

buildingSMART International and Industry Foundation Classes (IFC): **THE solution** to A/E/C/O data interoperability

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 @jw_ouellette @buildingSMARTIn #DigADE2017

Agenda

Who is buildingSMART International?

What is IFC?

Why IFC?

buildingSMART
International home of openBIM

About Users Standards Compliance Chapters Members News Site Map

Professional Leadership

buildingSMART is transitioning from a volunteer led to a professionally led organization. We are building a fully professional leadership team.

READ MORE

Driving transformation of the built asset economy through creation & adoption of open, international standards

- What is openBIM ?**
A universal approach to the collaborative design, realization and operation of buildings based on open standards and workflows. Industry Foundation Classes (IFC) buildingSMART is the sharing of information between the project, design, procurement, maintenance and operations teams.
- What's in it for me?**
Benefits include New Markets, Scale Benefits, Improved Performance and Industry Development. Specific benefits to building owners and operators, product manufacturers and others.
- Our Standards**
buildingSMART aim to promote increasing international consensus on specific standards to accelerate implementation and uptake for mutual benefit. For a list of published international standards.
- Why buildingSMART?**
Significant improvements in cost, value and environmental performance can be achieved.
- Data Dictionary**
The buildingSMART Data Dictionary (bSDD) is a library of objects and their attributes. It's used to identify objects in the built environment and their specific properties regardless of language.
- Compliant Software**
All software successfully tested for compliance with buildingSMART Standards.

Who is buildingSMART International?

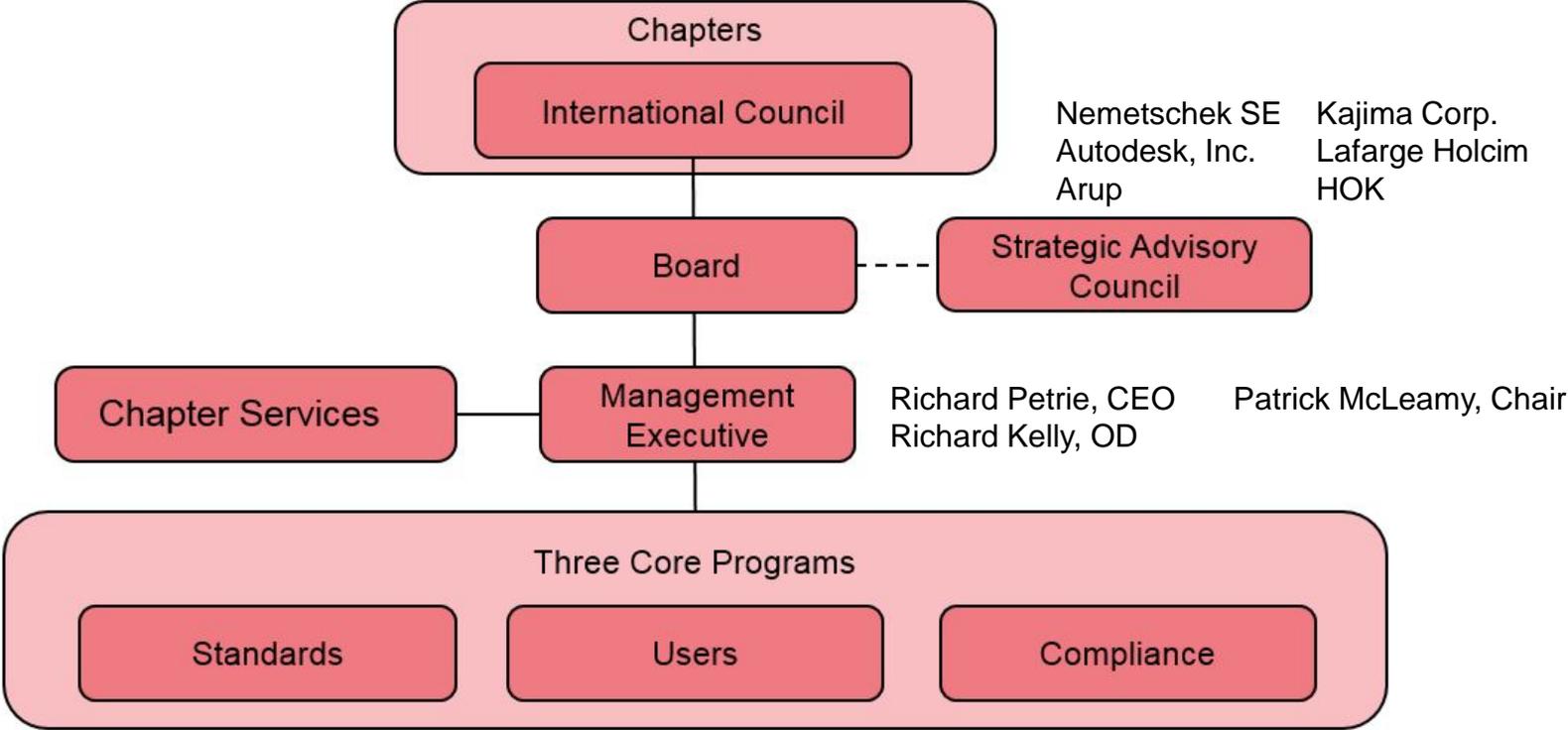
Who is buildingSMART International?



<http://buildingsmart.org>

Who is buildingSMART International?

buildingSMART Organization



Who is buildingSMART International?

Companies and organizations “putting their money where there mouth is”!

Strategic Advisory Council €200k+



International Members €20k-40k

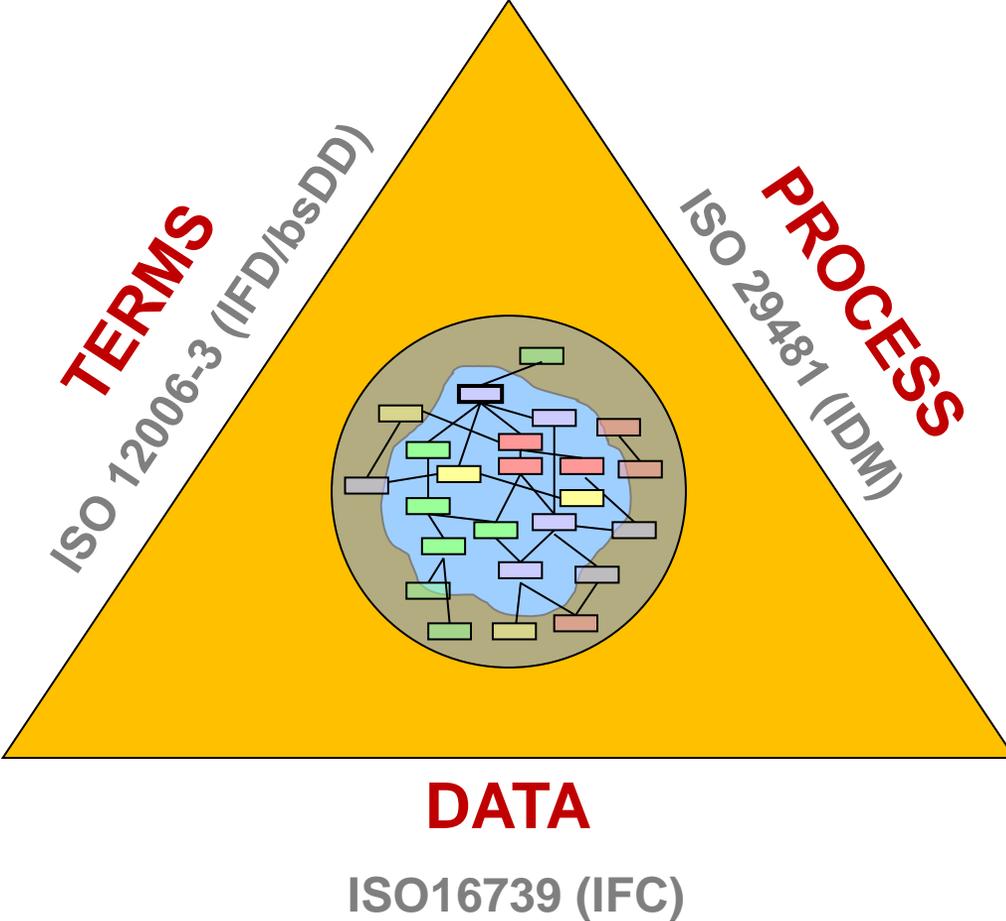


Standard Members €8k-15k



Who is building SMART International?

