Future proofing 3D models, a software industry perspective

Building a Digital Future: Challenges & Solutions for Preserving 3D Models
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Image courtesy of Tesla Motors, Inc.

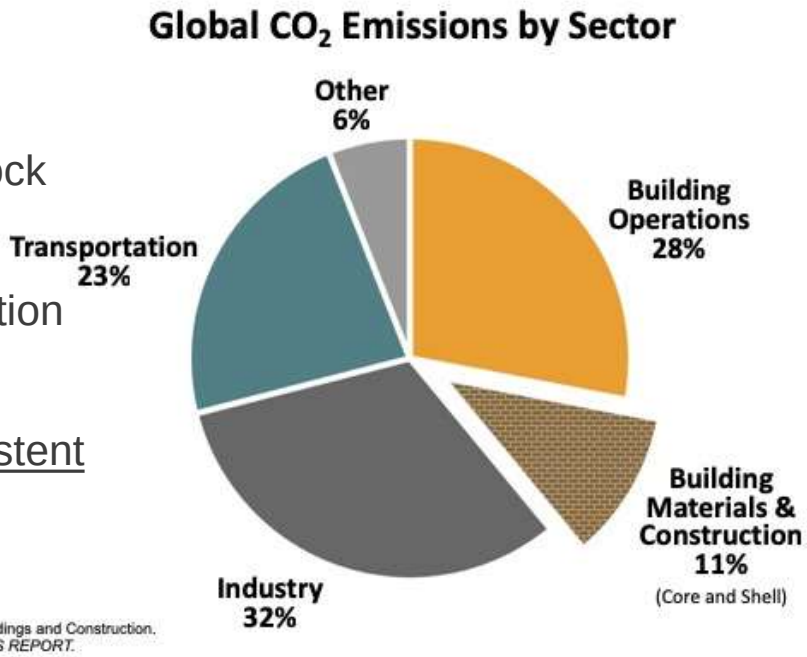
Image courtesy of Gensler.

Is there genuine value in keeping and preparing 3D records?

Many reasons to preserve models of our heritage

e.g. Meet obligations to Reduce Global Greenhouse Emissions

- Approximately two-thirds of the building area that exists today will still exist in 2050.
- 40% of Global Greenhouse emissions are from buildings.
- Renovations affect only ½-1% of the building stock annually.
- This needs to increase to meet emissions reduction targets set by the Paris Agreement.
- Records of most buildings are limited or non-existent

