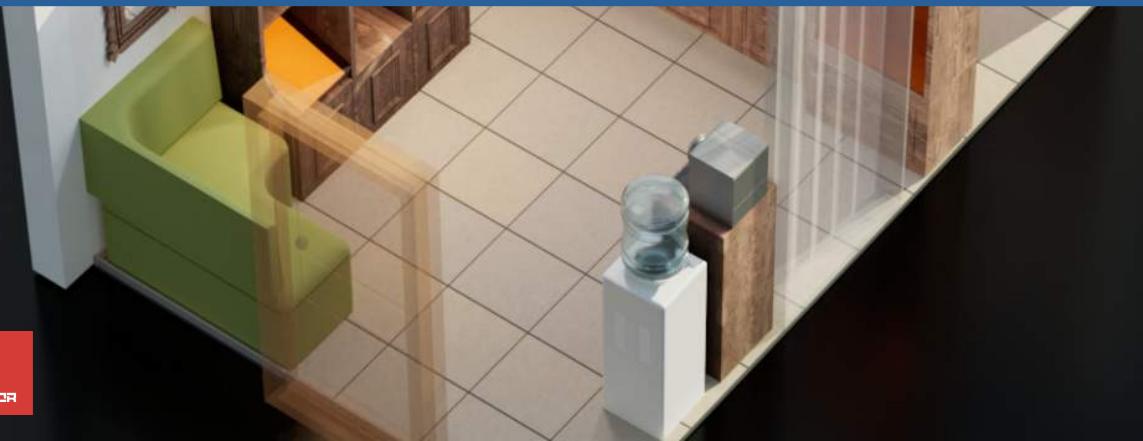


Data transfer between CAD and DCC Applications



Theme

In modern engineering processes we are use 2D drawing and 3D parametric modeling, based on 2D drawings and links between parts.

All geometry based on NURBS-surfaces with parametric links

Model parts contain attributes, parameters and over information

Attributes in one part, can be linked and affect over attributes in over parts.

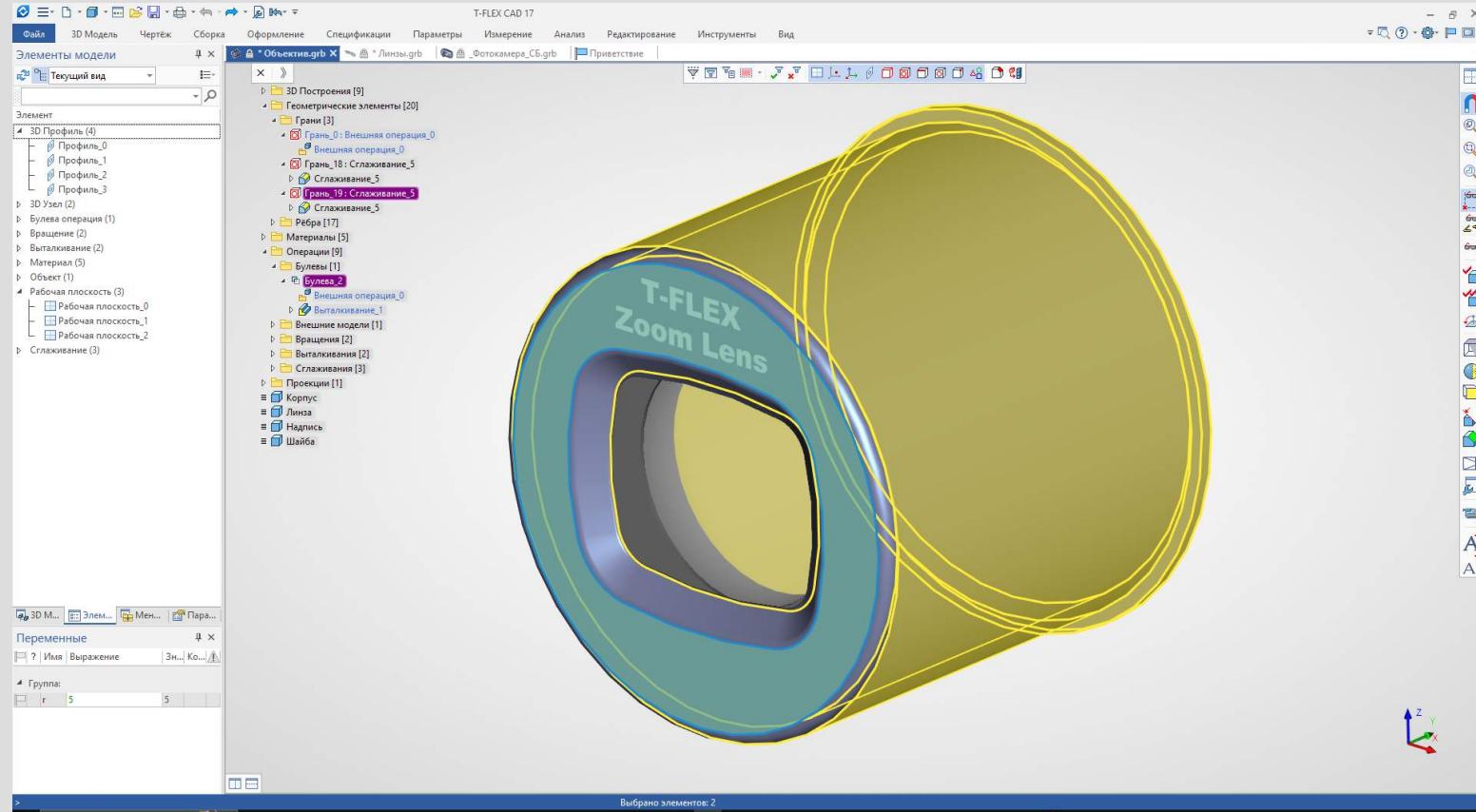
Key problem in Rendering workflow — correct transfer 3D model data and it's information (instances, lights, materials, textures etc.) between applications.