Develop and maintain open international standards for BIM



Who is buildingSMART International?

IDM (Information Delivery Manual)

Formal business case representation of data exchange

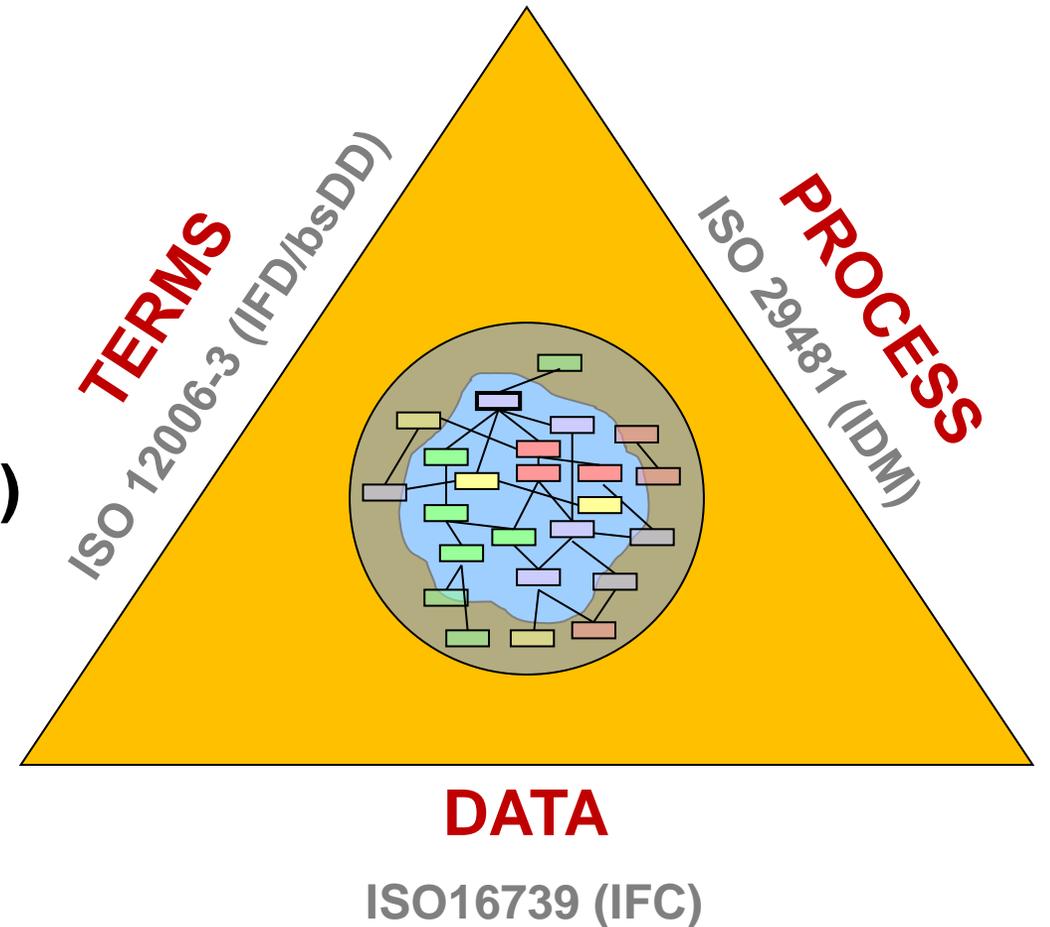
IFC (Industry Foundation Classes)

Technical specification of data model

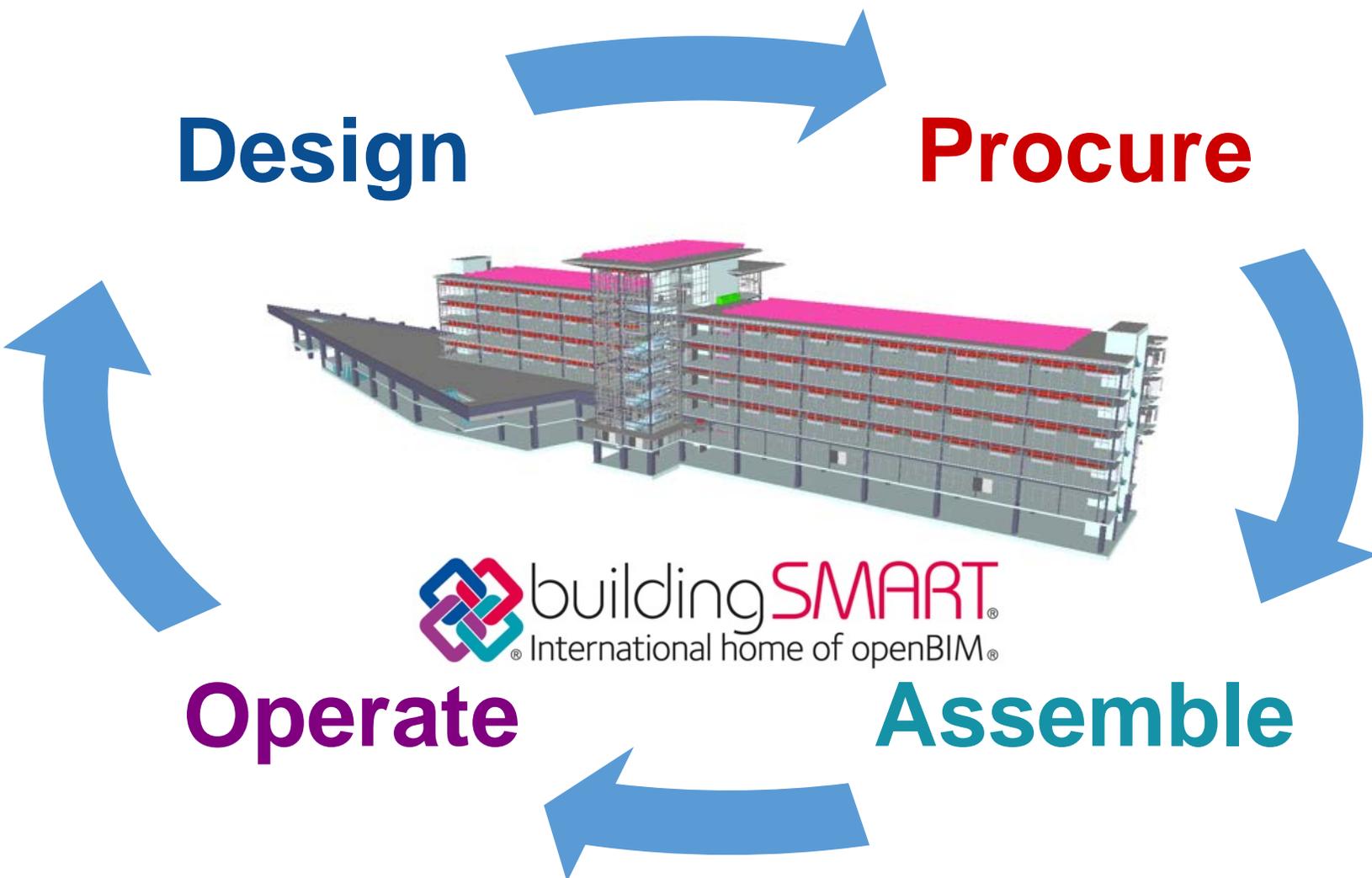
IFD (International Framework for Dictionaries)

aka buildingSMART Data Dictionary (bDDD)

Unique and consistent definitions of all concepts



Who is buildingSMART International?



Who is buildingSMART International?



