BIM Alliance Sweden – November 24th, 2016

"Interoperability & openBIM, the future of construction »

Emmanuel Di Giacomo
EMEA - AEC Ecosystem Business Development Manager
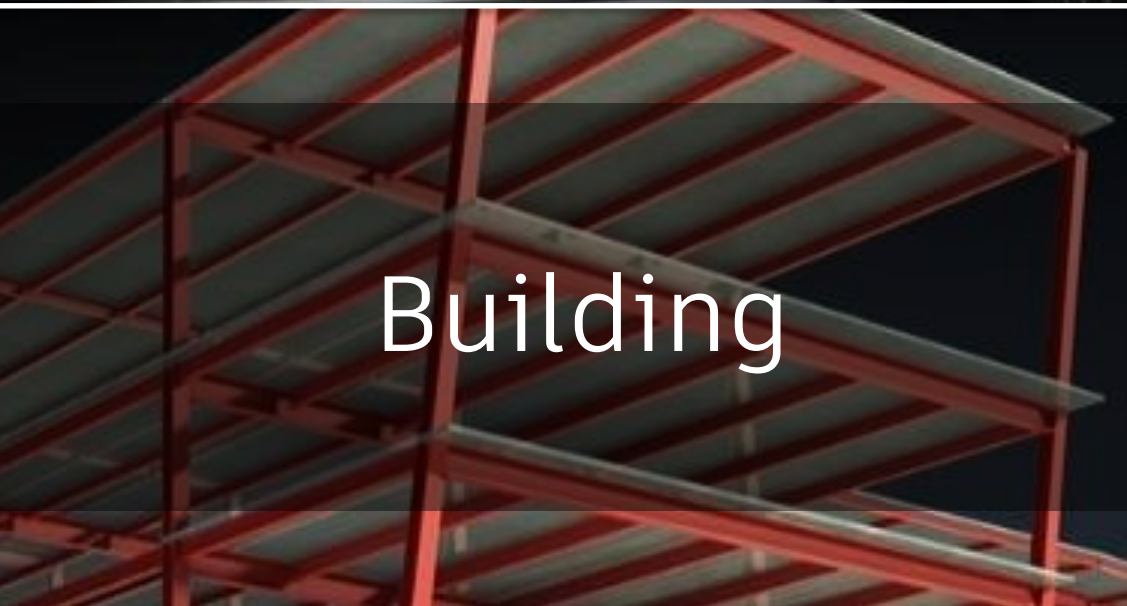Autodesk
Architect D.P.L.G.