Modern CAD applications



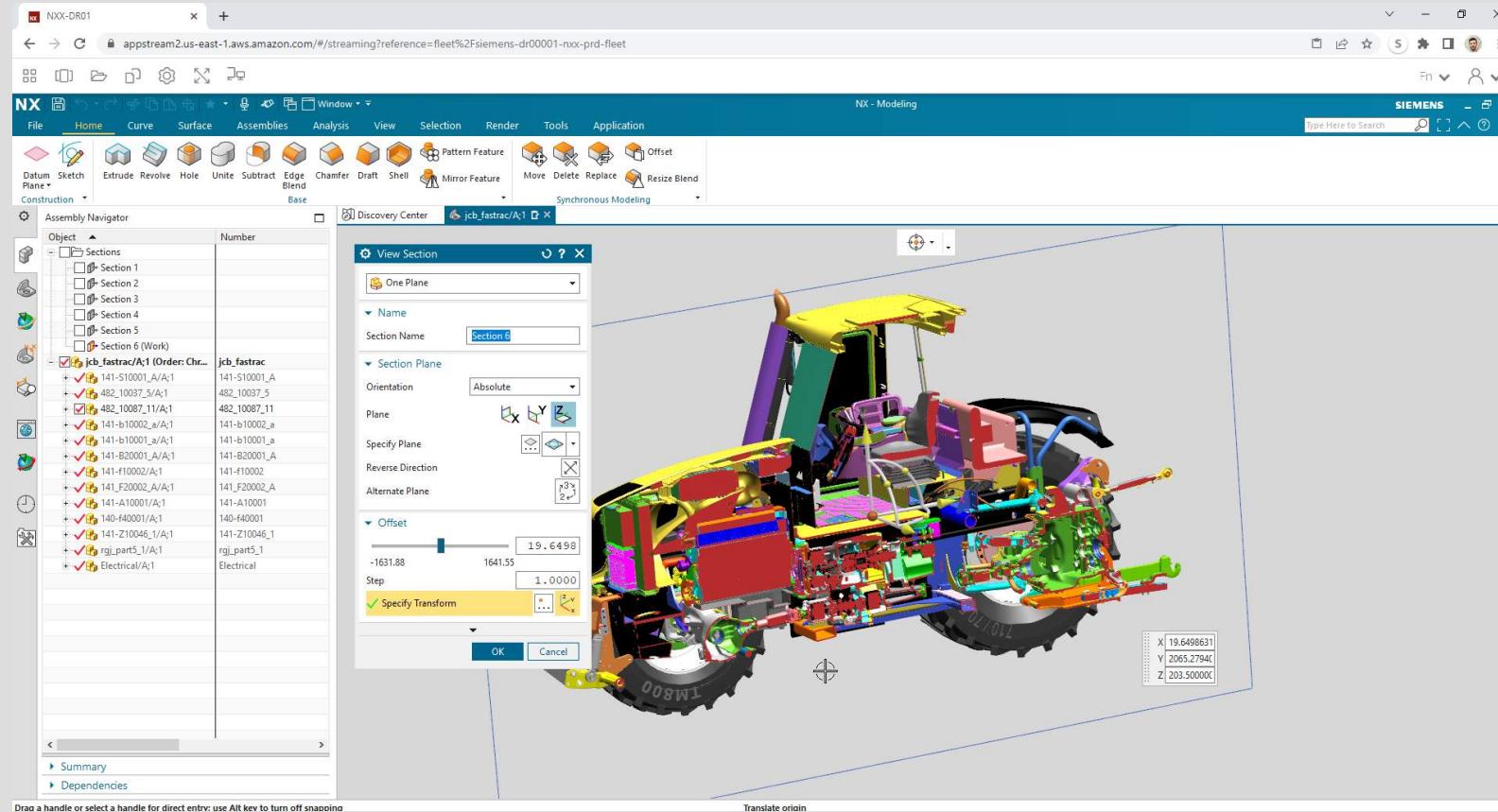
Modern CAD applications



T-FLEX CAD — Modern CAD for modeling, analysis, simulations and rendering products.



Modern CAD applications



Siemens NX (running in web view) — Legendary CAD for mechanical engineering.