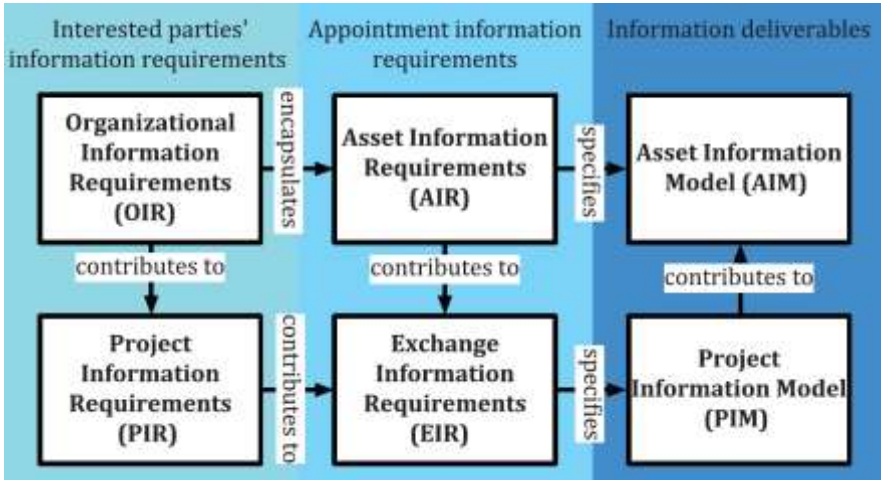


Demand for retaining 3D/BIM records is increasing

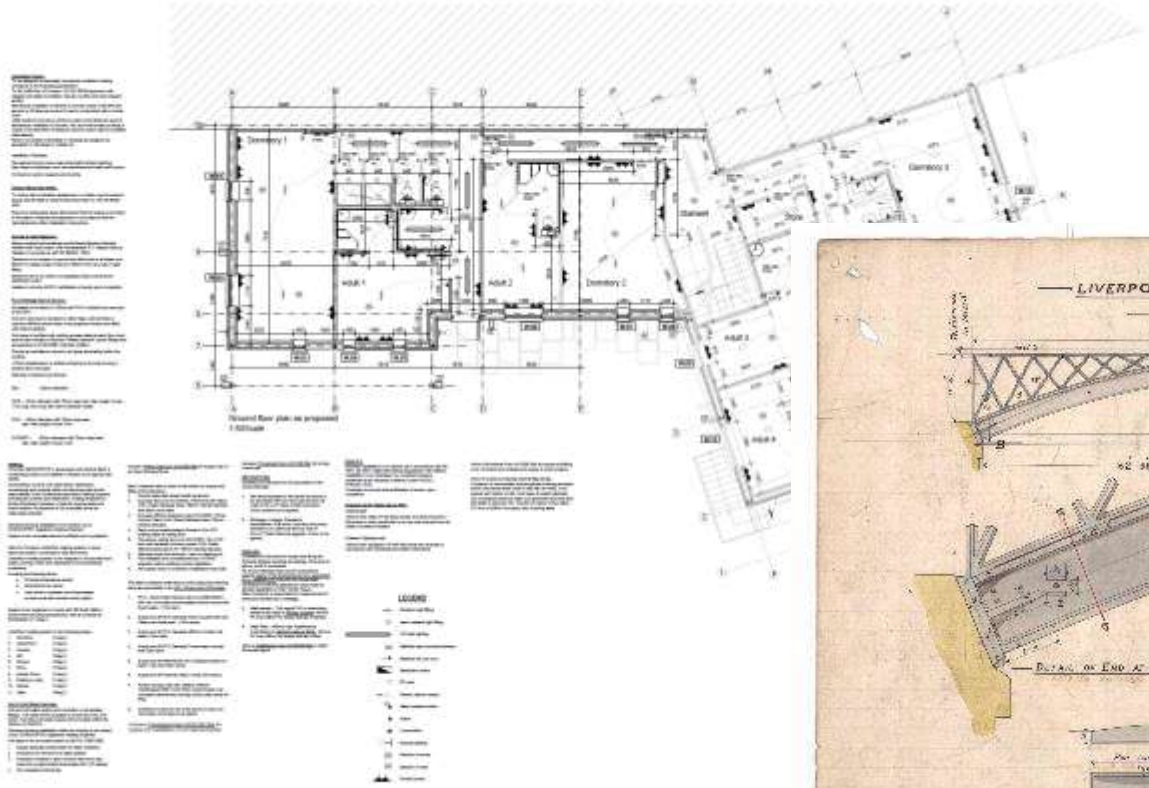
BIM – Building Information Modelling

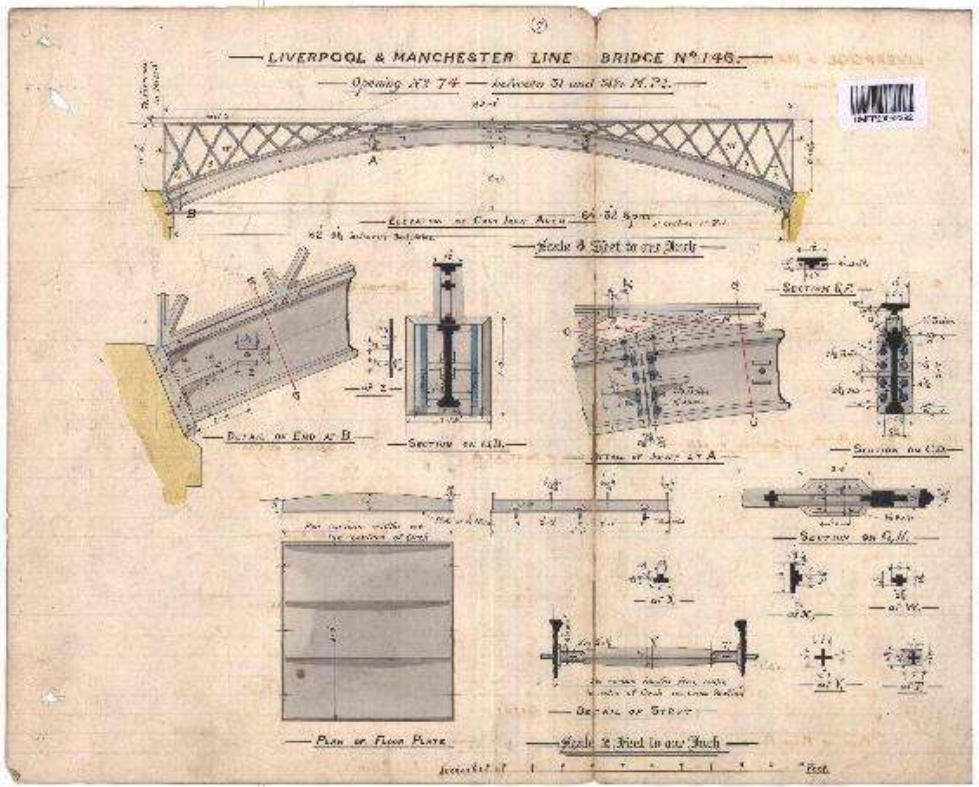
- Hackett Report – Building a Safer Future
  - Transparency of information and audit trail …through the life cycle of a building from planning to occupation and maintenance
  - …creation of a digital record ...from initial design through to construction and changes that occur throughout occupation

- ISO 19650 Family of standards
  - Focus on importance of clear Information Requirements for Lifecycle of built assets
  - Defines Information Management processes for using BIM in projects



What is possible to prepare, share and store today?




LIVERPOOL & MANCHESTER LINE BRIDGE N°146
Opening N°74 — between 31 and 32 M.P.
Scale 8 Feet to one Inch
Section KZ
Section on G.H.
Plan of Floor Plate
Scale 2 Feet to one Inch

