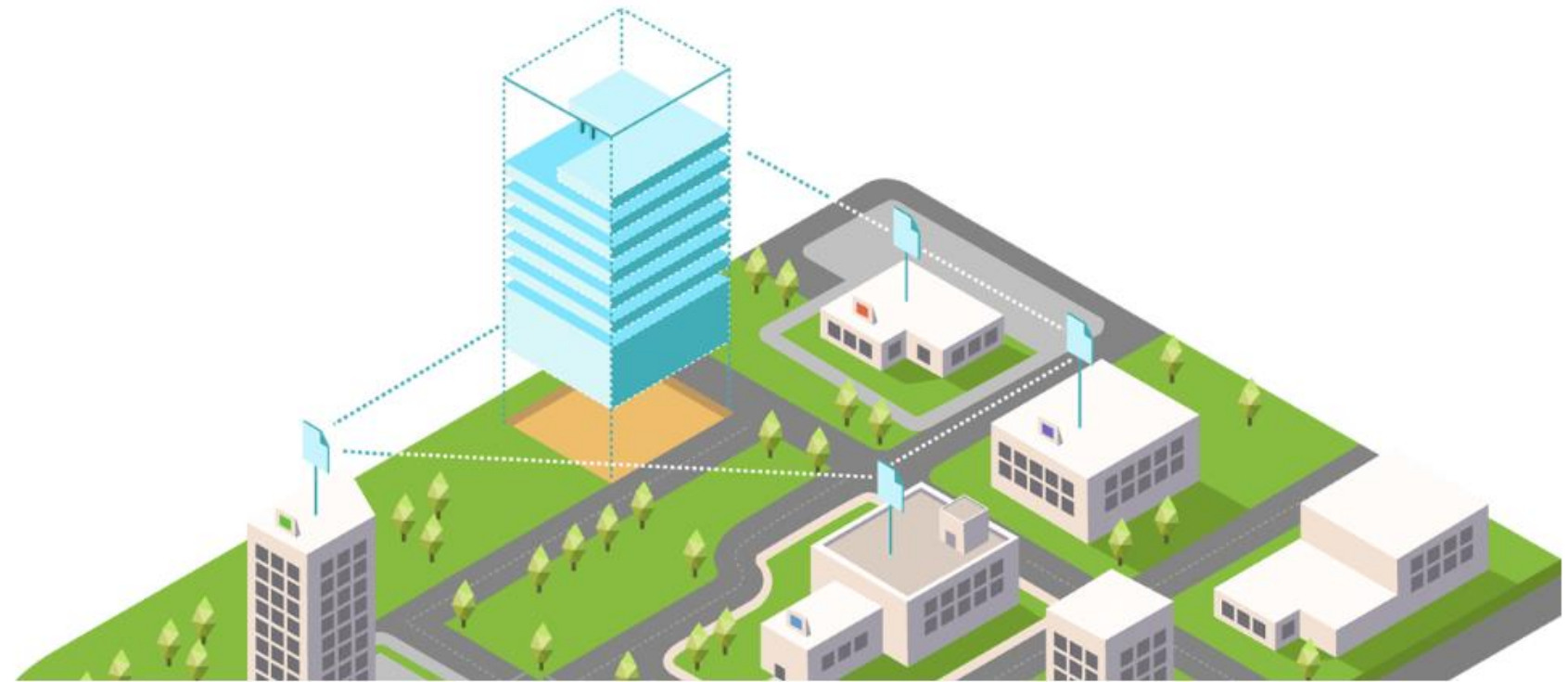
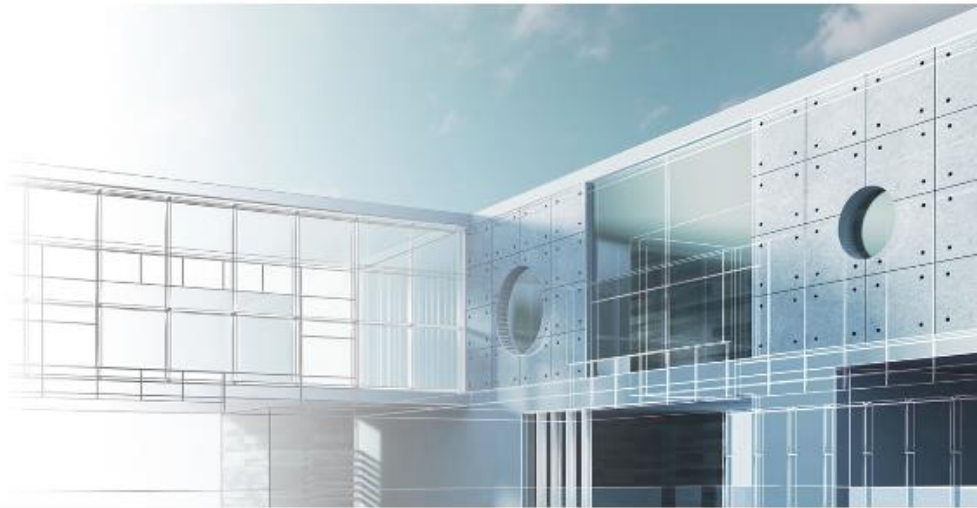




# How are we committed to Interoperability?

# Let's start with a question on openBIM & Interoperability...

Question:



Do you know when Autodesk started supporting openBIM®?