Image courtesy of Siemens

Modern CAD applications

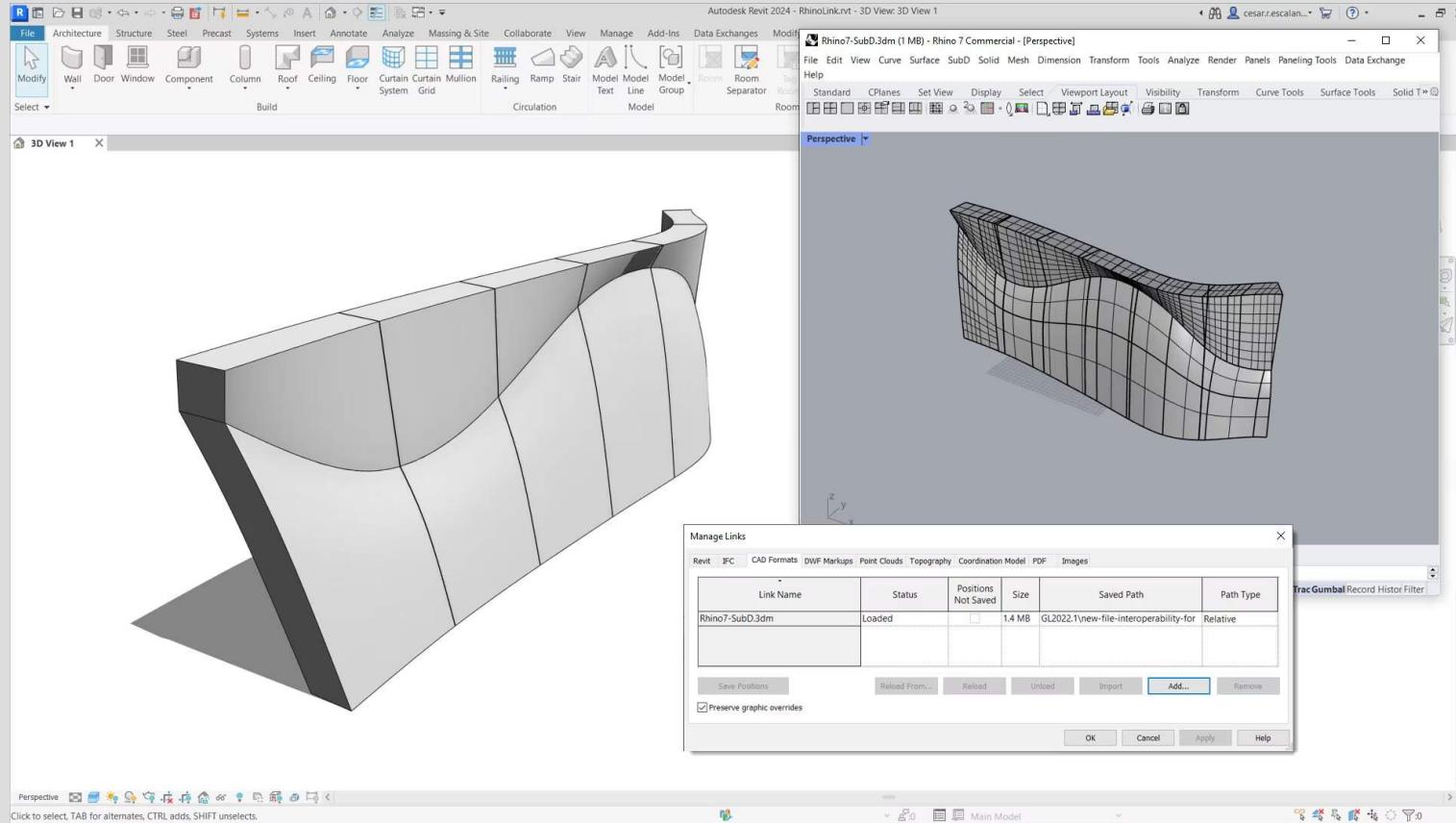


CATIA from Dassault Systèmes SE — CAD for large scale mechanical engineering and industrial design.