DOCUMENTATION

OPTIMIZATION

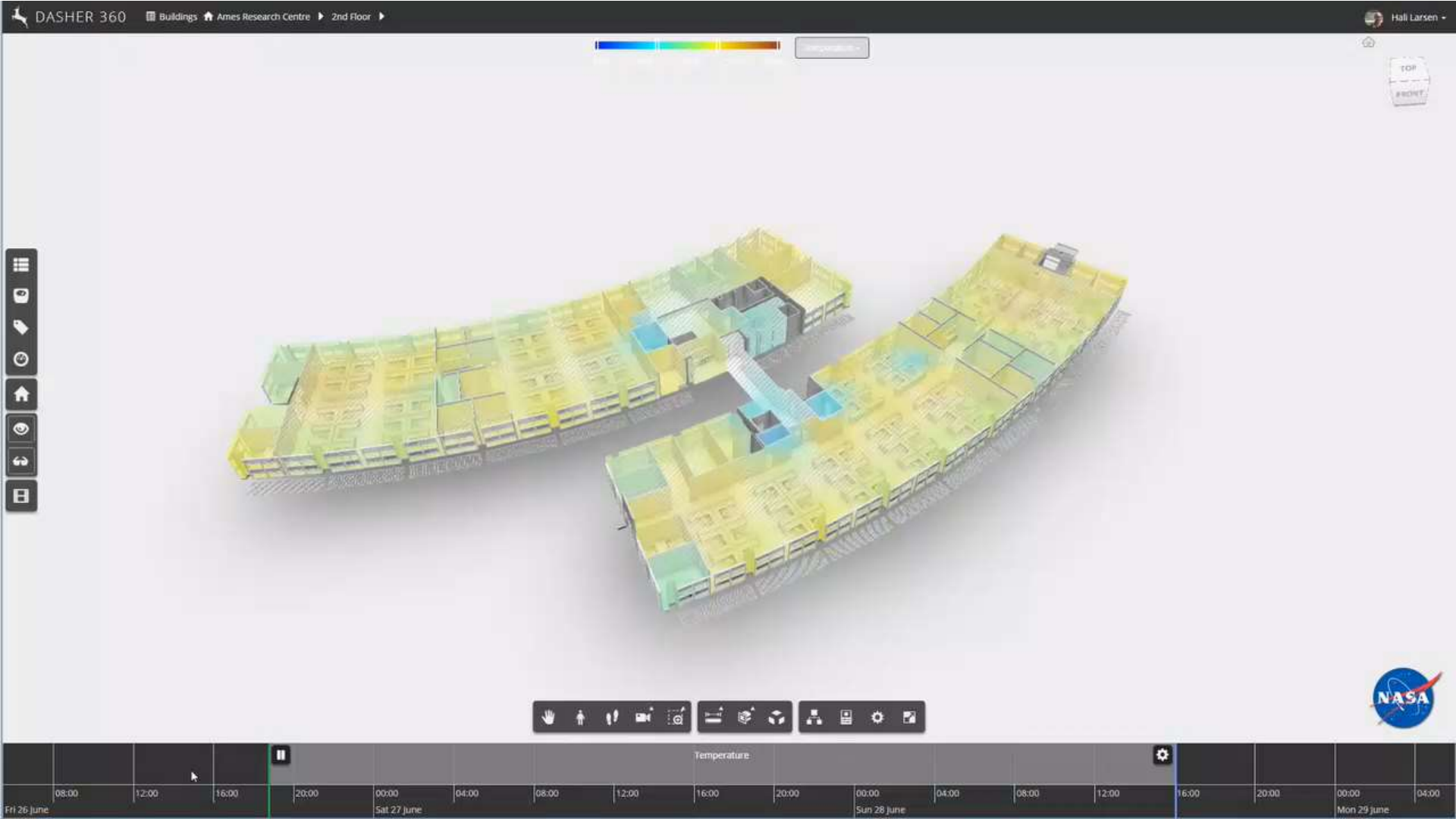

London Blackfriars station (courtesy of Network Rail and Jacobs)


"I Make Rotterdam" project in the Netherlands is a prime example of a crowd funded project. Image courtesy of Zones Urbaines Sensibles

CONNECTION


AUTODESK MAYA 2020
AUTODESK 3DS MAX 2020
AUTODESK AUTOCAD 2020
AUTODESK REVIT 2020
AUTODESK FUSION 360
AUTODESK INVENTOR 2020
AUTODESK BIM 360
AUTODESK ALIAS SURFACE 2020
AUTODESK POWERMILL 2020
AUTODESK FLAME 2020
AUTODESK AUTOCAD LT 2020


CENTER FOR THE ARTS


DASHER 360
Buildings
Ames Research Centre
2nd Floor
Hali Larsen
TOP
FRONT
Temperature
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
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04:00
Fri 26 June
Sat 27 June
Sun 28 June
Mon 29 June