“IFC4”

ISO 16739

EN ISO 16739

DIN EN ISO 16739
BSI EN ISO 16739



ISO 8879
XML



ISO 10303
STEP



ISO 19775
X3D

ISO TC184/SC4 (data model standard)
ISO TC59/SC13 (process, terms, BIM guidance, etc.)
OGC (BIM and Geospatial)

Who is buildingSMART International?

People. From all over the world. Working together. Making a difference.



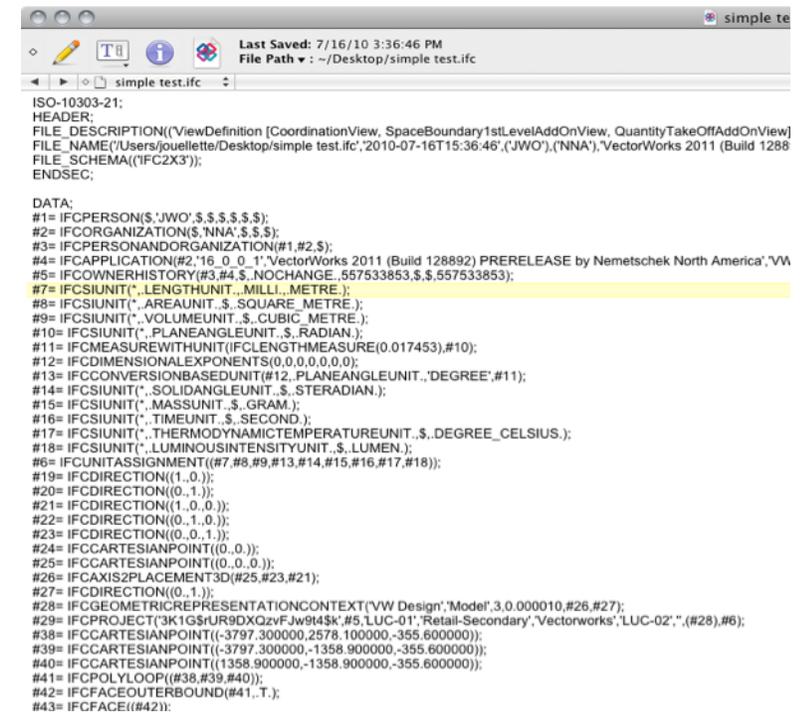
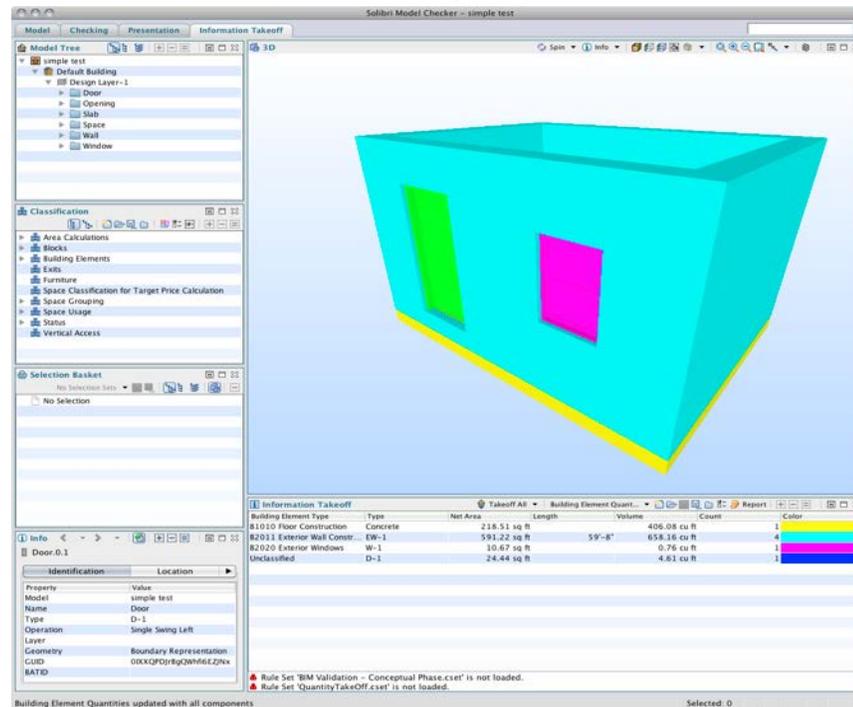
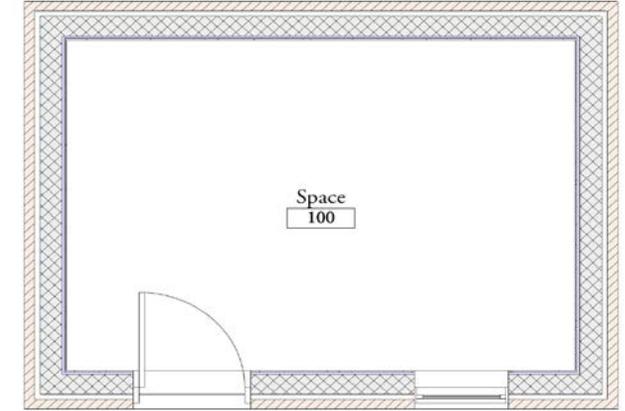
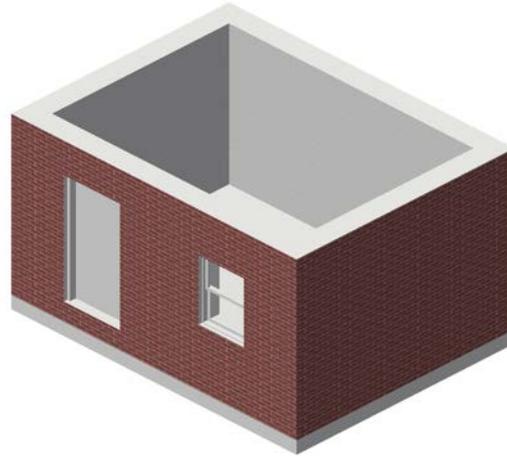
London, October 2017

What is IFC?

What is IFC?

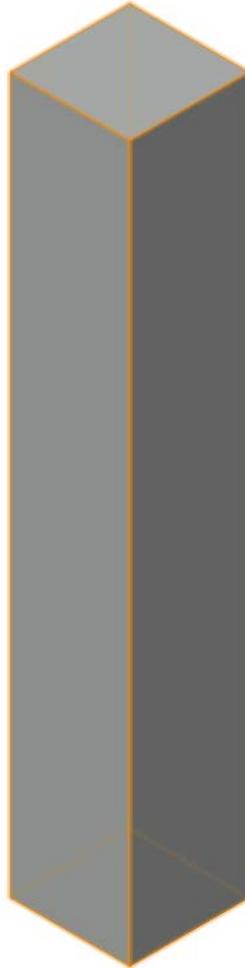
A non-proprietary, open standard means of describing the built environment and freely exchanging and/or storing that information digitally

Geometry
+
Information



What is IFC?

What is it?



What is IFC?

Geometry

Solid?

Surfaces?

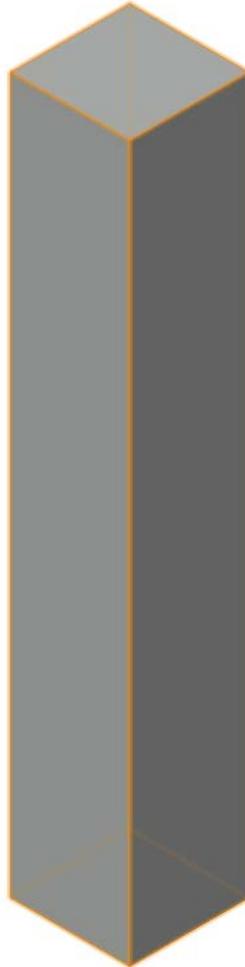
Semantics

Column?

Wall?

Pile?

Duct?



Attributes/Properties

Identity?

Manufacturer?

Color/Material?

Performance?

Weight?

Classification?

Relationships

Internal / External?

Story / Level?

Connections?