Image courtesy of Dassault Systèmes SE

Modern AEC CAD applications

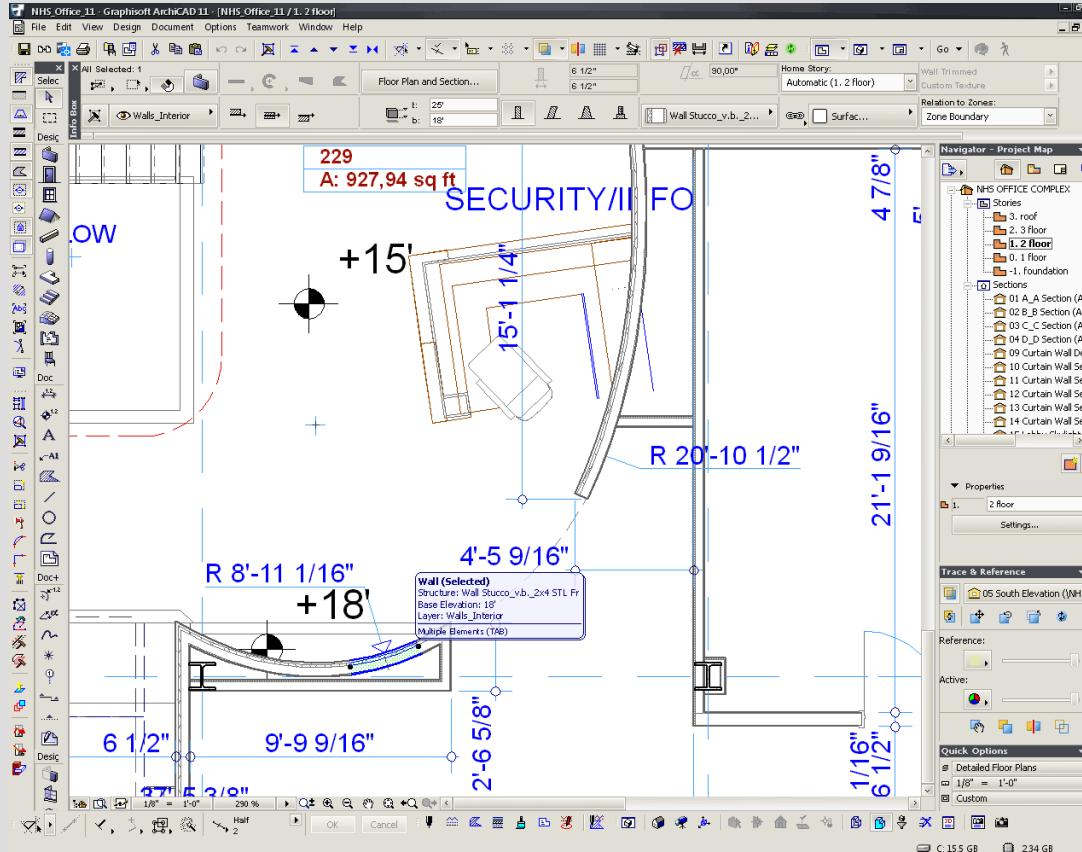


Autodesk Revit – modern 3D architectural modeling and engineering CAD.



Image courtesy of Autodesk Inc.

Modern AEC CAD applications



ArchiCAD – modern AEC CAD with powerful features in modeling, data exchange and planning.