## Since it's 1982 founding, Autodesk's commitment to interoperability runs deep

- First major CAD vendor to run applications on nonproprietary hardware
- Released an open way to get data in and out of our flagship application before any other major CAD vendor (DXF)
- Founding member of International Alliance for Interoperability (which became buildingSMART)



# Autodesk realizes the importance of data interoperability

Interoperability in architecture, engineering, and construction (AEC) industry:

- Allows systems and applications to work together and freely exchange design and construction data
- Prevents data from being “locked in” specific applications or vendors
- Is key to driving end-to-end Building Information Modeling (BIM) process across teams, projects, and applications including building operations.





## Industry Foundation Class (IFC) file format supports interoperability and is:

- A platform-neutral, object-based, open file format designed to transfer 3D geometry and attribute information
- Developed and maintained by buildingSMART International
- A commonly used collaboration format to share information within BIM-based projects including Arch, MEP and Structural disciplines.
- Supported by about 150 software applications worldwide to enable better workflows in AEC industry



# Autodesk supports IFC and buildingSMART International openBIM

## Actively participates in buildingSMART's Strategic Advisory Committee and Standards Committees

- Secured the rigorous IFC 2x3 Coordination View 2.0 certification in the first wave of vendors
- Includes IFC 4 capabilities in Autodesk® Revit® 2017 
- Maintains the most IFC certifications of any vendor
- Made IFC import/export tool for Revit open source (only vendor) 

# There is only one buildingSMART's openBIM®

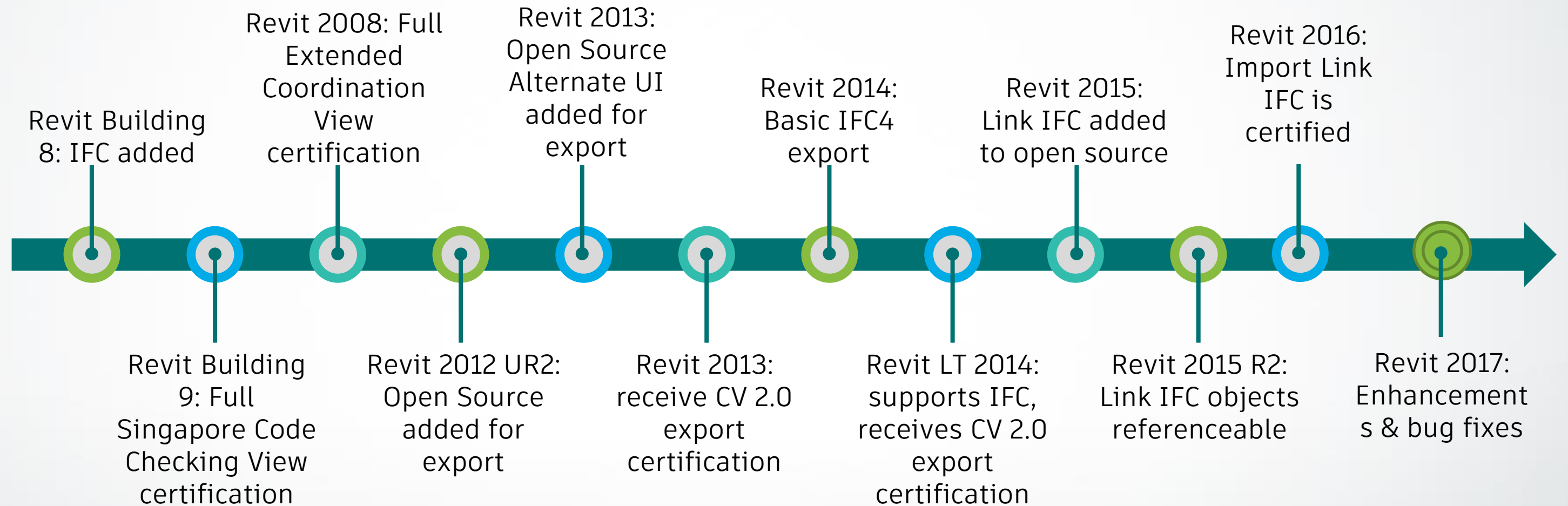


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The worldwide authority driving transformation of the built asset economy through creation & adoption of open, international standards.

# History of IFC in Autodesk Revit (through Revit 2017)



# The IFC certification process is crucial

## The buildingSMART IFC software certification process:

- Is the only official IFC certification process
- Promotes consistent and reliable IFC specifications, regardless of vendor or application
- Improves quality of software interfaces

## The certification process includes:

- Automatic IFC file checking
- High-quality test cases for export and import
- Certification award logo