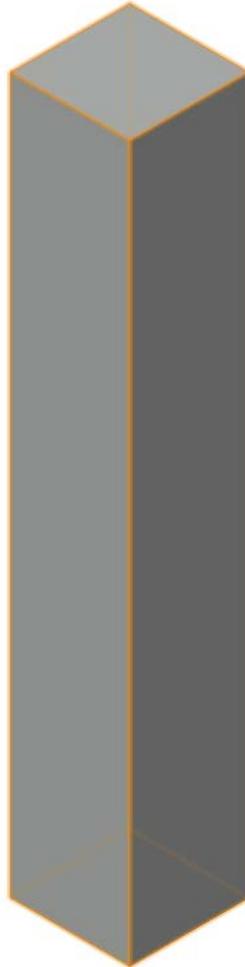
What is IFC?

Geometry

Solid: An extrusion of a 300mm x 300mm rectangular profile

Semantics

Column



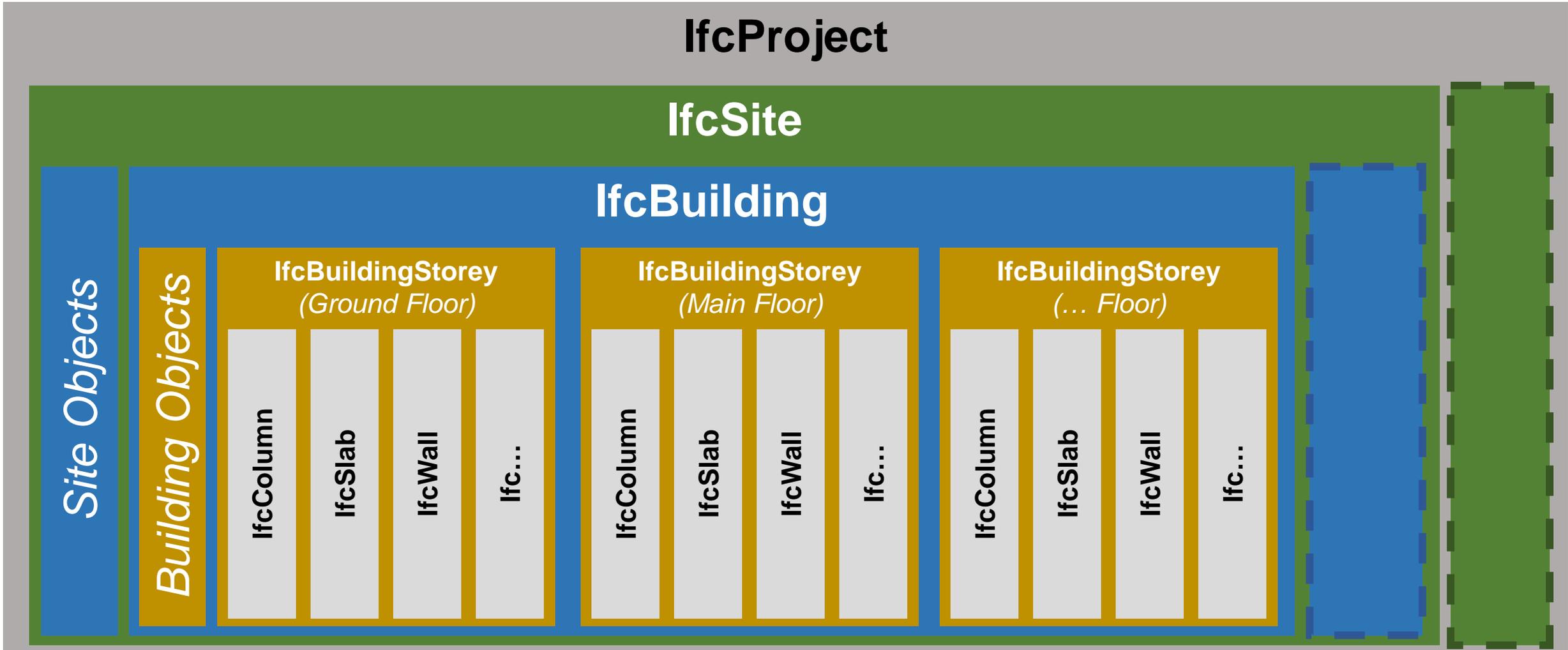
Attributes/Properties

Column D-2, RGB140-142-140, Cast Concrete, 150lbs/ft³, 5400psi

Relationships

Internal bearing, 2nd story, bearing on footing below and supporting slab above, structural system, has reinforcing

What is IFC?



What is IFC?

More than just objects....

IfcControl

Performance History

Cost / Value

Sequencing

...

IfcProcess

Work planning

Tasks for execution

Schedules / Timetables

Procedures

Events

Resources

IfcActor

Occupants

Roles

Responsibilities

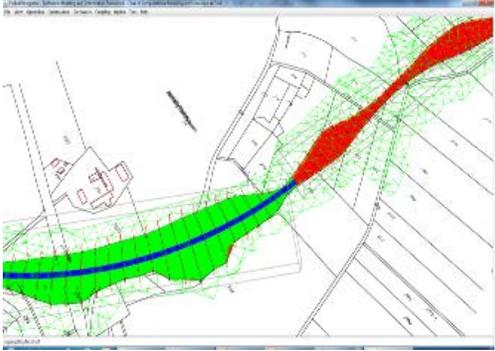
Actions

Identity

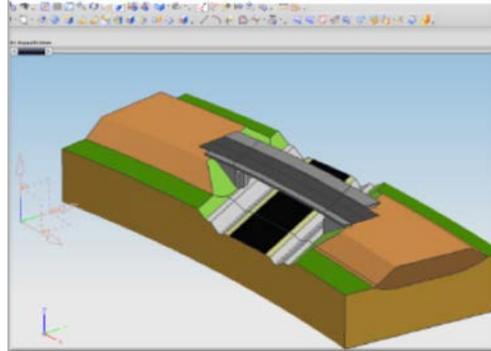
...

What is IFC?

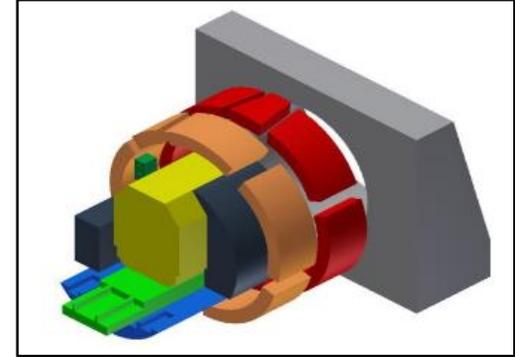
More than just buildings....