Capture reality and create new 3D models


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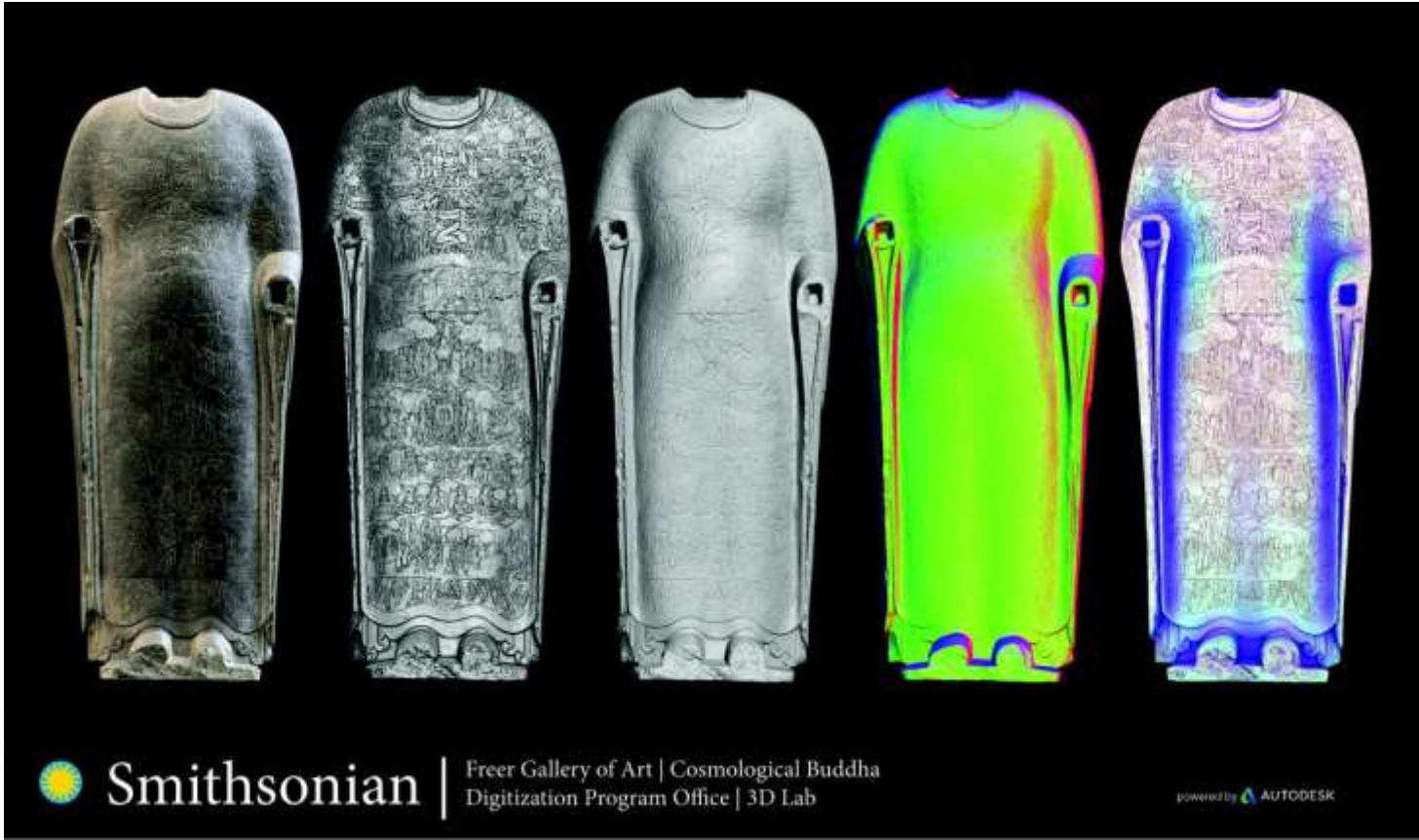
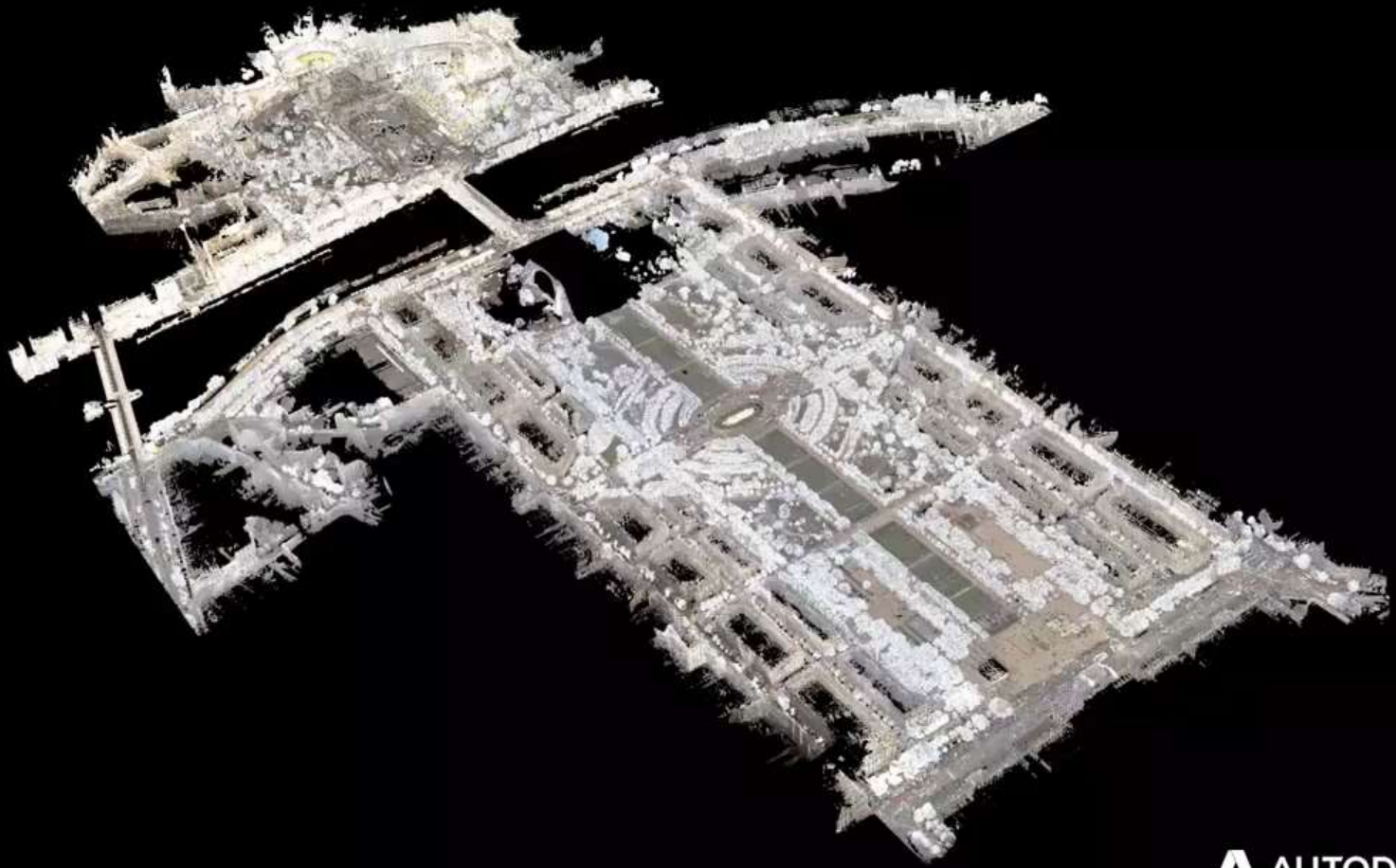
Smithsonian Institute – *3D project*