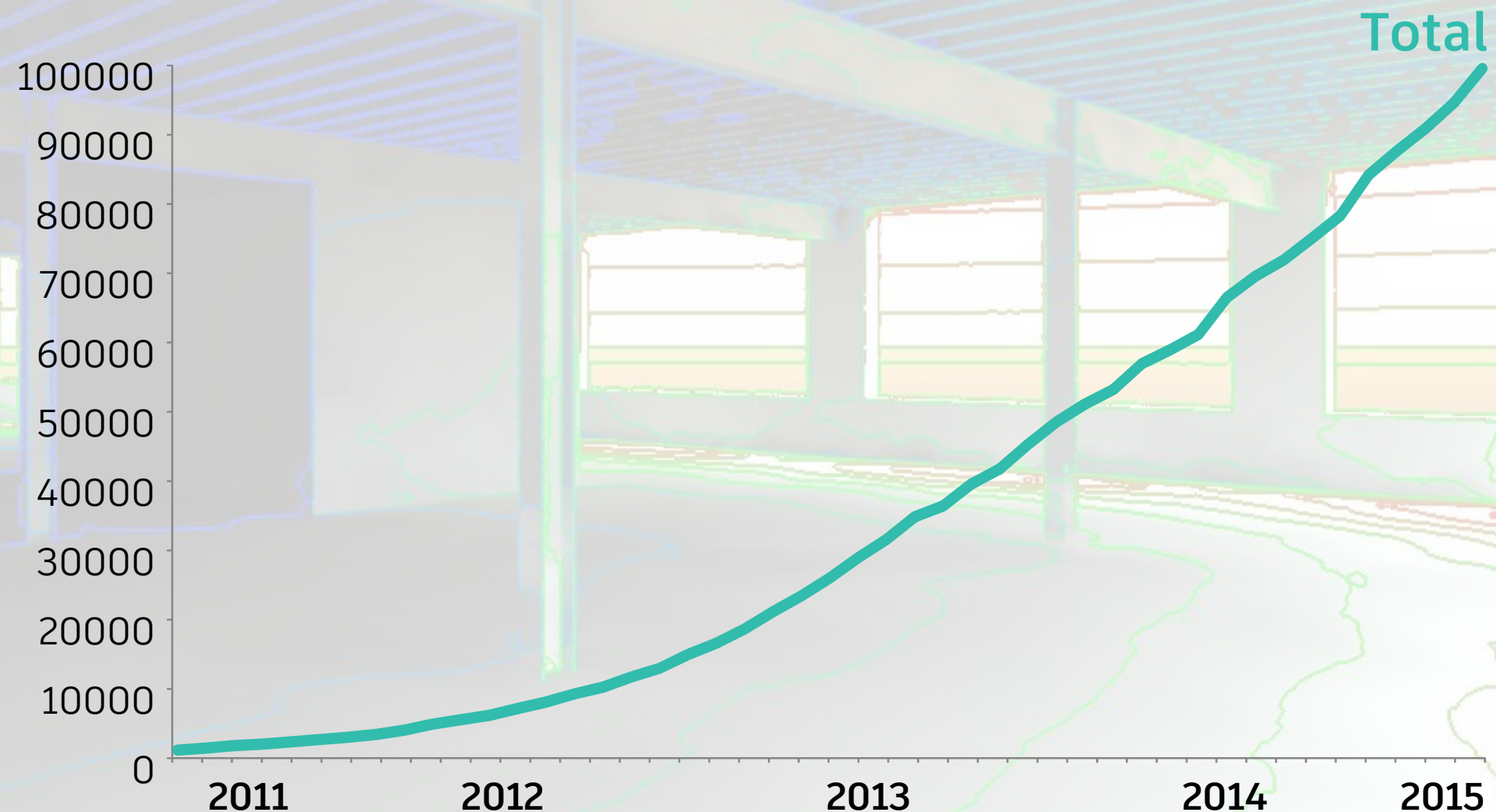
# Autodesk Revit IFC is open source

## Advantages of Autodesk Revit IFC open source

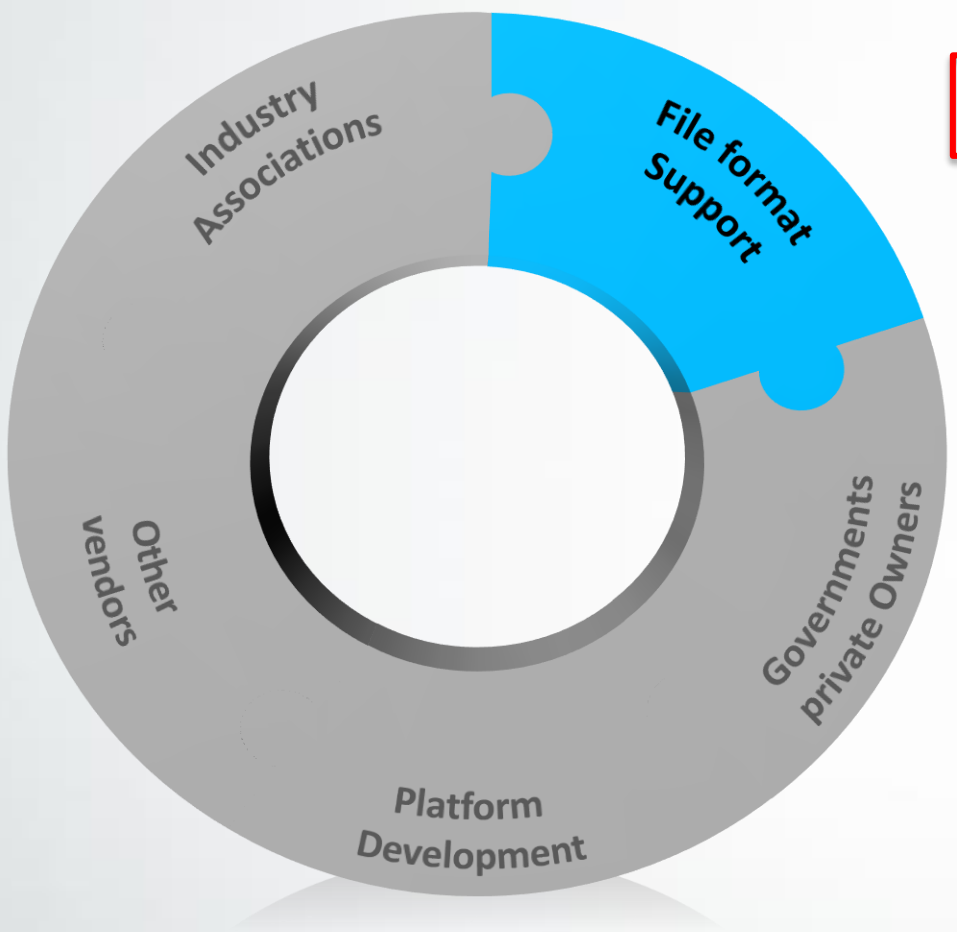
- Increase customer flexibility - adapt your IFC output based on your corporate standards.
- In the first 5 years since its release there have been 50 software updates of the open source toolkit.
- Provide a method for quick support of IFC schemas and model view definitions (MVDs) as they are introduced.
- Allow others outside the Autodesk Revit software development team to make contributions to IFC functionality.
- Allow our Product Team to benefit from our experience and introduce IFC exchange capabilities.