Image from Wikipedia

Progressive technologies in modern modeling

Parametric and procedural modelling

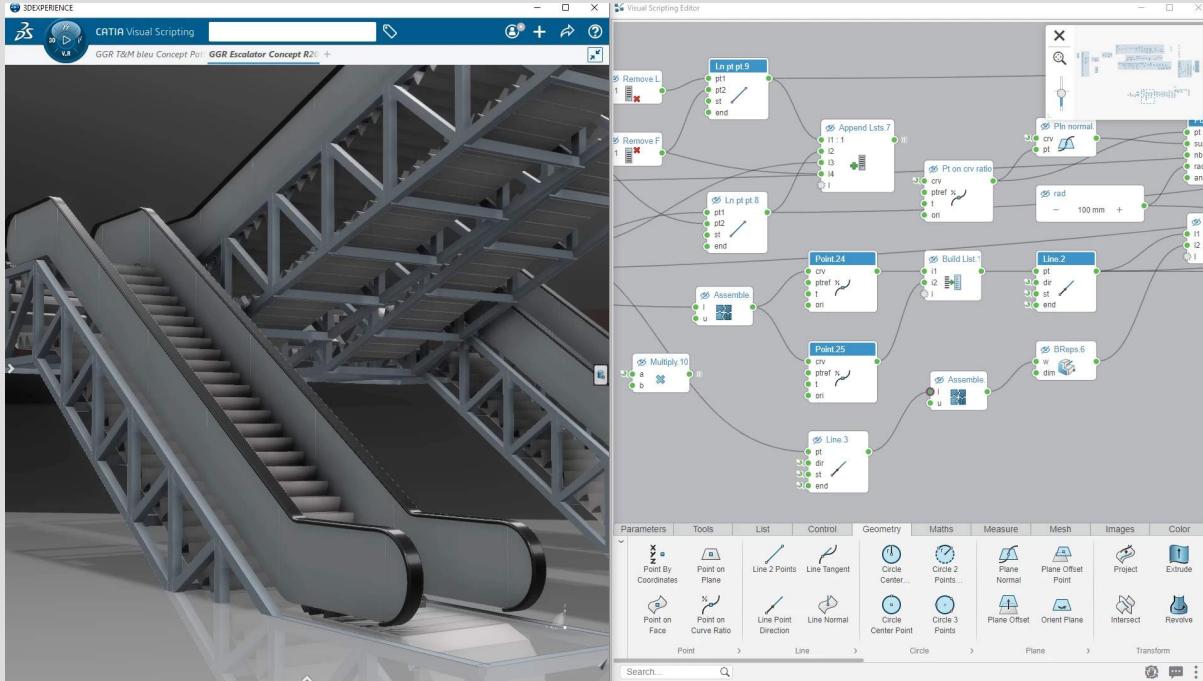


Image courtesy of Dassault Systèmes SE



Progressive technologies in modern modeling

Parametric and procedural modelling

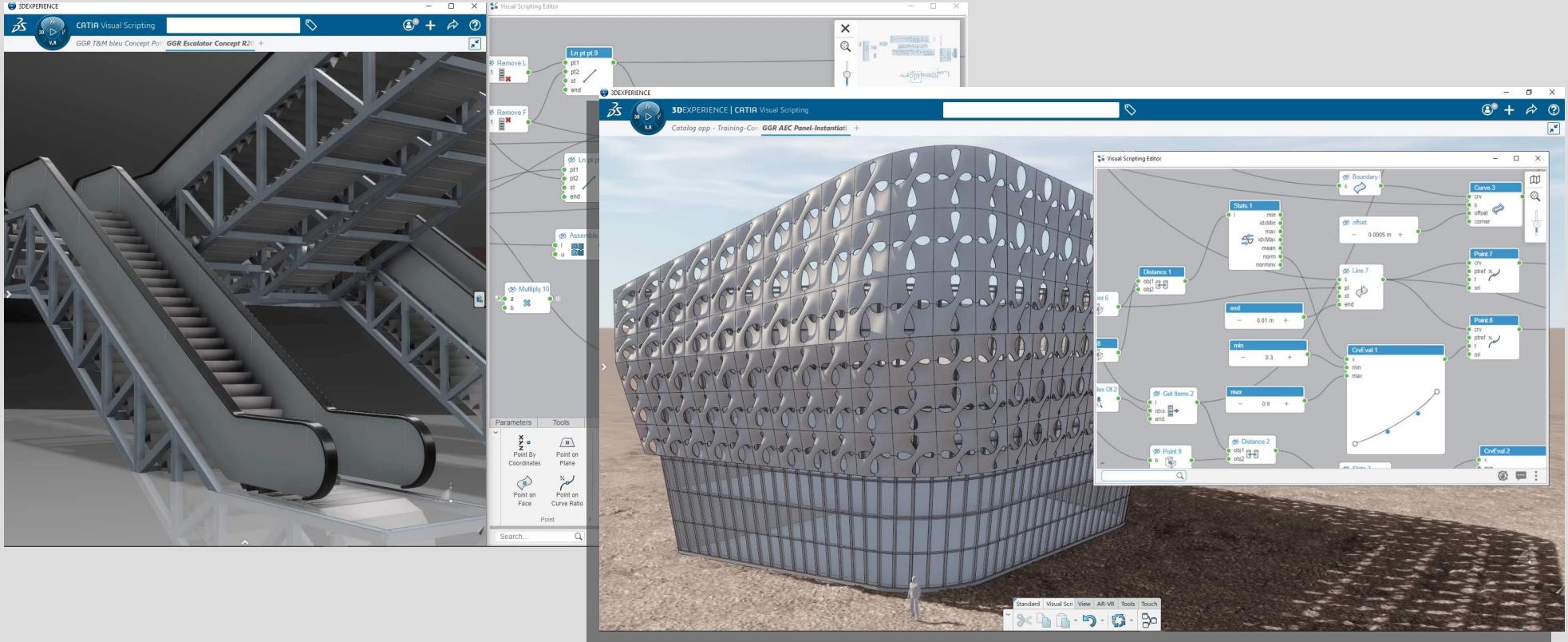


Image courtesy of Dassault Systèmes SE



Progressive technologies in modern modeling

Parametric and procedural modelling benefits

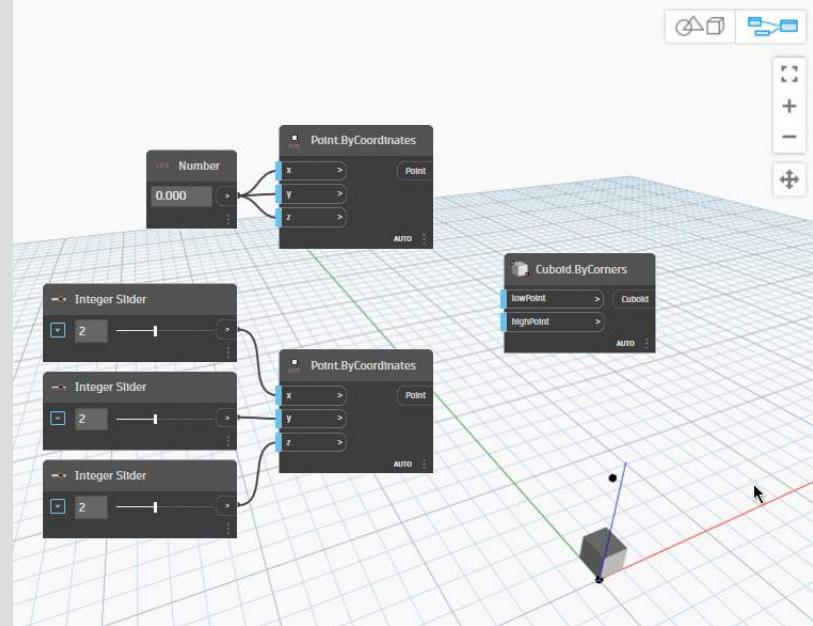
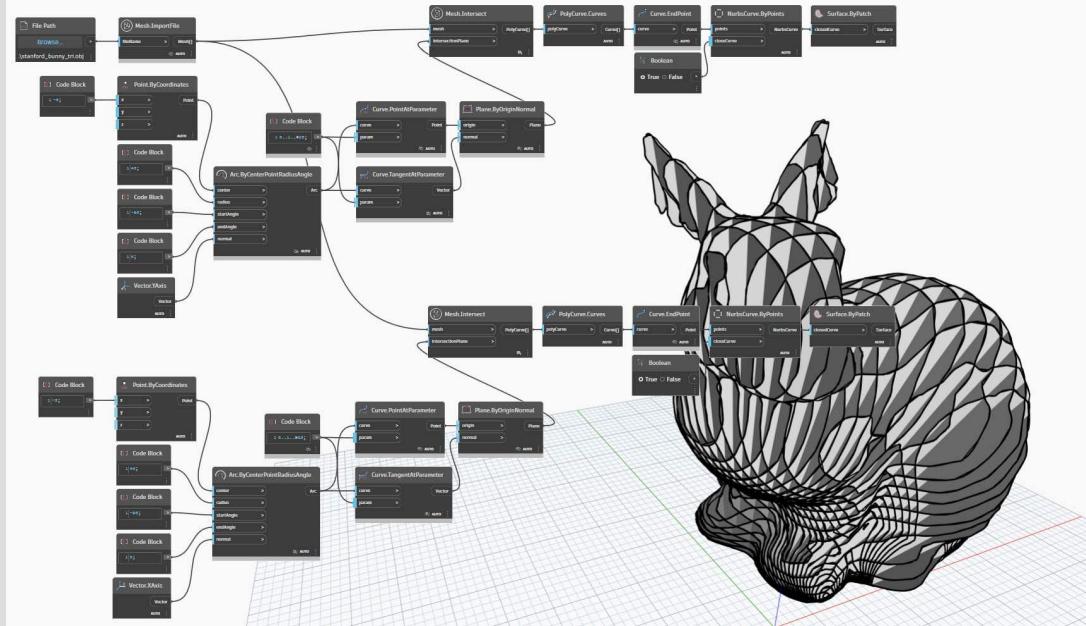