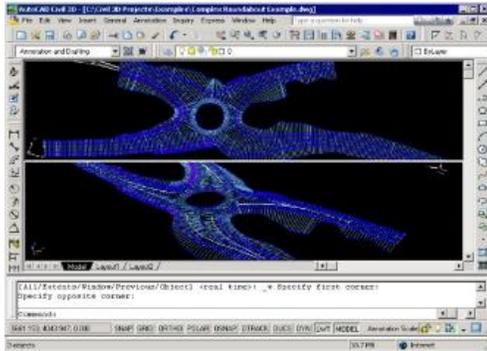
Alignment
Common baseline



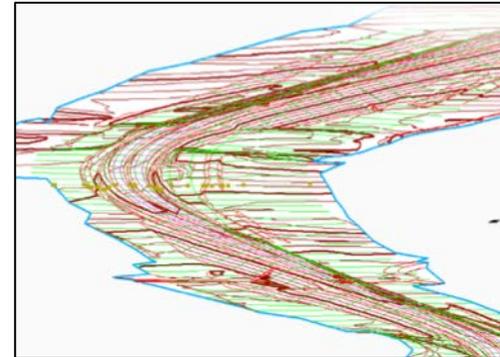
Bridges
IFC-Bridge



Tunnelling
IFC-Tunnel

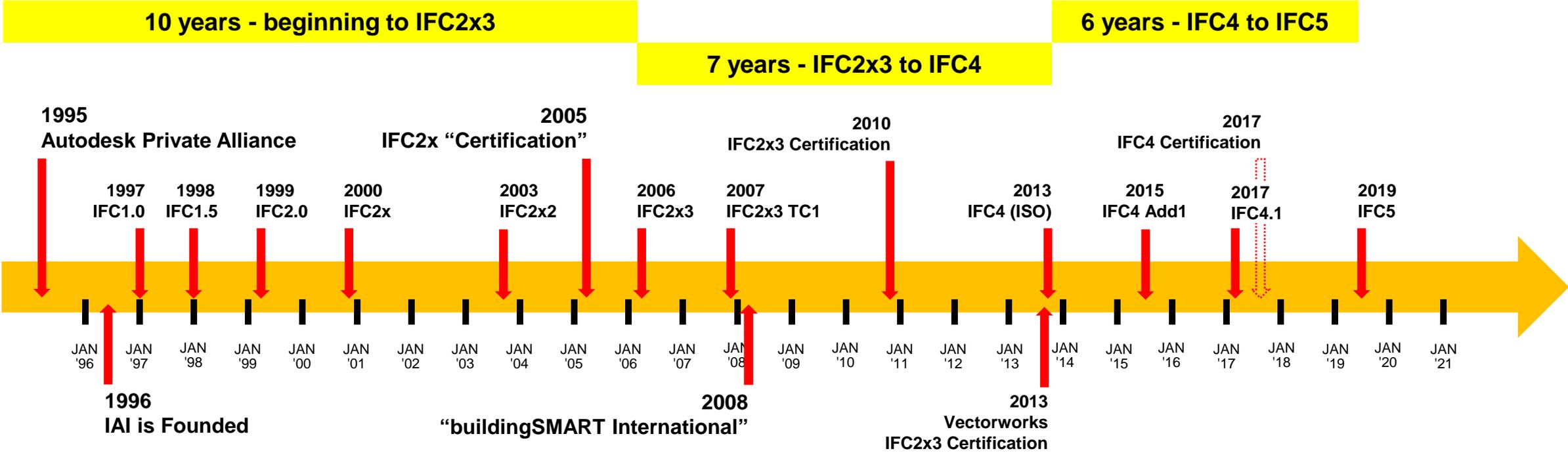


Roads
IFC-Road



Railways
IFC-Railway

What is IFC?



Courtesy of Dr. Thomas Liebich, AEC3 Deutschland GmbH

What is IFC?