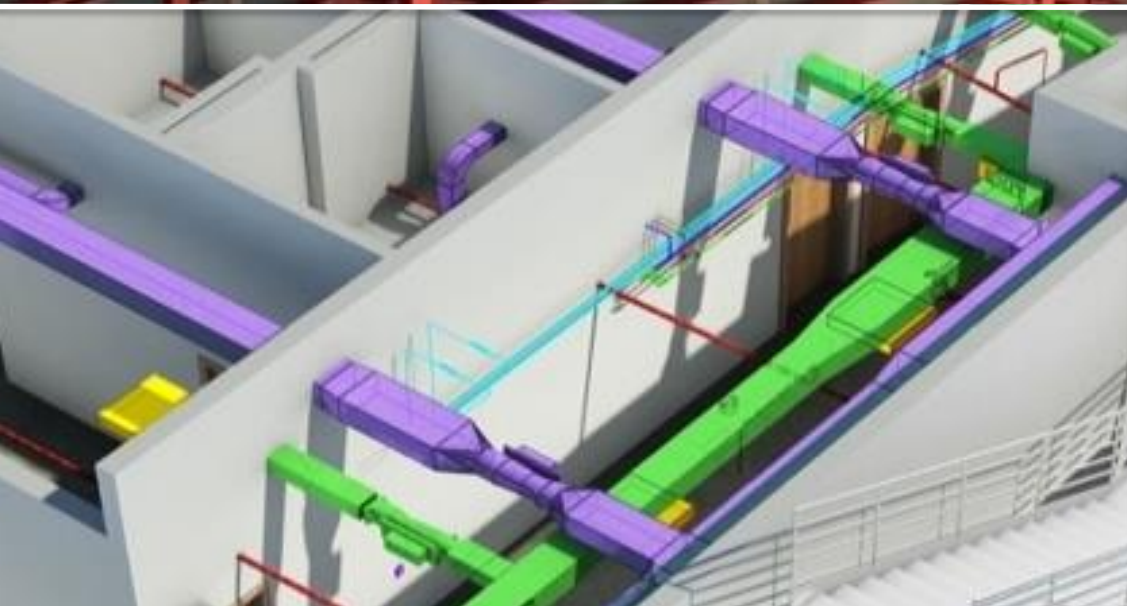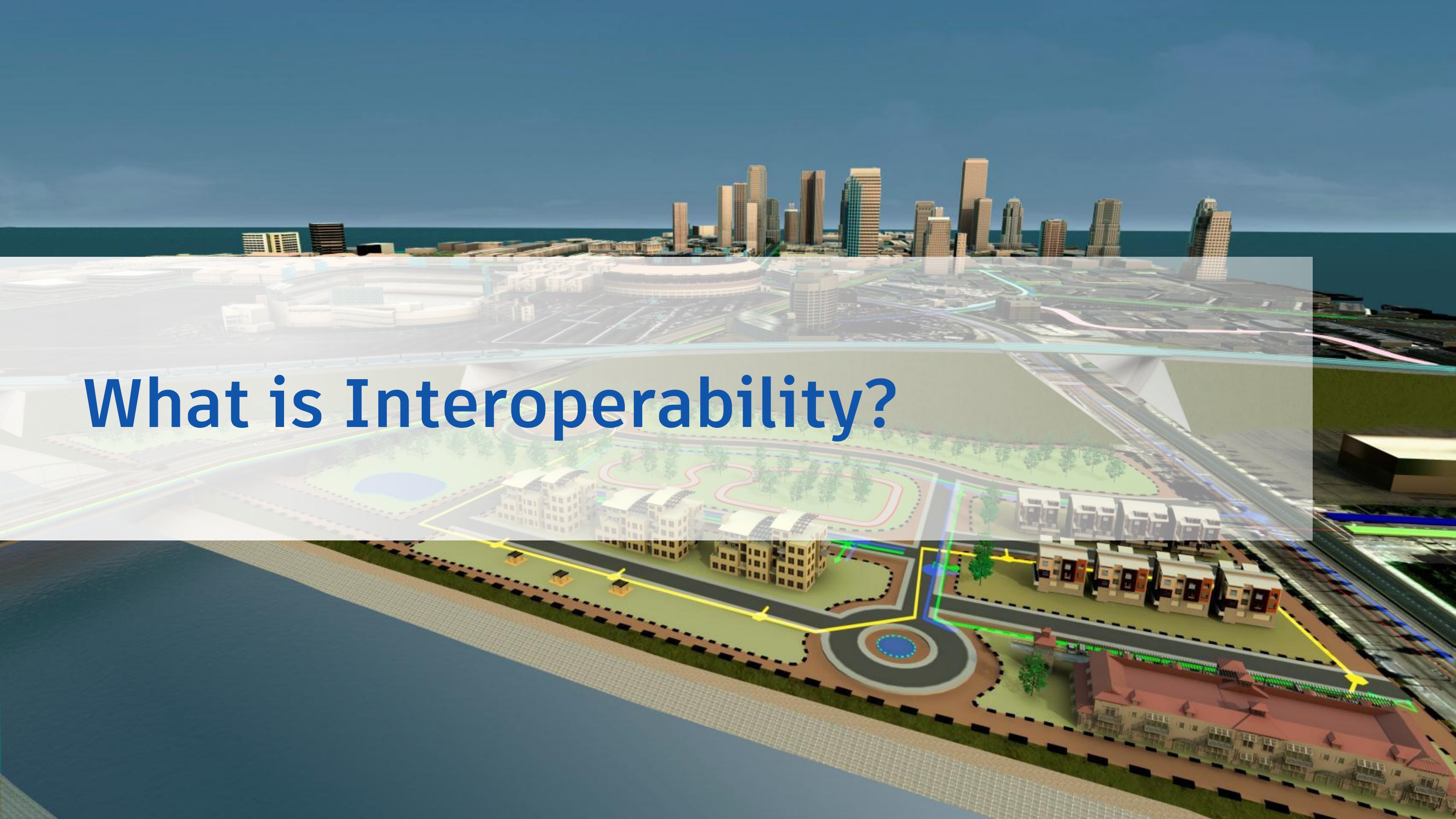# Mission: Lead the Industry's business process transformation to BIM

Building

Infrastructure

Energy & Utilities

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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

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Workflow Solutions

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

GIS	Scheduling	CAFM /IWMS / CMMS	BIM	Automated Fabrication
SHP	CSV	DWG	IFC	SAT

Cost Estimating	Civil Design	ERP	CAD	Energy Analysis
ODBC / XLS	LandXML	API	DWG	gbXML

Product Design	Structural Analysis	Scheduling	O & M	Visualization
PRT	CIS/2	CSV	COBie	FBX

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Technology, standards & best practices

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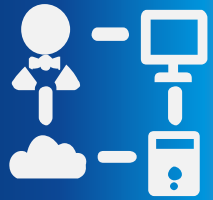
1 **Software Technologies**

Interoperability Standards **2**

Building Information Modeling (BIM)
- Supports New Business Practices
- Expands business capabilities

IFC, XML, MVD's
- Support best practices & performance
- Provide formats & standards

Integrated Project Delivery (IPD)
- Define Requirements
- Drive adoption & enhancement

Business Practices **3**

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What is openBIM® and IFC today?