Image courtesy of Autodesk Inc.

Key problems in data transfer



Key problems in data transfer

If you work with one or two CAD applications, transferring data between them can be straightforward. Especially if you are working with products of the same line.

For example, Autodesk Revit.

Data between applications in a single format is easier to save and transmit than between different platforms with different data formats.

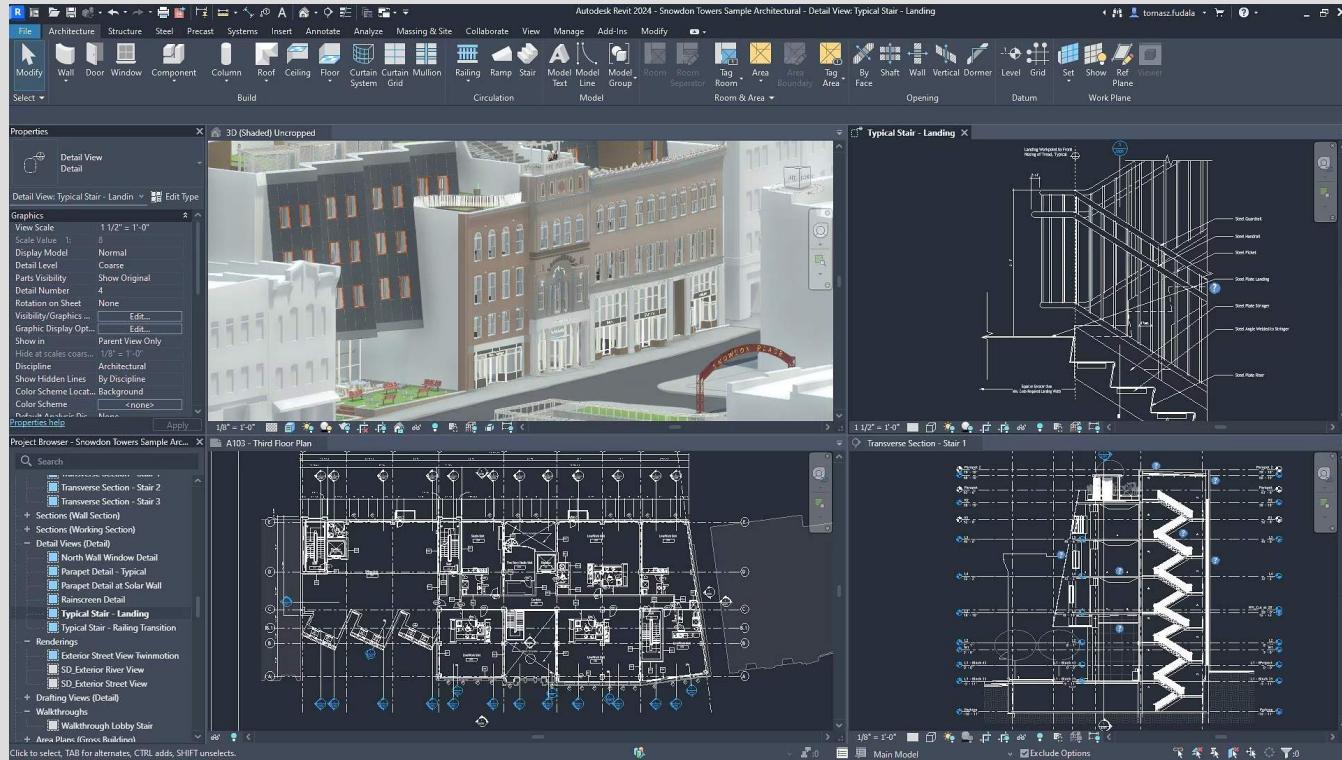


Image courtesy of Autodesk Inc.