https://3d.si.edu/



Smithsonian Institute – *3D project*

Apollo 11 Command Module Columbia 1969 https://3d.si.edu/



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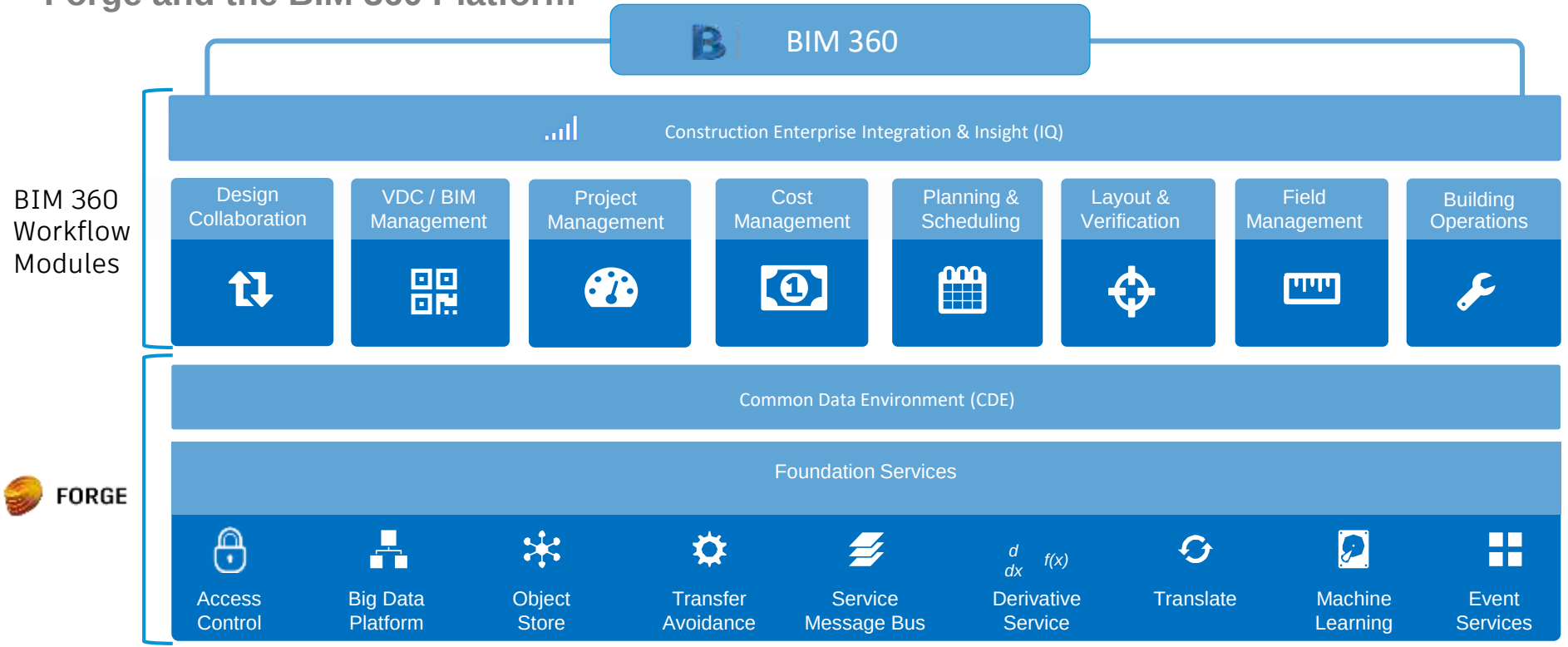
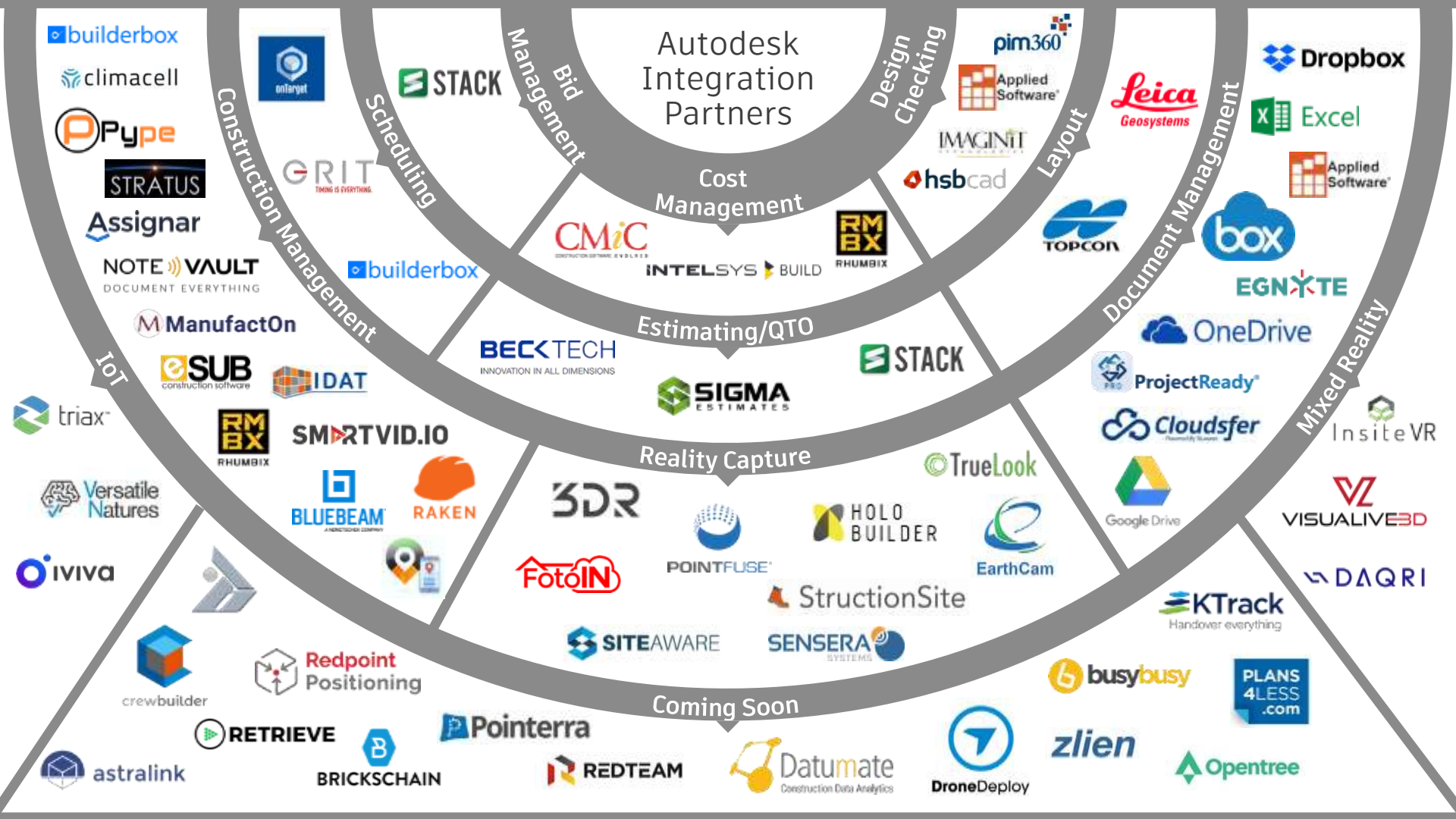
Autodesk supports preparing, sharing and storage of more than just CAD and models