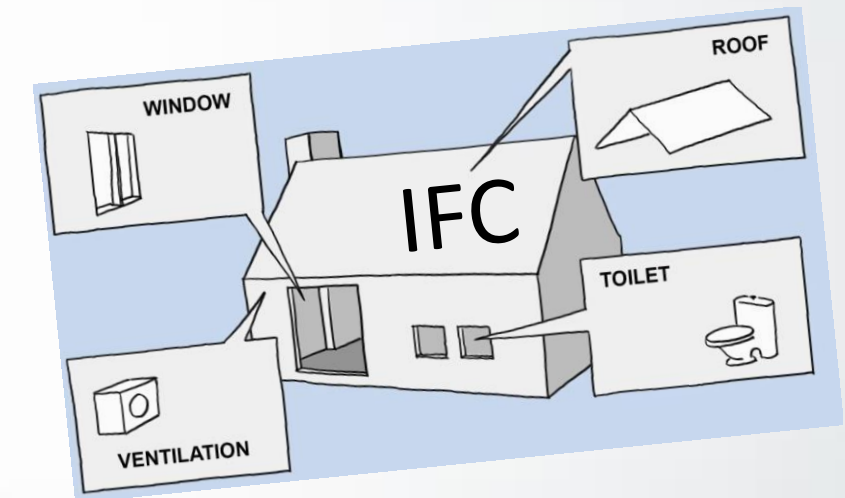# What openBIM® does for you…

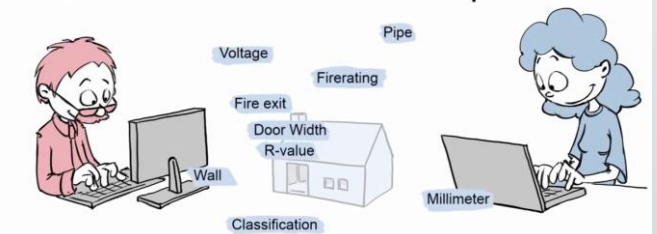buildingSMART is the solution

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.
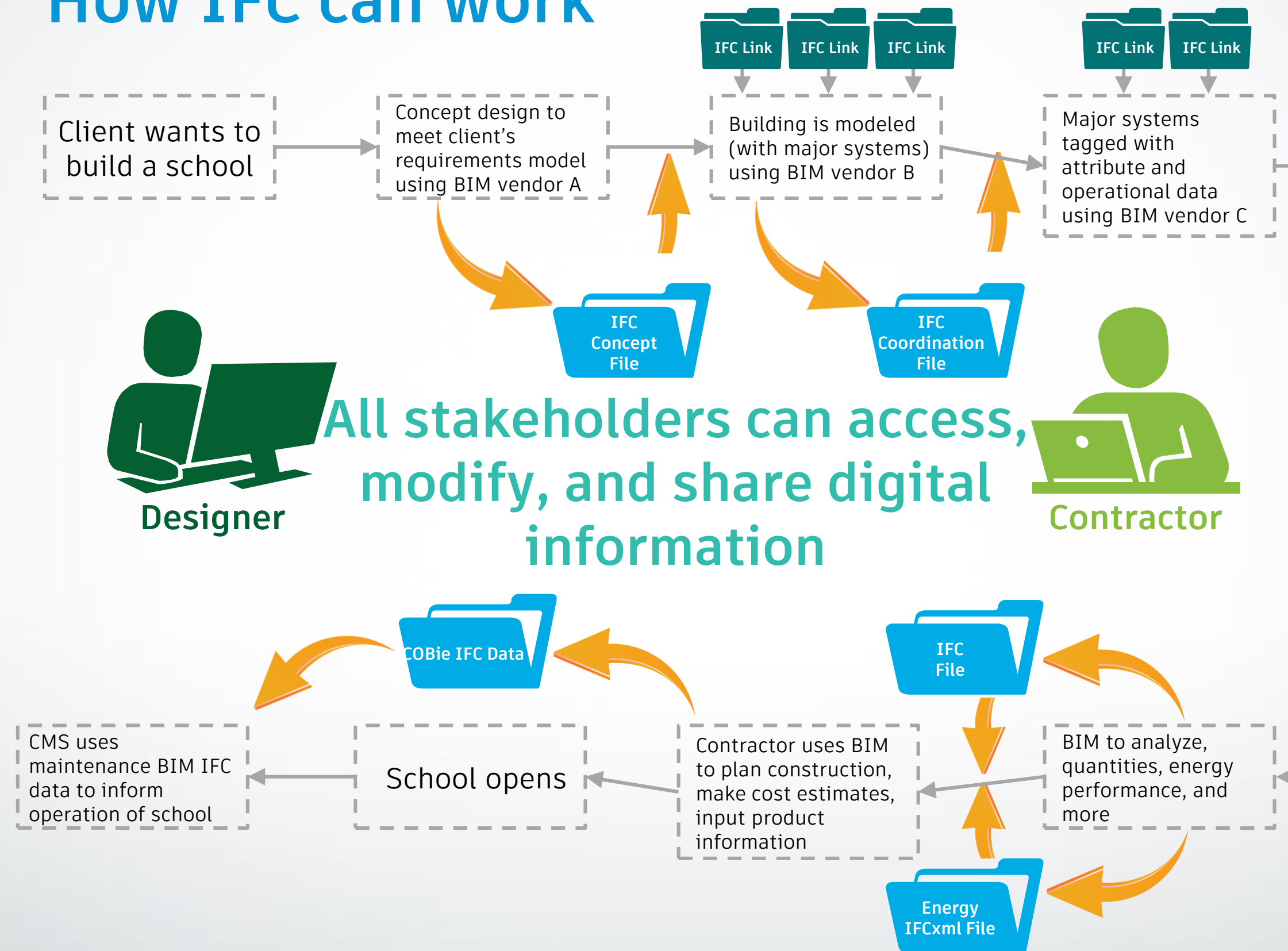
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How IFC can work