IFC-STP (.ifc)

```
ISO-10303-21;
HEADER;
FILE_DESCRIPTION(('ViewDefinition [CoordinationView_V2.0]','ExchangeRequirement[Architecture]'),'2;1');
FILE_NAME('Users/jouellette/Vectorworks Cloud Services/Miscellaneous/simple IFC
test.ifc','2017-06-03T16:33:32','Architect'),('Nemetschek Vectorworks, Inc.),'Vectorworks Architect 2017 SP3 (Build 356720)
(64-Bit) by Vectorworks, Inc.','Macintosh','');
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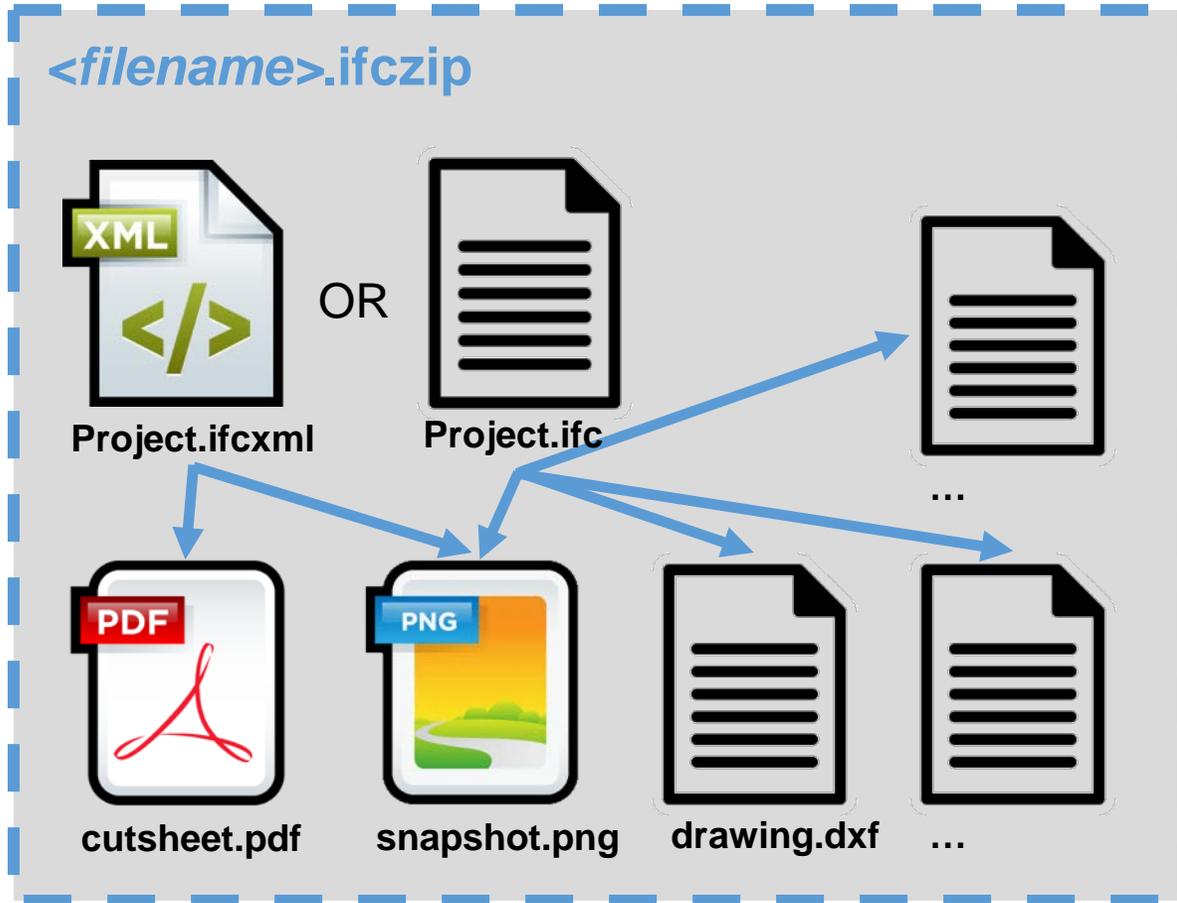
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#3= IFCTELECOMADDRESS($,$,$,$,$,$,$,$,'www.vectorworks.net');
#4= IFCPOSTALADDRESS($,$,$,'Architect',$,$,$,$,$,$);
#1= IFCPERSON($,'Architect',$,$,$,$,(#2),(#3,#4));
#6= IFCACTORROLE(.ARCHITECT.,$,$);
#7= IFCTELECOMADDRESS($,$,$,$,$,$,$,$,'www.vectorworks.net');
#8= IFCPOSTALADDRESS($,$,$,'Architecture',$,$,$,$,$,$);
#5= IFCORGANIZATION($,'Vectorworks, Inc.',$,(#6),(#7,#8));
#9= IFCPERSONANDORGANIZATION(#1,#5,$);
#10= IFCAPPLICATION(#5,'22_0_3_1','Vectorworks Architect 2017 SP3 (Build 356720) (64-Bit) by Vectorworks, Inc.','VW2203');
#11= IFCOWNERHISTORY(#9,#10,$,.NOCHANGE.,1496784812,$,$,1496784812);
#13= IFCSIUNIT(*,.LENGTHUNIT.,$.MILLI.,$.METRE.);
#14= IFCSIUNIT(*,.AREAUNIT.,$.SQUARE_METRE.);
#15= IFCSIUNIT(*,.VOLUMEUNIT.,$.CUBIC_METRE.);
#16= IFCSIUNIT(*,.PLANEANGLEUNIT.,$.RADIAN.);
#17= IFCMEASUREWITHUNIT(IFCLENGTHMEASURE(0.017453),#16);
#18= IFCDIMENSIONALEXPONENTS(0,0,0,0,0,0);
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#20= IFCSIUNIT(*,.SOLIDANGLEUNIT.,$.STERADIAN.);
#21= IFCSIUNIT(*,.MASSUNIT.,$.GRAM.);
#22= IFCSIUNIT(*,.TIMEUNIT.,$.SECOND.);
#23= IFCSIUNIT(*,.THERMODYNAMICTEMPERATUREUNIT.,$.DEGREE_CELSIUS.);
#24= IFCSIUNIT(*,.LUMINOUSINTENSITYUNIT.,$.LUMEN.);
#25= IFCMONETARYUNIT(.USD.);
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#26= IFCDIRECTION(1.,0.);
#27= IFCDIRECTION(0.,1.);