Managing the Project and the Information

Forge and the BIM 360 Platform




Autodesk Integration Partners
Bid Management
Design Checking
Scheduling
Layout
Cost Management
Construction Management
Document Management
Estimating/QTO
IoT
Mixed Reality
Reality Capture
Coming Soon
builderbox
climacell
onTarget
STACK
pim360
Applied Software
Dropbox
Excel
Leica Geosystems
PPype
GRIT
IMAGINiT
hsbcad
STRATUS
Assignar
CMiC
INTELSYS BUILD
RHUMBIX
TOPCON
box
EGNYTE
NOTE VAULT
DOCUMENT EVERYTHING
builderbox
ManufactOn
BECKTECH
INNOVATION IN ALL DIMENSIONS
STACK
OneDrive
eSUB
construction software
IDAT
SIGMA ESTIMATES
ProjectReady
triax
RHUMBIX
SMARTVID.IO
Cloudsfer
InsiteVR
TrueLook
Versatile Natures
BLUEBEAM
RAKEN
3DR
HOLO BUILDER
Google Drive
VISUALIVE3D
iviva
FotoIN
POINTFUSE
EarthCam
DAQRI
StructionSite
KTrack
Handover everything
SITEAWARE
SENSERA SYSTEMS
crewbuilder
Redpoint Positioning
busybusy
PLANS 4LESS .com
RETRIEVE
Pointerra
astralink
BRICKSCHAIN
REDTEAM
Datumate
Construction Data Analytics
DroneDeploy
zlien
Opentree

Data Interoperability

Workflow - Change Management

assemble
AN AUTODESK COMPANY

Name	Model Name	A	B	Variance	Unit
Air Terminals	ARCHITECTU...	1	0	1.00	EA
Air Terminals : Return Grille - Rectangular - Hosted : Stan...	ARCHITECTU...	1	0	1.00	EA
Ceilings	ARCHITECTU...	570.24	617.50	(47.25)	SF
Ceilings : Compound Ceiling : Acoustic Panel System 24 ...	ARCHITECTU...	168.00	227.25	(59.25)	SF
Ceilings : Compound Ceiling : Acoustic Panel System 24 ...	ARCHITECTU...	252.00		252.00	SF
Ceilings : Compound Ceiling : Generic 4"	ARCHITECTU...		252.00	(252.00)	SF
Ceilings : Compound Ceiling : Perforated Panel System (...	ARCHITECTU...	150.24	138.24	12.00	SF
Communication Devices	ARCHITECTU...	12	0	12.00	EA
Communication Devices : Display-LCD-Panasonic-Stand...	ARCHITECTU...	10	0	10.00	EA
Communication Devices : Display-LCD-Panasonic-Stand...	ARCHITECTU...	2	0	2.00	EA
Doors	ARCHITECTU...	2	2	0.00	EA
Doors : Door_Single_Parametric Transom : B1_3'-4"x9'-6...	ARCHITECTU...	0	2	(2.00)	EA
Doors : Door_Single_Parametric Transom_Sidelite : D_5'-...	ARCHITECTU...	2	0	2.00	EA
Floors	ARCHITECTU...	239.63	454.51	(214.88)	SF
Floors : Floor : Concrete Pavers	ARCHITECTU...		454.51	(454.51)	SF
Floors : Floor : FIN_CARPET_CP2	ARCHITECTU...	239.63		239.63	SF

Interoperability Fundamentals
File exchange between products

Backwards Compatibility

Is this an issue?

Like other software vendors we encourage users to **upgrade to the latest versions** for new **features, security and** general software **support**

AutoCAD **can save back** down to DXF12; AutoCAD does convert objects to make them readable in such old releases of AutoCAD so there will be some losses.

Models in **newer Revit versions** can be **used in an older release** by **saving to IFC/DWG**

If the need is **only to view a model**, best answer is to **upload to a Cloud Viewer**

Forward Compatibility

Is this the real question?

DWG files can be opened using **any AutoCAD of the same version** number **or later**.

Revit **automatically upgrades older version data to the current version** when opening.

Autodesk's Free online viewer can **View 2D and 3D** designs in **50+ file formats**.

Autodesk A360 mobile app can also **view 50+ formats**.