Client wants to build a school

→

Concept design to meet client's requirements model using BIM vendor A

→

Building is modeled (with major systems) using BIM vendor B

→

Major systems tagged with attribute and operational data using BIM vendor C

IFC Link   IFC Link   IFC Link

IFC Link   IFC Link

IFC Concept File

IFC Coordination File

Designer

All stakeholders can access, modify, and share digital information

Contractor

COBie IFC Data

IFC File

CMS uses maintenance BIM IFC data to inform operation of school

←

School opens

←

Contractor uses BIM to plan construction, make cost estimates, input product information

←

BIM to analyze, quantities, energy performance, and more

Energy IFCxml File

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How are we committed to Interoperability?

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

Question:
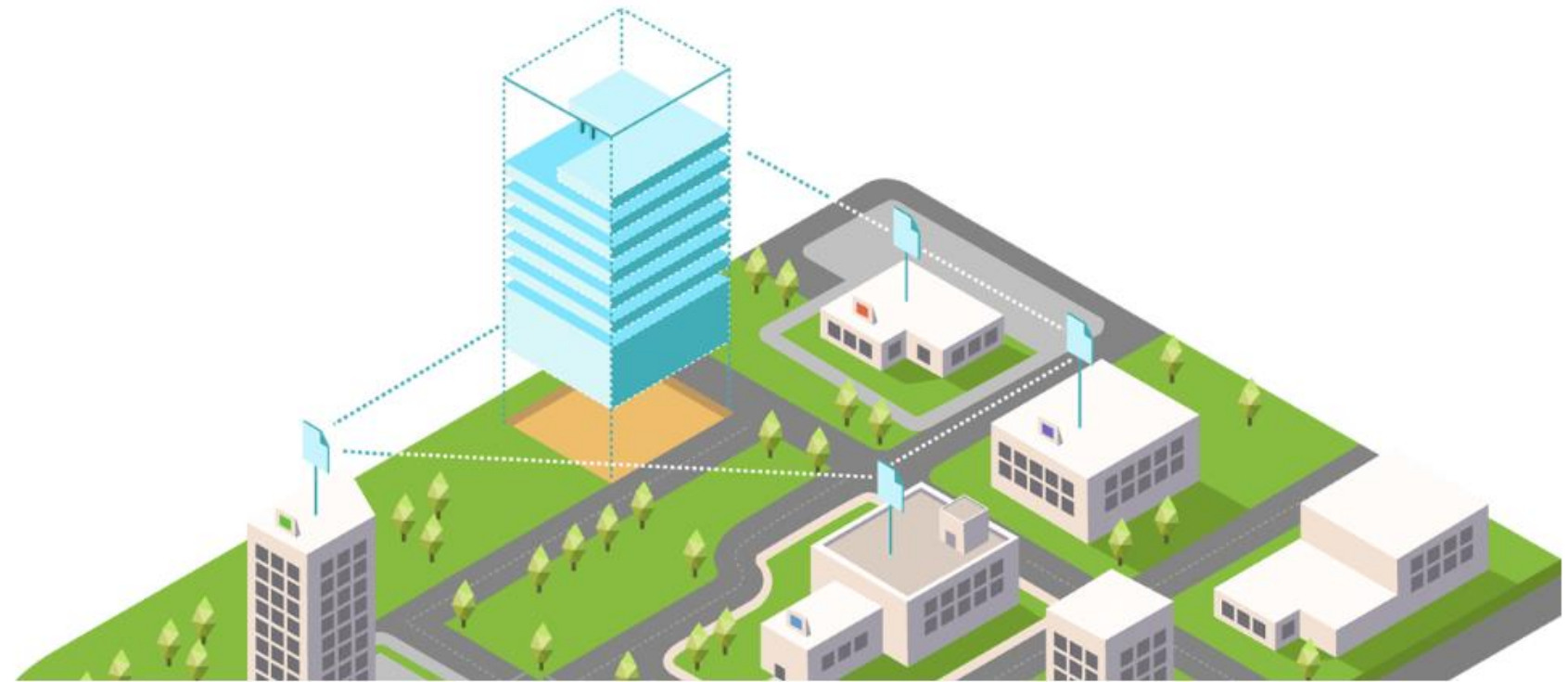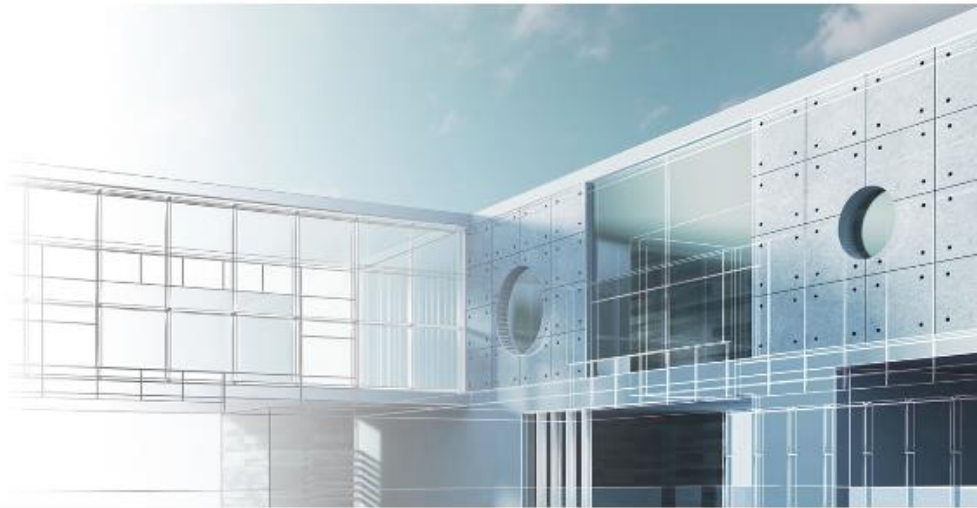
Do you know when Autodesk started supporting openBIM®?