# Revit IFC has 120,000+ downloads

Download momentum is growing every day



# Many file formats - IFC simplifies workflows



|                           |   |
|---------------------------|---|
| Export                    | ↑ |
| Export & Import           | ↕ |
| Import                    | ↓ |
| Partial (2 or more steps) | ≈ |

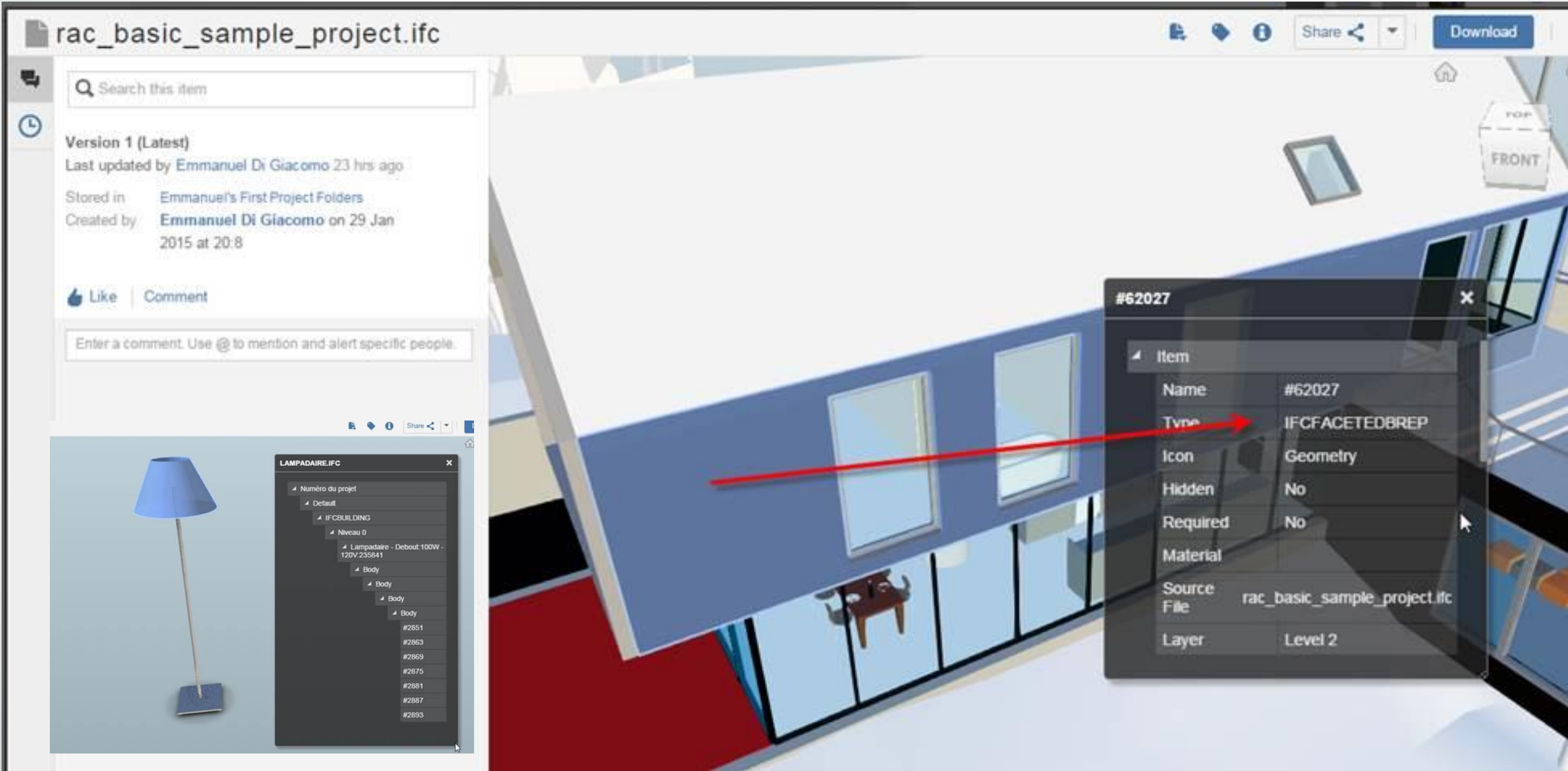
| Exchange Standard  | AutoCAD | AutoCAD Architecture | AutoCAD MEP | Plant 3D | P&ID | Revit Architecture | Revit MEP | Revit Structure | AutoCAD Structural Detailing | Robot | Civil 3D | InfraWorks | Map 3D | Inventor | Navisworks | 3ds Max Design | ReCap | 360 Field | 360 Glue |
|--------------------|---------|----------------------|-------------|----------|------|--------------------|-----------|-----------------|------------------------------|-------|----------|------------|--------|----------|------------|----------------|-------|-----------|----------|
| COBie              |         | ≈                    | ≈           |          |      | ↗                  | ↗         | ↗               |                              |       |          |            |        |          |            |                |       | ≈         |          |
| IFC 2x3 ISO 16739  |         | ↕                    | ↗           |          |      | ↕                  | ↕         | ↕               |                              |       | ≈        | ↘          |        |          | ↘          |                |       | ↘         | ↘        |
| IFC4               |         |                      |             |          |      | ↗                  | ↗         | ↗               |                              |       |          |            |        |          |            |                |       |           |          |
| gbXML              |         |                      | ↘           |          |      | ↗                  | ↕         | ↗               |                              |       |          |            |        |          |            |                |       |           |          |
| ISO 15926          |         |                      |             | ≈        | ≈    |                    |           |                 |                              |       |          |            |        |          |            |                |       |           |          |
| LandXML            |         |                      |             |          |      |                    |           |                 |                              |       | ↕        | ↘          | ↕      |          |            | ↘              |       |           |          |
| STEP ISO 10303     | ↘       | ↘                    | ↘           | ≈        |      |                    |           |                 |                              |       |          |            |        | ↕        | ↘          | ↘              |       | ↘         | ↘        |
| CityGML            |         |                      |             |          |      |                    |           |                 |                              |       |          | ↘          |        |          |            |                |       |           |          |
| WFS                |         |                      |             |          |      |                    |           |                 |                              |       | ↘        | ↘          | ↘      |          |            |                |       |           |          |
| WMS                |         |                      |             |          |      |                    |           |                 |                              |       | ↘        | ↘          | ↘      |          |            |                |       |           |          |
| IGES               | ↕       | ↕                    | ↕           | ↕        |      | ≈                  | ≈         | ≈               |                              |       |          |            |        | ↘        | ↘          | ↕              |       | ↘         | ↘        |