Viewing **Old 3D files is NOT a problem** for **industry standard software**

Autodesk and Interoperability

www.autodesk.com/interoperability

1988 Autodesk introduces **DXF** as an open CAD exchange format

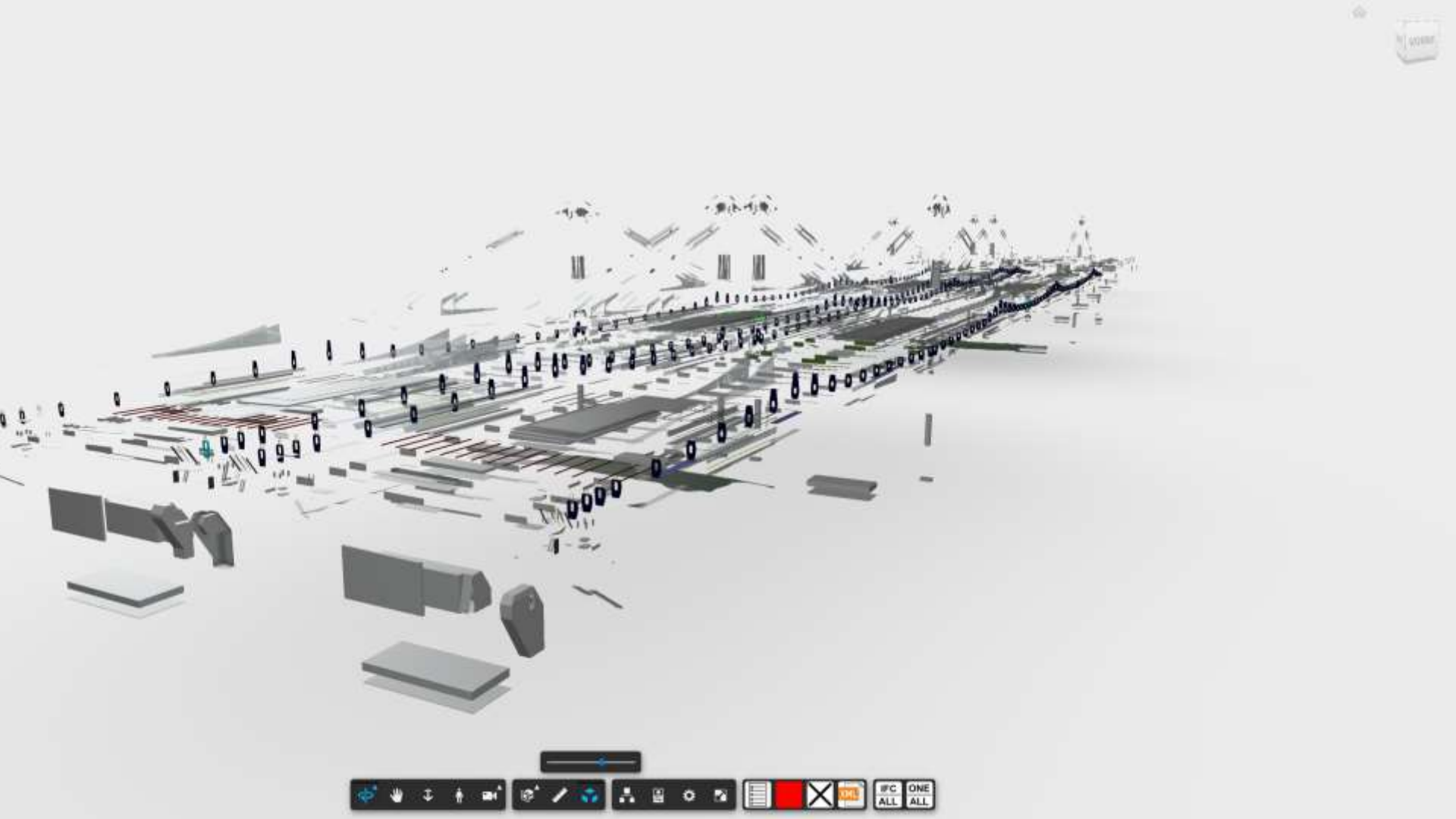
1996 **Founding member** of International Alliance for Interoperability (which became **buildingSMART**)

2011 Autodesk is first software vendor to offer an **open source IFC** import/export tool (Revit)

2013 Revit 2014 amongst first BIM software tools to support **IFC4**

2016 IFC-Support for **Inventor** using the Revit IFC engine

IFC Bridge in Forge PoC – Technical University of Munich


IFC
ALL
ONE
ALL

We support Standards wherever we can

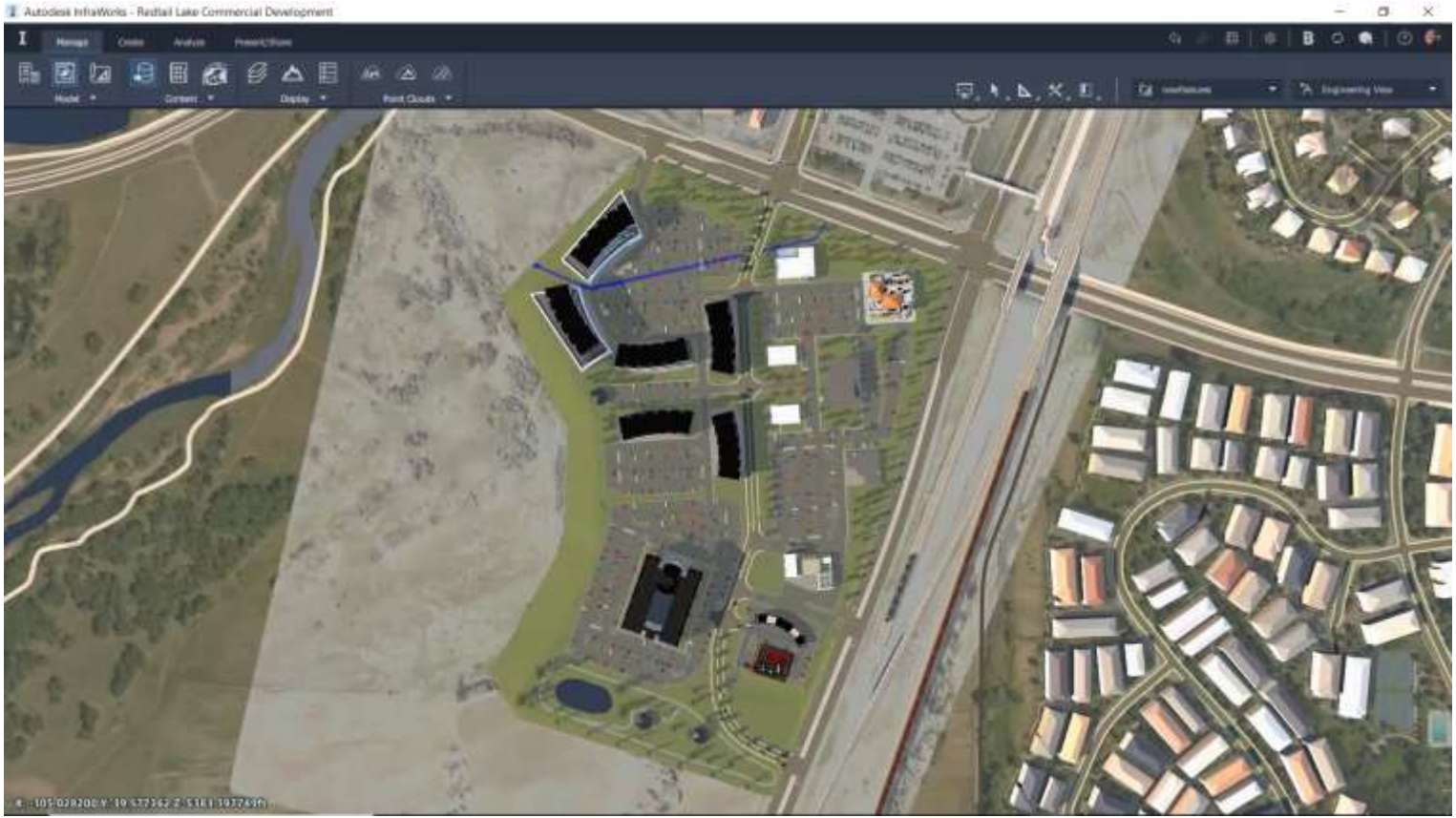
example selected Autodesk Built Environment Products