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)

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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)

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There is only one buildingSMART's openBIM®

History of IFC in Autodesk Revit (through Revit 2017)

Revit Building 8: IFC added

Revit 2008: Full Extended Coordination View certification

Revit 2013: Open Source Alternate UI added for export

Revit 2014: Basic IFC4 export

Revit 2015: Link IFC added to open source

Revit 2016: Import Link IFC is certified

Revit Building 9: Full Singapore Code Checking View certification

Revit 2012 UR2: Open Source added for export

Revit 2013: receive CV 2.0 export certification

Revit LT 2014: supports IFC, receives CV 2.0 export certification

Revit 2015 R2: Link IFC objects referenceable

Revit 2017: Enhancements & bug fixes

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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

IFC2x3 CV2.0 ARCH
IFC2x3 CV2.0 STRUC
IFC2x3 CV2.0 MEP

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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
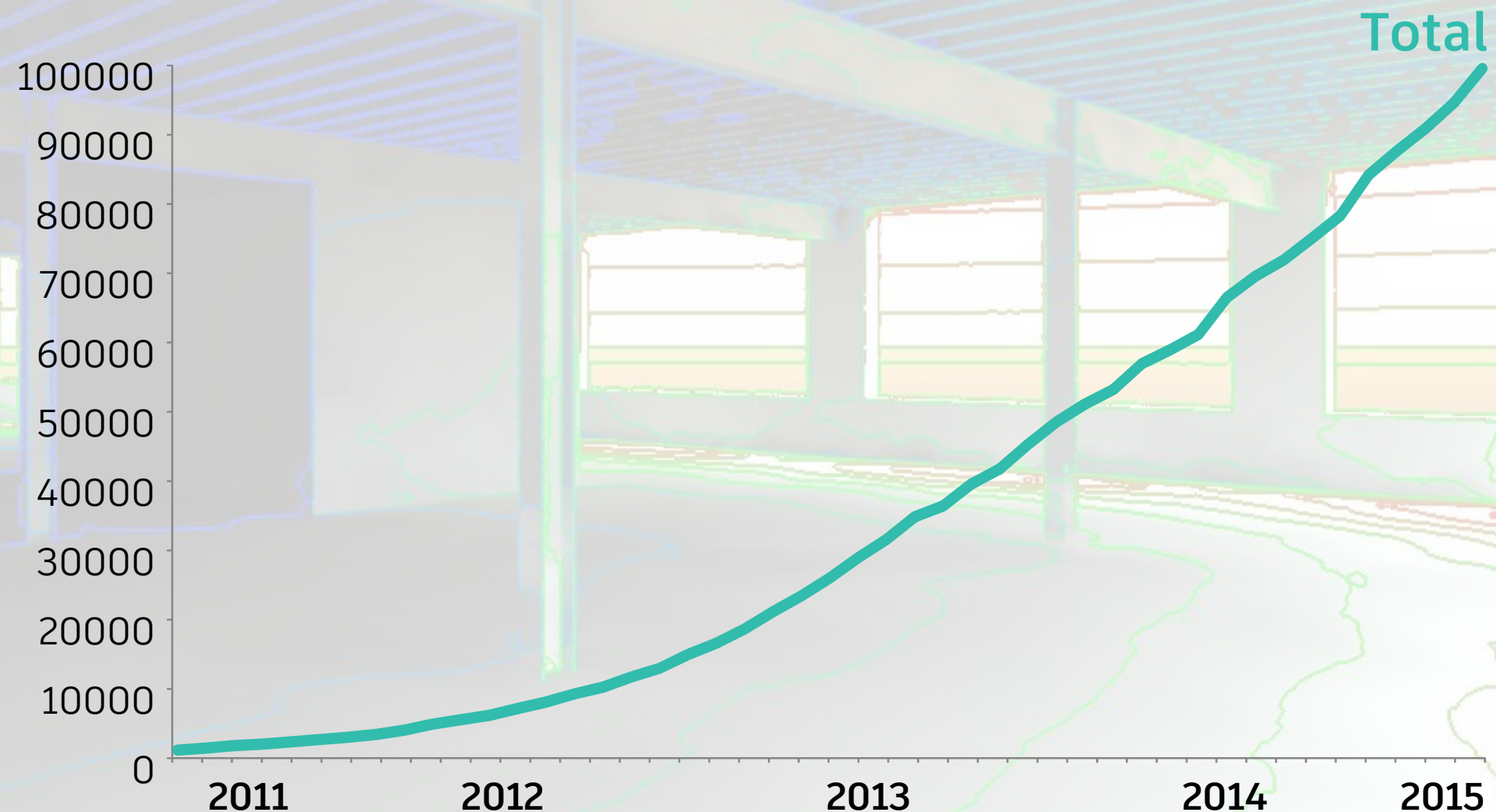
Many file formats - IFC simplifies workflows