| FBX                | ↕       | ↕                    | ↕           | ↕        |      | ↗                  | ↗         | ↗               |                              |       |          | ↕          |        | ↕        | ↘          | ↕              |       | ↘         | ↘        |
| CIS/2              |         |                      |             |          |      |                    |           | ↕               | ↕                            | ↕     |          |            |        |          | ↘          |                |       | ↘         | ↘        |
| DWF(x)             | ↕       | ↕                    | ↕           | ↕        | ↕    | ↕                  | ↕         | ↕               | ↕                            | ↗     | ↕        | ↕          | ↕      | ↕        | ↕          | ↗              | ↗     | ↘         | ↕        |
| DWG                | ↕       | ↕                    | ↕           | ↕        | ↕    | ↕                  | ↕         | ↕               | ↕                            | ↕     | ↕        | ↘          | ↕      | ↕        | ↘          | ↘              |       | ↘         | ↘        |
| DGN                | ↕       | ↕                    | ↕           | ↕        | ↕    | ↕                  | ↕         | ↕               | ↕                            | ↘     | ↕        |            | ↕      |          |            |                |       |           |          |
| csv/xml            | ↕       | ↕                    | ↕           | ↕        | ↕    | ↗                  | ↗         | ↗               |                              |       | ↕        | ↘          | ↕      |          | ↕          |                |       |           |          |
| SQL                | ↕       |                      |             |          |      | ↕                  | ↕         | ↕               |                              |       | ↕        | ↕          | ↕      |          |            |                |       |           |          |
| E57 (point clouds) | ↘       | ↘                    | ↘           | ↘        |      | ↘                  | ↘         | ↘               |                              |       | ↘        |            |        | ↘        | ↘          | ↘              | ↕     | ↘         | ↘        |
| STL                | ≈       | ≈                    | ≈           |          |      | ↗                  | ↗         | ↗               |                              |       |          |            |        | ↕        |            | ↘              |       |           |          |
| DEM                |         |                      |             |          |      |                    |           |                 |                              |       | ↕        | ↘          | ↕      |          |            | ↕              |       |           |          |
| ISO 19115/19130    |         |                      |             |          |      |                    |           |                 |                              |       | ↕        |            | ↕      |          |            |                |       |           |          |
| RVT                | ≈       | ≈                    | ≈           | ≈        | ≈    | ↕                  | ↕         | ↕               | ≈                            | ↕     | ≈        | ↘          | ≈      | ↕        | ↘          | ↘              |       | ↘         | ↘        |
| SKP                | ↘       | ↘                    | ↘           | ↘        | ↘    | ↘                  | ↘         | ↘               | ↘                            | ≈     | ↘        | ↘          | ↘      | ≈        | ↘          | ↘              |       | ↘         | ↘        |
| DXF                | ↕       | ↕                    | ↕           | ↕        | ↕    | ↕                  | ↕         | ↕               | ↕                            | ↕     | ↕        | ↘          | ↕      | ↕        | ↘          | ↕              |       | ↘         | ↕        |