Export	↗
Export & Import	↕
Import	↘
Partial (2 or more steps)	≈

Exchange Standard	AutoCAD	Plant 3D	AutoCAD P&ID	Revit	Robot	Civil 3D	InfraWorks	Map 3D	Inventor	Navisworks	3ds Max Design	ReCap Pro	BIM 360 Docs
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	↕	↕	↕	↕	↕	↕	↘	↕	↕	↘	↕		↘

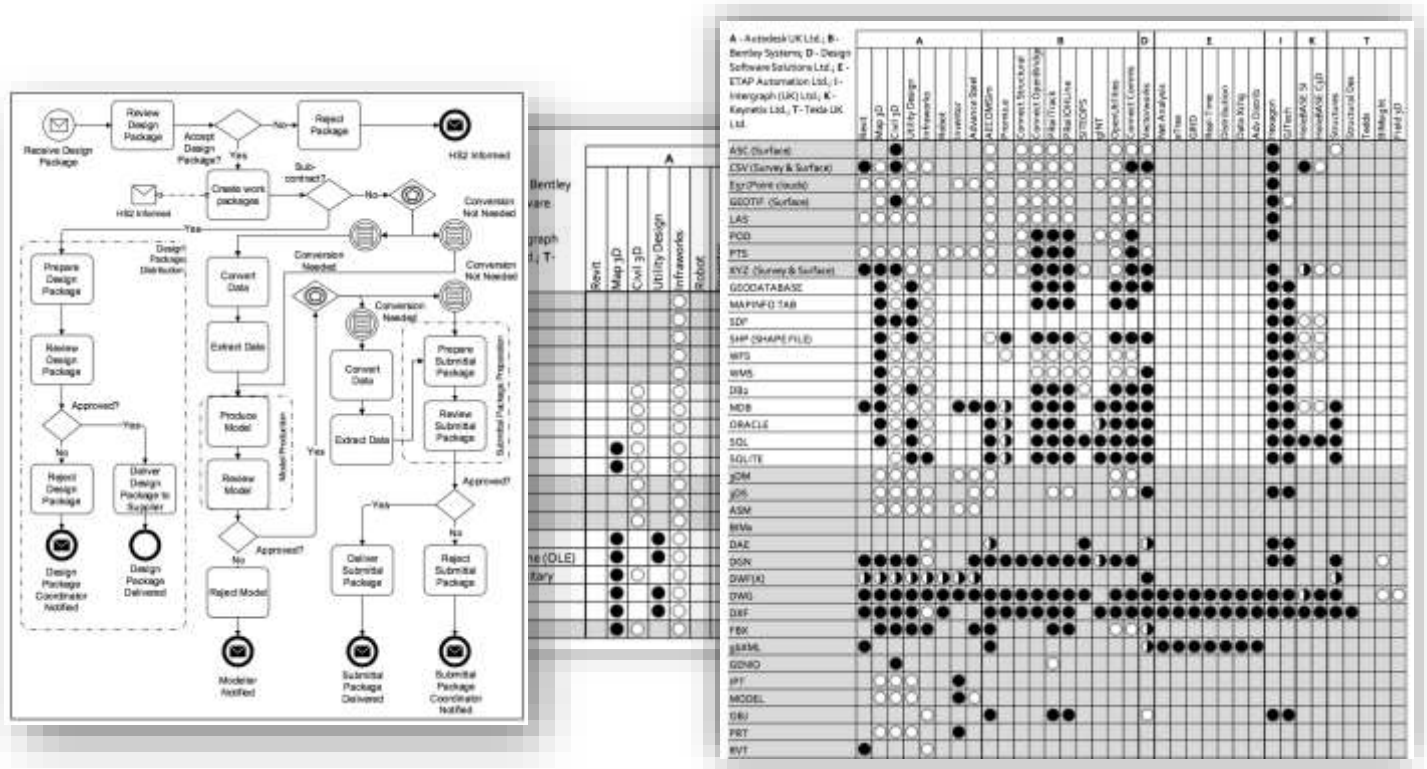
Direct integration with 3rd parties

Autodesk – ESRI partnership



HS2 – Imperative to be Neutral and Future Proofed

Autodesk Consulting Multi-Vendor Data Study



HS2 – Multiple Data Exchange Formats by Activity

BIM Compatible formats useful today and in future, supported by many vendors

Information Item Type	Exchange Format
CAD Technical Products	DGN, v8 DWG, RVT
CAD Technical Product Outputs	PDF
Graphical Information Models	IFC, iDGN, NWF, NWD, 3D PDF
Asset Data / Asset Information Files	JSON, XML, IFCXML, COBie
GIS Data	SHP, ArcGIS (GDB)
Raster Data	TIFF
Survey Data (Geological)	AGS, gINT, DGN, DWG
Survey Data (Point Cloud)	POD, E57
Verification and validation assurance evidence	Microsoft Office, PDF, HTML
Other Documents	Microsoft Office, PDF, HTML

Closing thoughts

Preserving 3D Models

Key considerations

- It is critical to first understand the Information Requirements
  - applying the ISO 19650 standard is a good consideration
- Understand the information you currently access and where 3D models and/or BIM is used
- Examine how you host data – are your systems capable of holding and viewing models?
- For new projects or renovations, ask for models in formats that can be of use today and tomorrow such as commonly used native formats and appropriate open formats
- Keep your viewing (and editing) software up to date