Legend:
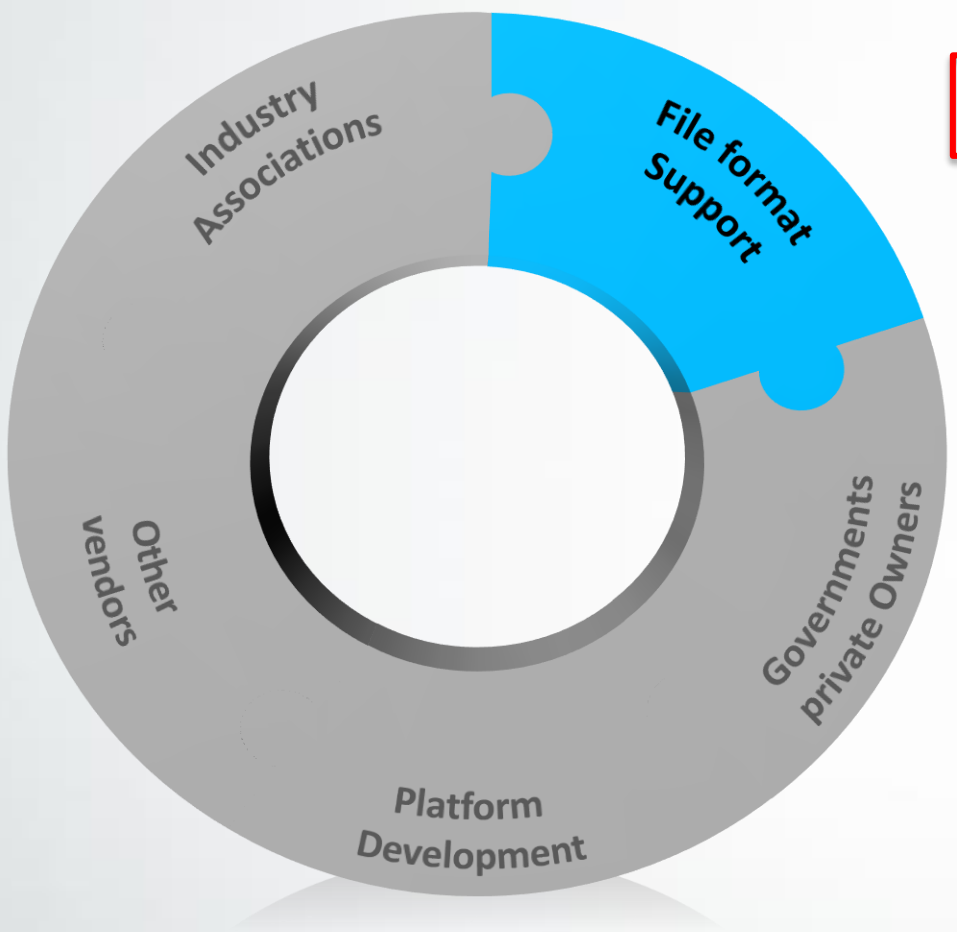
Export	↑
Export & Import	↕
Import	↓
Partial (2 or more steps)	≈