## 14 Autodesk 2017 products that support IFC

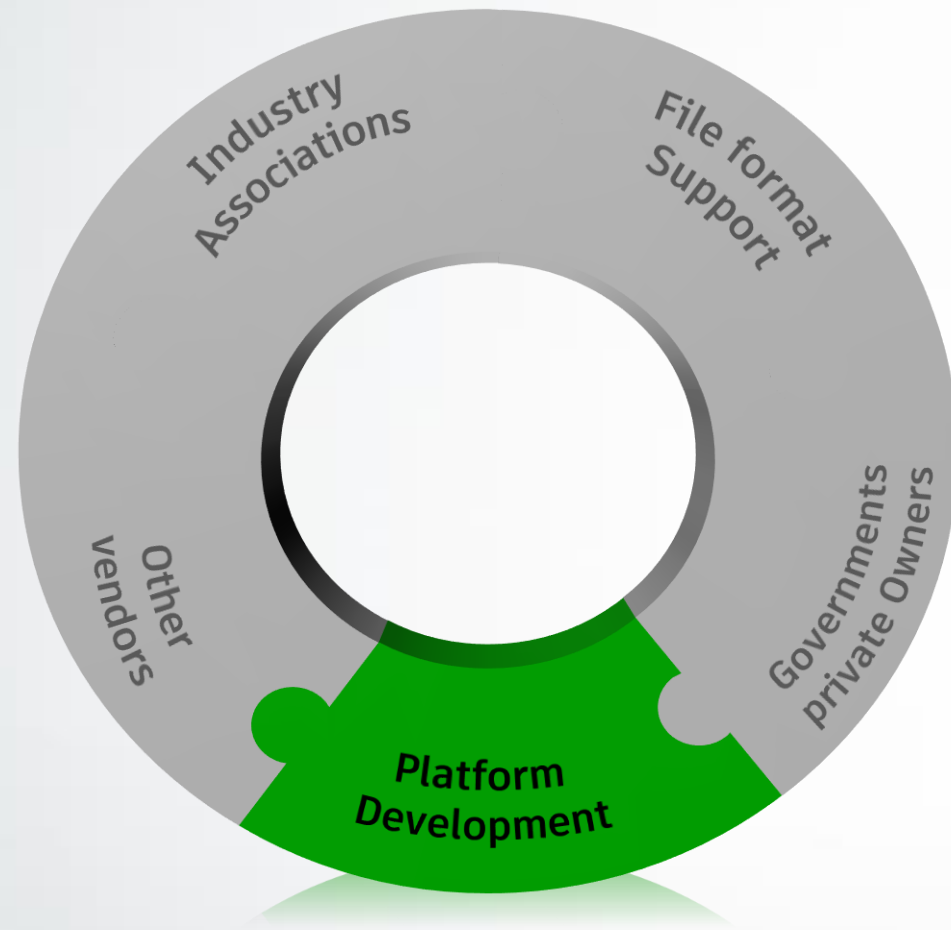
- Advance Steel (In progress)
- AutoCAD Architecture (Export certified, Import in progress)
- AutoCAD MEP (In progress)
- AutoCAD Civil 3D
- BIM 360 Team (TBL)
- BIM360 Glue (TBL)
- CADmep
- Fabrication ESTmep
- InfraWorks
- Inventor
- Navisworks solutions (In progress)
- Autodesk Revit (Architecture, Structure, MEP) (IFC certified)
- Autodesk Revit LT (Export certified, Import in progress)
- Robot Structural Analysis

- 5 certified products
- 4 in progress
- 2 to be launched
- Revit on all MVDs

# IFC Viewing – BIM 360 Platform / BIM 360 Family



# Open API's also allow for Collaborative Platform Development



- Core to Autodesk DNA
- 4,000 Autodesk Developer Network members
- Open software architecture – API – addons
- Business logic, Countrification, Industry Segments

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## Autodesk Developer Network

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The Autodesk Developer Network was created for software developers seeking proven tools and technologies to extend Autodesk products and technologies to produce superior design, geospatial, and media & entertainment software solutions. Whether you plan to customize existing Autodesk® software, create a plug-in, or tightly integrate Autodesk technology into your workflow and enterprise, Autodesk is committed to making technology that is accessible to you.