#28= IFCDIRECTION(1.,0.,0.);
#29= IFCDIRECTION(0.,1.,0.);
#30= IFCDIRECTION(0.,0.,1.);
#31= IFCARTESIANPOINT(0.,0.);
#32= IFCARTESIANPOINT(0.,0.,0.);
#33= IFCAXIS2PLACEMENT3D(#32,#30,#28);
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ifcXML

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xmlns:exp="urn:oid:1.0.10303.28.2.1.1" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:iso.org:standard:10303:part(28):version(2):xmlschema:common
http://www.iai-tech.org/ifcXML/IFC2x3/FINAL/ex.xsd">
  <uos configuration="i-ifc2x3" description="" edo="" id="uos_1" xmlns="http://www.iai-tech.org/ifcXML/IFC2x3/FINAL"
xmlns:ex="urn:iso.org:standard:10303:part(28):version(2):xmlschema:common"
xsi:schemaLocation="http://www.iai-tech.org/ifcXML/IFC2x3/FINAL http://www.iai-tech.org/ifcXML/IFC2x3/FINAL/IFC2X3.xsd">
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        <FacsimileNumbers/>
        <PagerNumber></PagerNumber>
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      <GivenName></GivenName>
      <MiddleNames/>
      <PrefixTitles/>
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What is IFC?

ifcZIP



The future....

ifcJSON

Web services data exchange

ifcOWL

Web-based semantic data documentation

ifcRDF

Web-based language for semantic data linking

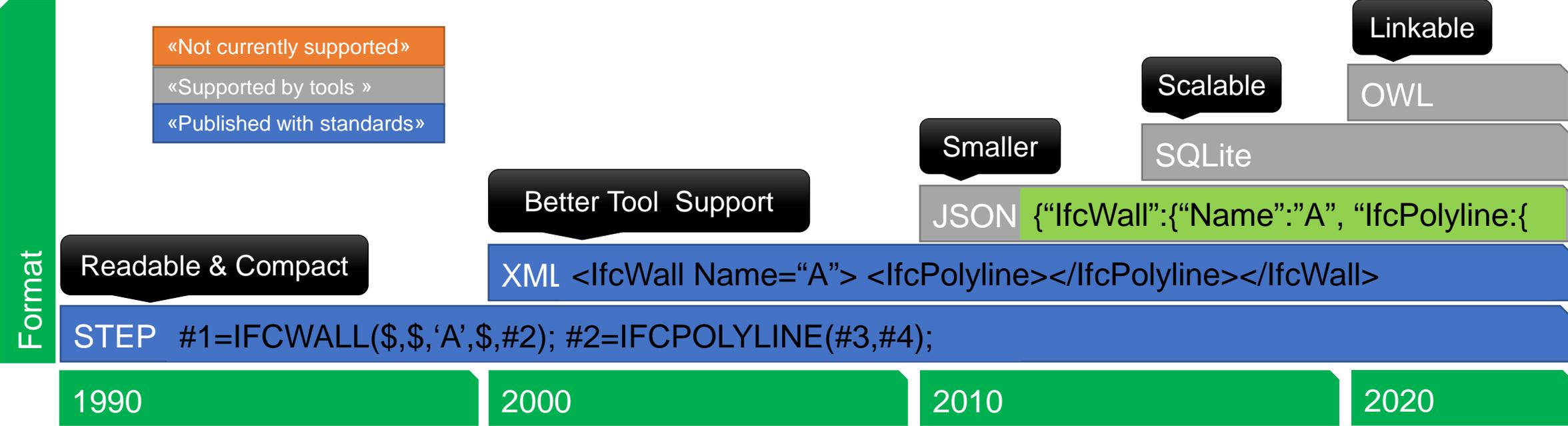
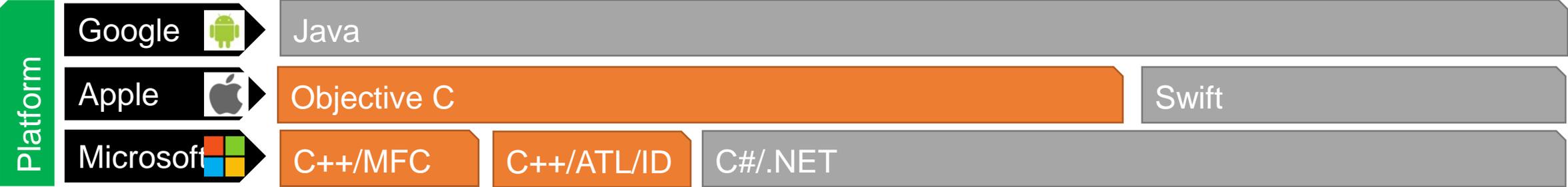
ifcQL

Query language IFC-based databases/servers

ifc???

What is IFC?

Courtesy of Tim Chipman, Constructivity and bSI Model Support Group



What is IFC?

The best way to communicate building data. Globally. Without barriers.



David Hockney Building

Bradford College is one of Britain's largest further education colleges...

[Read More](#)



MT Højgaard

MT Højgaard are a large Danish company with expertise in construction, civil engineering...

[Read More](#)



New Østfold Hospital