| 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

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IFC Viewing – BIM 360 Platform / BIM 360 Family
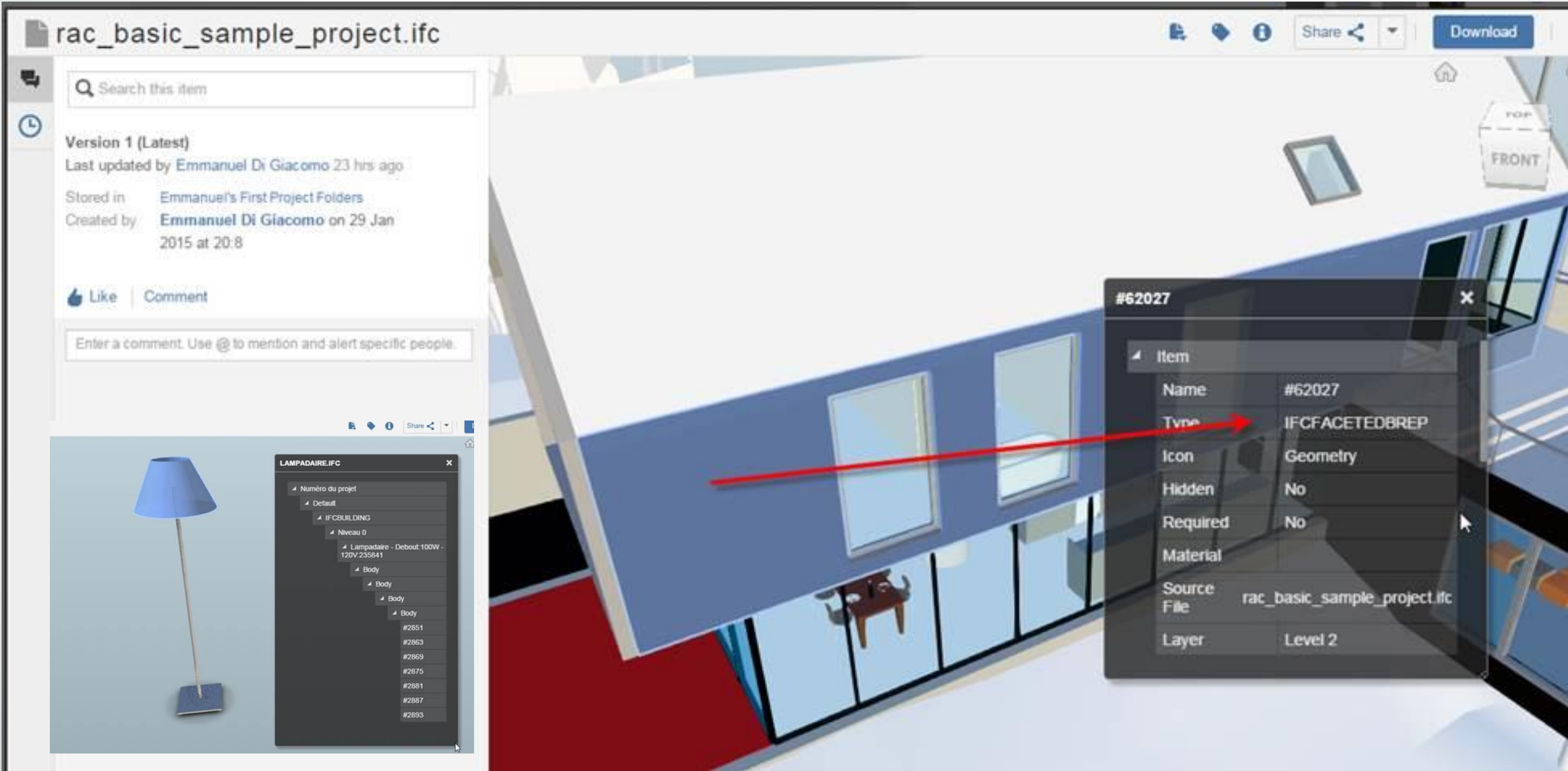
Open API's also allow for Collaborative Platform Development
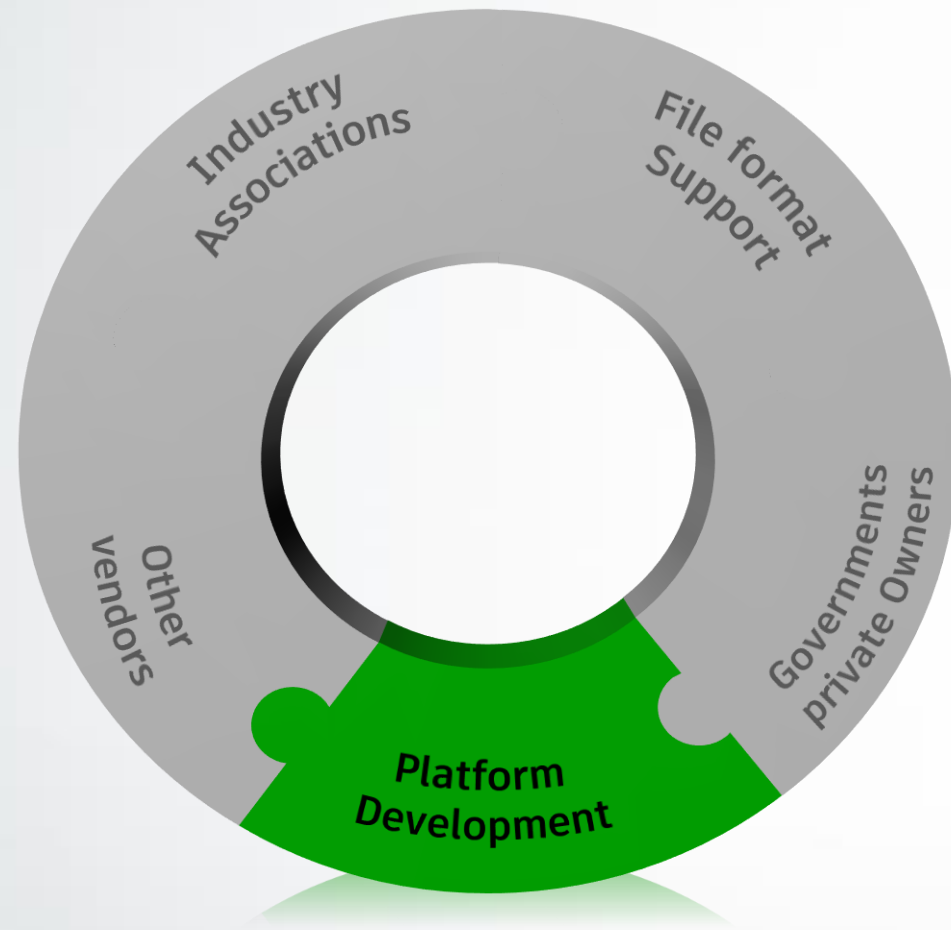
- Core to Autodesk DNA
- 4,000 Autodesk Developer Network members
- Open software architecture – API – addons
- Business logic, Countrification, Industry Segments