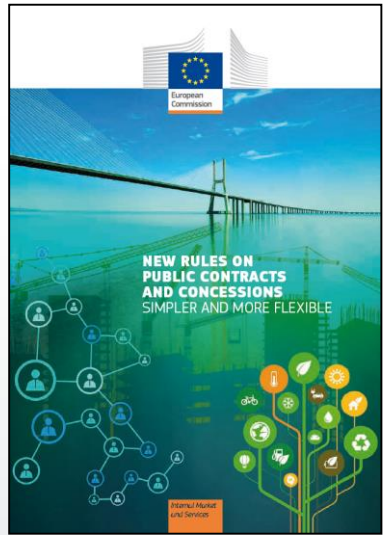
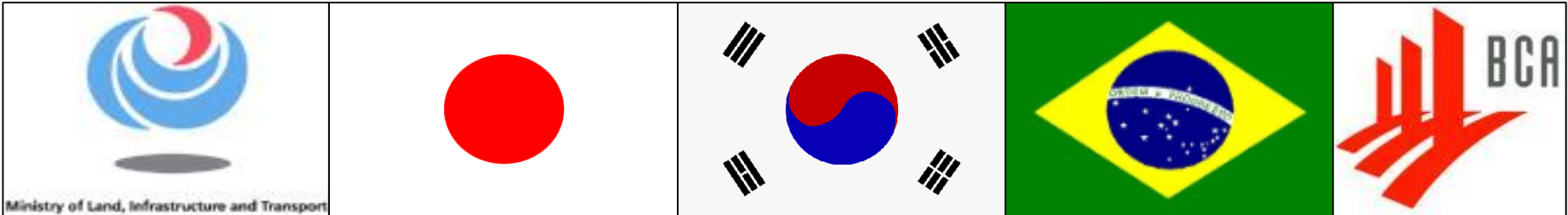
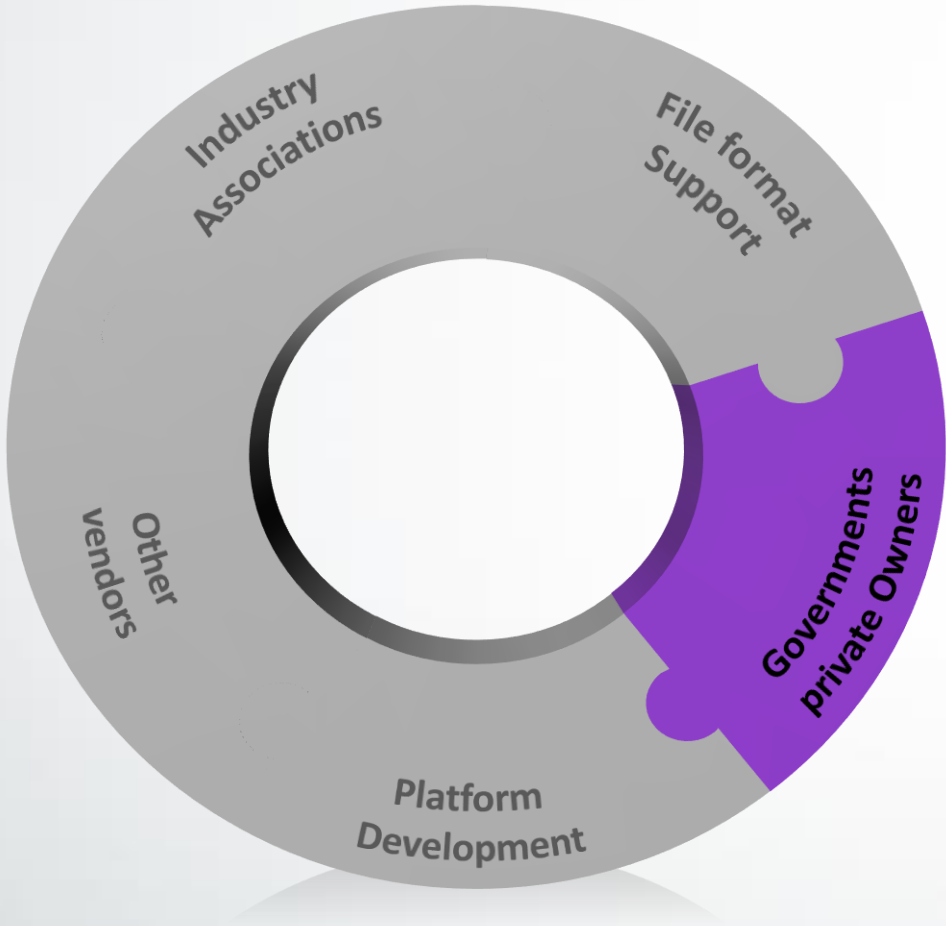
**Platform Technologies**

Whichever Autodesk platform technology you work with, we can support your development of superior design, engineering,

**Community**

Quickly learn Autodesk platform technologies, and get speedy help from fellow software developers under moderation by

# Governments support



BIM in EU Public Procurement



# Autodesk commitment to openBIM®

FOUNDER &  
INITIATOR &  
STRATEGIC  
ADVISOR  
COUNCIL



<http://buildingsmart.org/about/about-buildingsmart/history/>



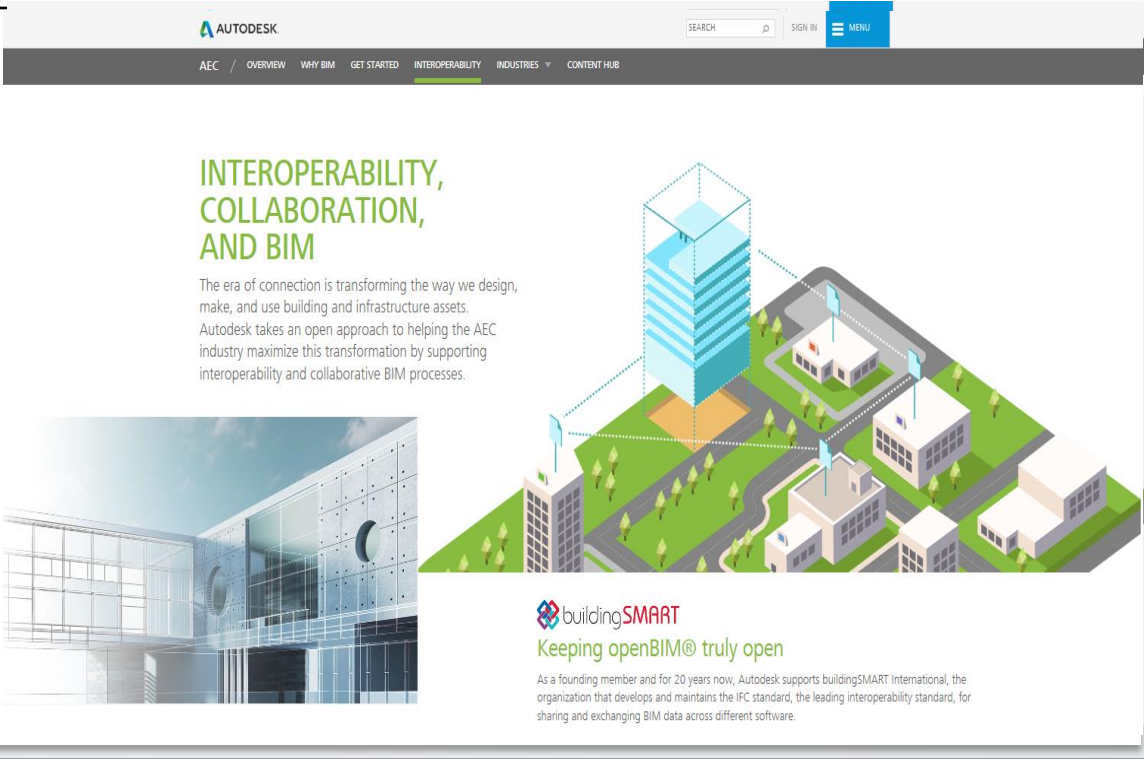
<https://www.facebook.com/AutodeskRevit/>