Østfold is a county lying south-east of Oslo in Norway. In the late 1990s...

[Read More](#)



Cookham Wood

The Cookham Wood Trial Project combines collaborative working ...

[Read More](#)

Award Winners 2017

Design Award: Tønsbergprosjektet (The Tønsberg Project), Norway



The project was established as the first IPD project in Norway (to our knowledge Europe). Project meetings utilised Virtual Design & Construction (VDC) and Target Value Design (TVD) methodologies both for improving design and construction planning.

IFC was mandatory for all BIM-based exchanges. Some of the project objectives included:

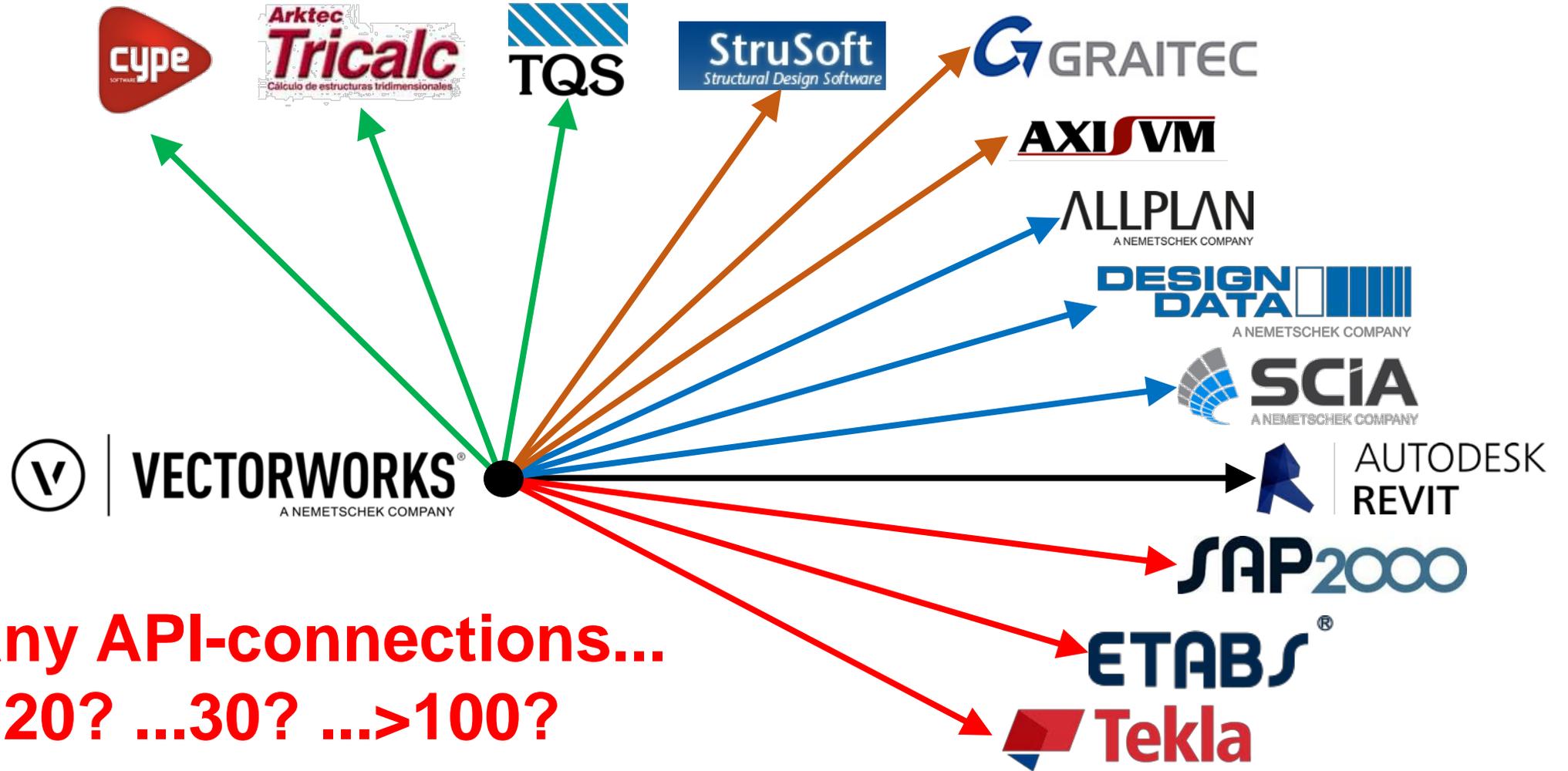
- functional and construction quality equal to or better than comparable hospitals;
- 10% reduction of project cost;
- 50% reduction of construction time for all constructions above ground level, in relation to comparable projects;
- a complete open BIM handover documentation.
- BREEAM Very Good certification.

Why IFC?

Why IFC?



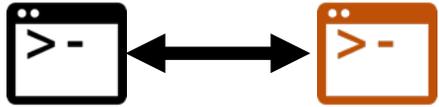
Why IFC?



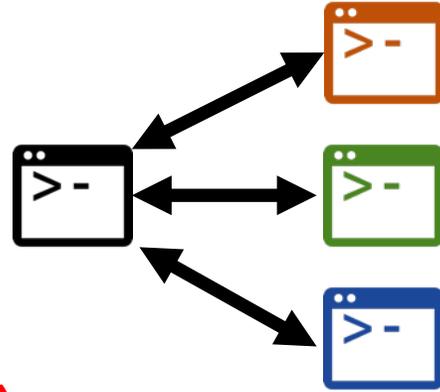
How many API-connections...
...13? ...20? ...30? ...>100?

Why IFC?

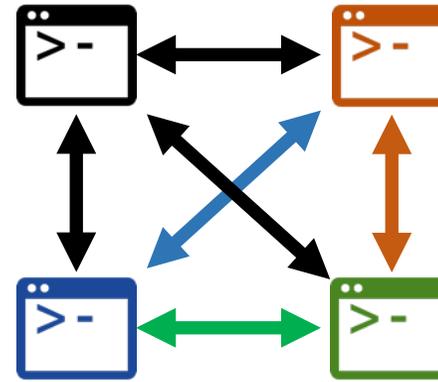
One-to-One



One-to-Many

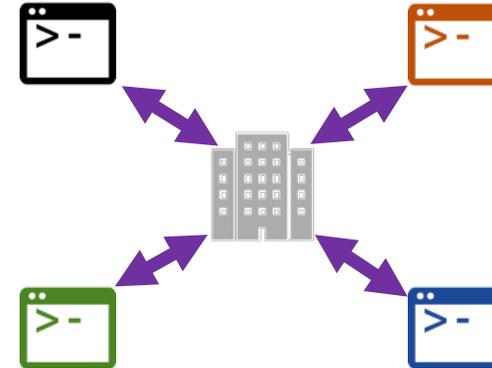
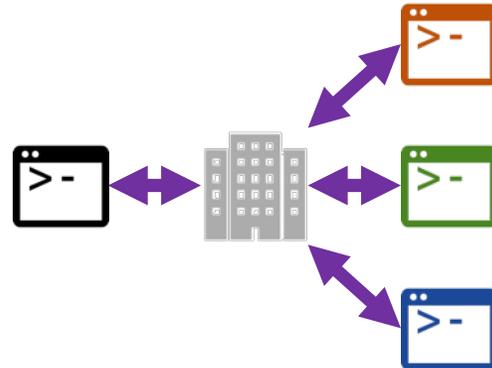
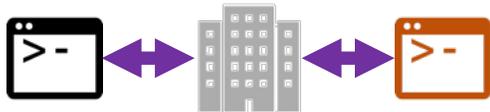


Many-to-Many



Application-centric (API)

Content-centric (IFC)

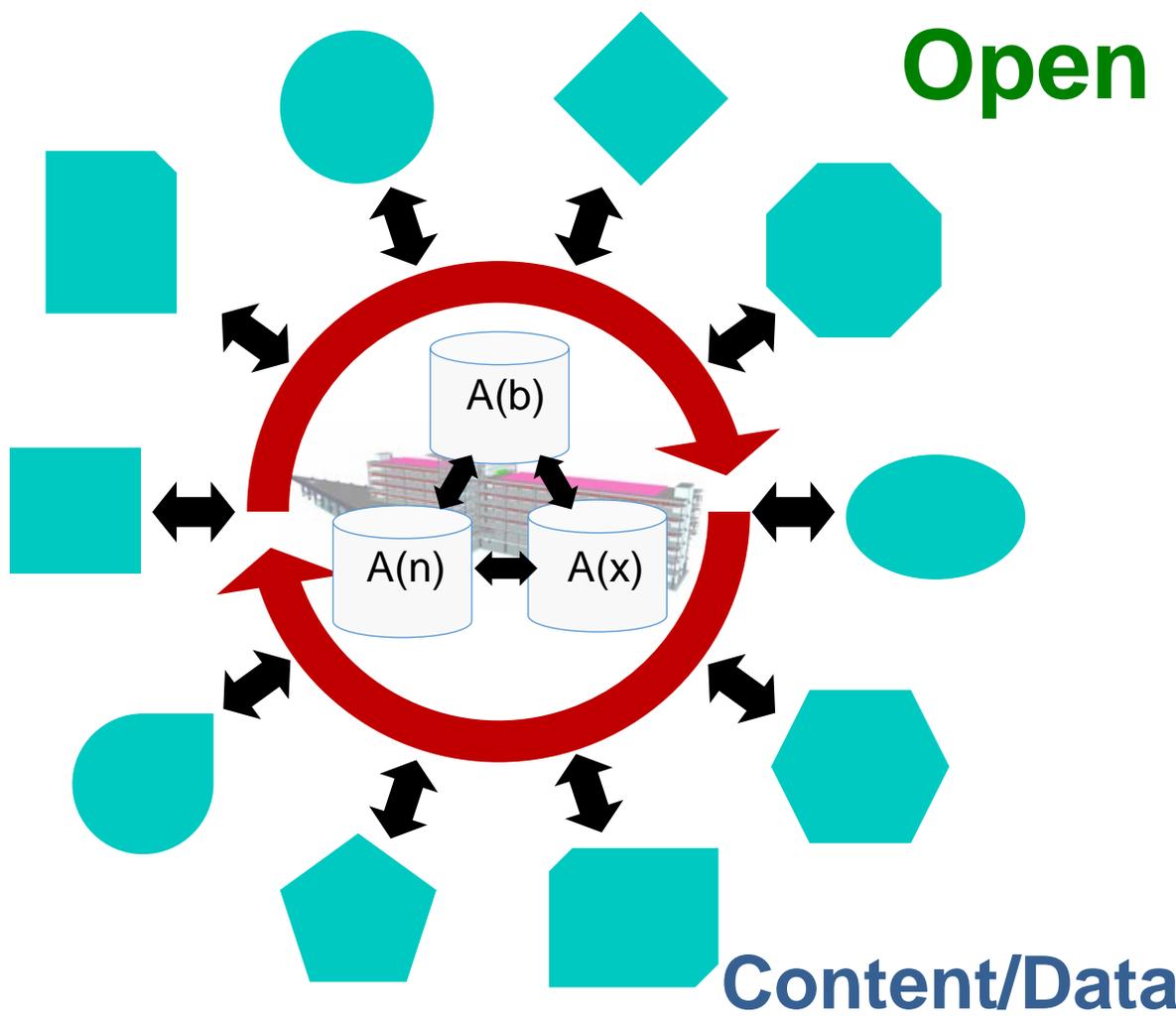


✓ Less work

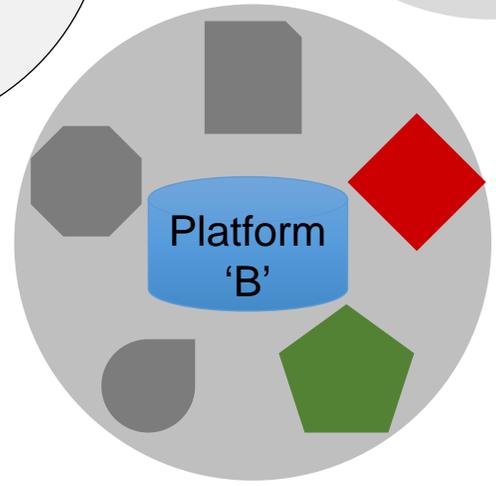
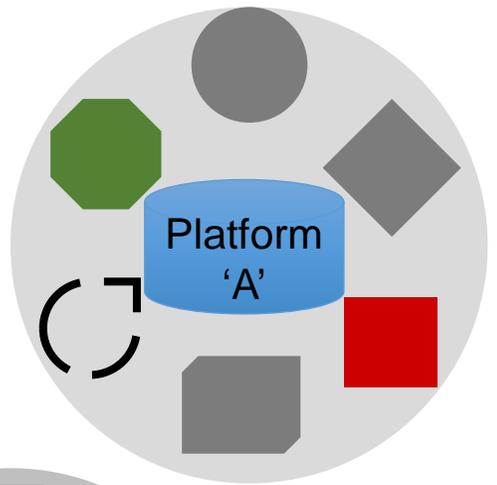
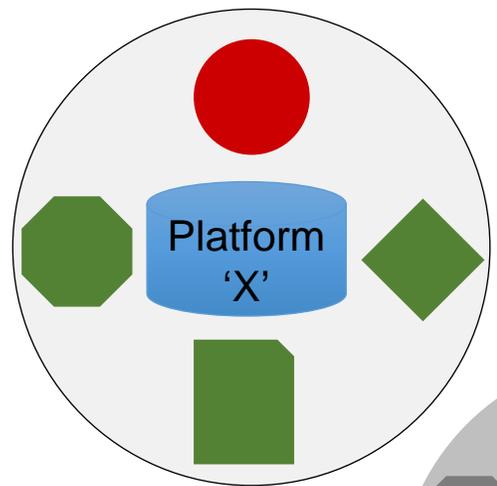
✓ Lower Threshold

✓ Larger Ecosystem

Why IFC?



Closed



Tools/Apps

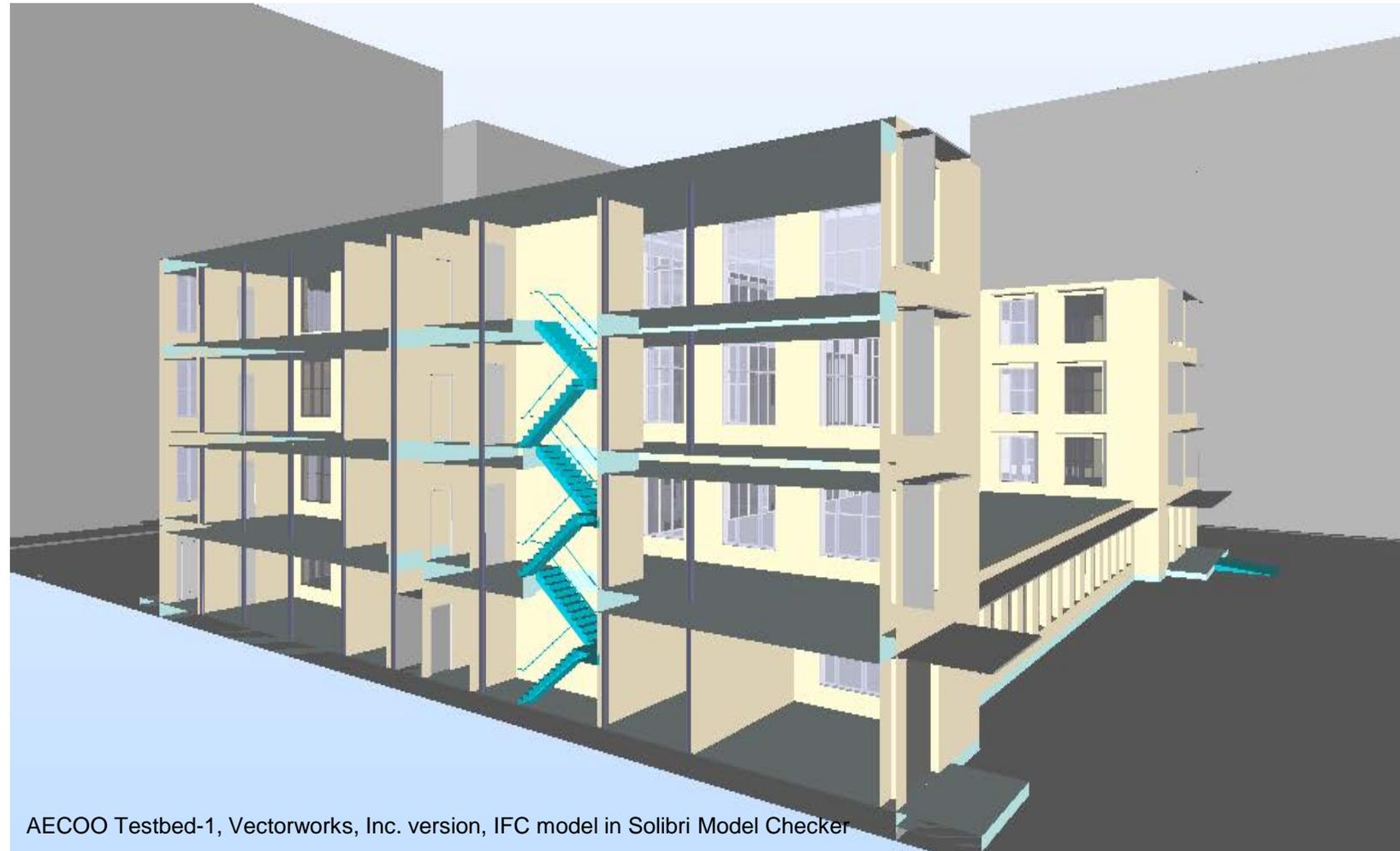
Why IFC?

Value

Ownership

Portability

Extensibility



Q&A

Thank you!

Contact:

jouellette@vectorworks.net

<http://www.buildingsmart.org>

<http://www.buildingsmart-tech.org>