Governments support

Autodesk commitment to openBIM®

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

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

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

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

FOUNDER & INITIATOR & STRATEGIC ADVISOR COUNCIL

14 PRODUCTS SUPPORTING IFC

INTEROPERABILITY PART OF AUTODESK DNA
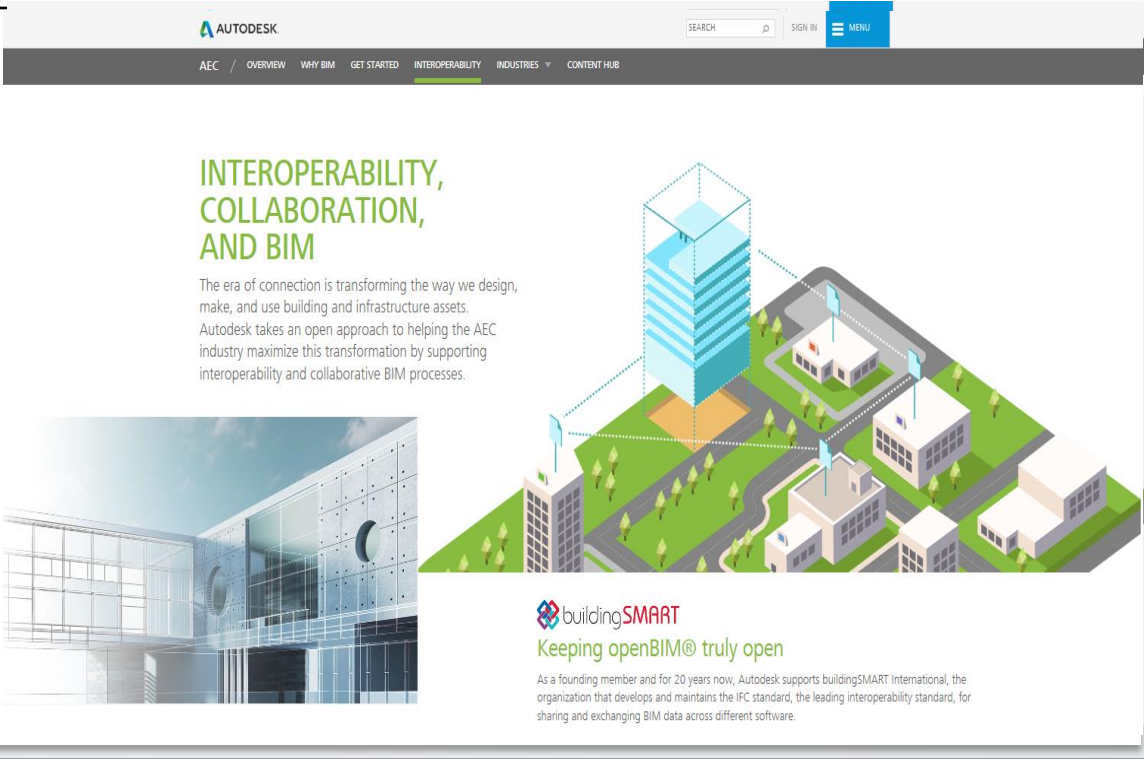
Focus on openBIM

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openBIM web sites

EU openBIM sites:
- www.autodesk.com/ifc
- www.autodesk.com/openbim
- www.autodesk.com/interoperability
- www.autodesk.fr/ifc
- www.autodesk.fr/openbim
- www.autodesk.fr/interoperability
- www.autodesk.de/ifc
- www.autodesk.de/openbim
- www.autodesk.de/interoperability

Thank You!