INTEROPERABILITY  
PART OF  
AUTODESK DNA

14 PRODUCTS  
SUPPORTING  
IFC



<https://www.facebook.com/AutodeskRevit/>



<http://www.autodesk.com/solutions/bim/bim-interoperability-standards>

Focus on openBIM

# openBIM web sites

EU openBIM sites:

- [www.autodesk.com/ifc](http://www.autodesk.com/ifc)
- [www.autodesk.com/openbim](http://www.autodesk.com/openbim)
- [www.autodesk.com/interoperability](http://www.autodesk.com/interoperability)
- [www.autodesk.fr/ifc](http://www.autodesk.fr/ifc)
- [www.autodesk.fr/openbim](http://www.autodesk.fr/openbim)
- [www.autodesk.fr/interoperability](http://www.autodesk.fr/interoperability)
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- [www.autodesk.de/openbim](http://www.autodesk.de/openbim)
- [www.autodesk.de/interoperability](http://www.autodesk.de/interoperability)

**AUTODESK.** RECHERCHER SE CONNECTER MENU

## BIM, openBIM® et Interopérabilité par Autodesk®

**Autodesk, une société engagée en faveur de l'interopérabilité, de l'openBIM® et du standard IFC**

Les bâtiments et les infrastructures sont complexes, tout comme les données des maquettes BIM pluridisciplinaires (BIM : Building Information Modeling) et les applications les prenant en charge. Autodesk est l'un des seuls éditeurs AEC et BIM proposant autant de solutions favorisant un flux de production BIM. Toutefois, nous estimons que les professionnels du secteur de l'AEC doivent pouvoir utiliser n'importe quelle application de n'importe quel éditeur, à n'importe quel stade de la conception, de la construction jusqu'à sa phase de gestion et maintenance. Autodesk s'engage donc en permanence à faire progresser l'openBIM® et l'interopérabilité dans l'ensemble du secteur.

Autodesk soutient activement buildingSMART International, l'organisation qui développe et gère le standard IFC, la plus importante norme en termes d'interopérabilité, en étant notamment membre actif d'une majorité de ses chapitres comme Medi@construct en France. Depuis 2011, plus de 100 000 utilisateurs ont téléchargé notre moteur d'import-export IFC Open Source pour Revit certifié par buildingSMART. Aucun autre éditeur n'a obtenu autant de certifications d'import et d'export IFC qu'Autodesk (plus de 14 de nos solutions pour l'AEC).

Autodesk a soutenu l'initiative de buildingSMART pour le développement de la norme d'échange de données BIM COBie (Construction Operations Building Information Exchange). En janvier 2013, nous avons relevé le défi COBie lancé par la buildingSMART Alliance nommé « Design Challenge for Architectural Design and Coordinated Design ». Il fut audité par une autorité indépendante et nous avons obtenu 100 % de résultats positifs en générant un élément livrable complet, conforme à la norme COBie et ne nécessitant aucun traitement ni aucune modification supplémentaire.

Enfin, Autodesk est le premier éditeur à avoir intégré le format IFC 4 au sein de sa plateforme BIM d'excellence, Revit il y a 4 ans au sein de Revit 2014.

Autodesk est le premier éditeur de solutions BIM et CAO à être en mesure de faire fonctionner ses applications sur du matériel non propriétaire et se consacre ainsi activement au concept d'ouverture ou Open Source. Autodesk:

- a créé une solution ouverte pour extraire et injecter des données dans ses applications principales, avant n'importe quel autre fournisseur majeur de CAO (le format DXF)
- a conçu un outil d'import/d'export IFC Open Source pour Revit
- a été parmi les premiers à garantir la certification au standard IFC version 2.0 Coordination View
- a contribué à la fondation de l'International Alliance for Interoperability en 1995, organisme devenu ensuite buildingSMART International
- Dédie à buildingSMART un soutien considérable dans son travail de promotion de l'ouverture du BIM ou openBIM®

**buildingSMART**  
International home of openBIM®

IFC2x3 CV2.0 IFC2x3 CV2.0 IFC2x3 CV2.0 IFC2x3 CV2.0

En savoir plus sur le processus de certification

**Compléments Revit**

Les compléments pour Revit vous aident à vous conformer aux standards d'interopérabilité (IFC) et à répondre aux exigences des maîtres d'ouvrage en termes de DOE (dossiers des ouvrages exécutés).

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