Key problems in data transfer

An important condition is to prepare the data in one application and export the data to a format supported by the target application.

For example, Autodesk Revit and Bentley Microstation (*.dgn) or Autodesk AutoCAD (*.dwg).

The model can be exported in its entirety, but this can create many problems.

For example: hi-detailed geometry, non-correct styles, lost additional data, dependencies between elements and many more.

For correct export, I recommend preparing the model and data in accordance with the requirements of the target format and supported by the target application.

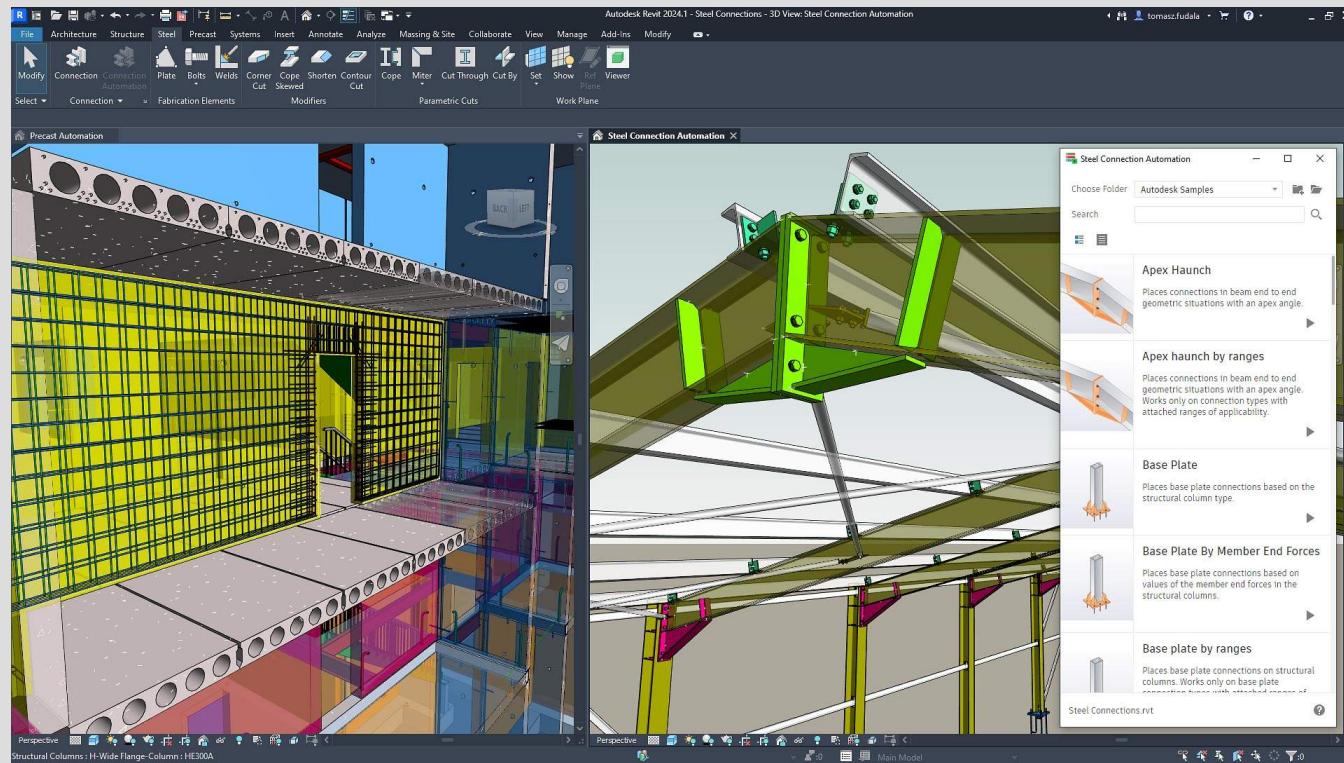


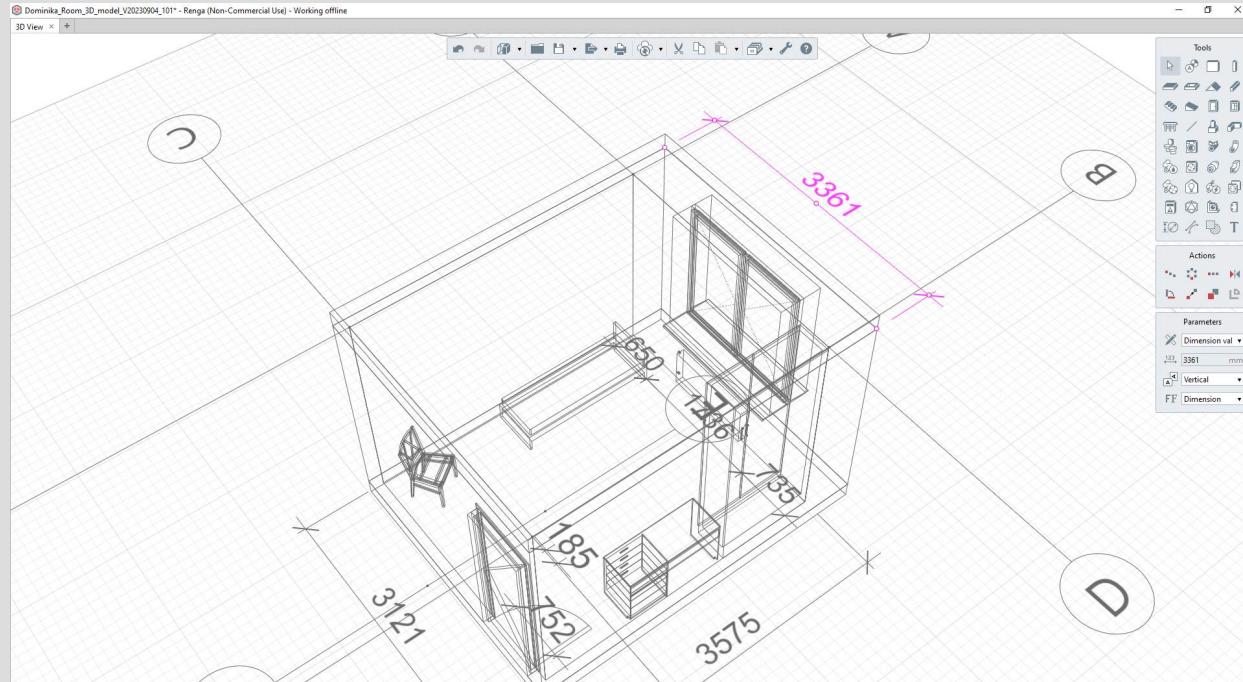
Image courtesy of Autodesk Inc.



Example workflow graph



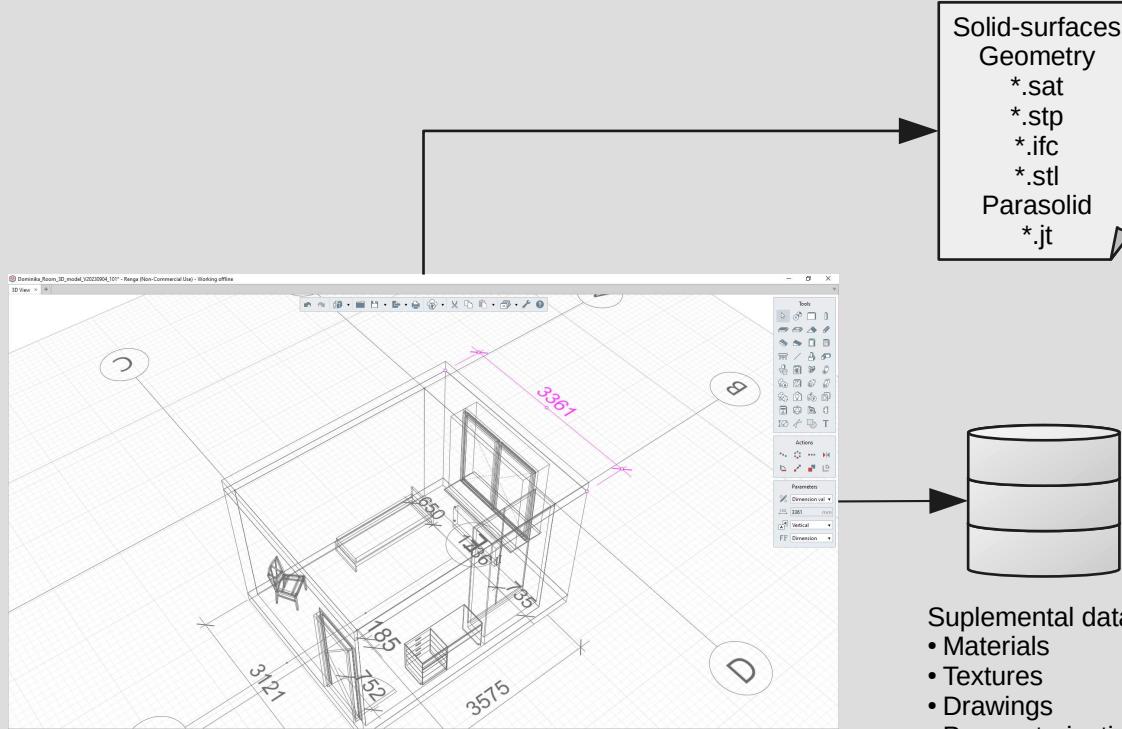
Example workflow graph | CAD to CAD



3D Model in AEC CAD
Renga BIM as example



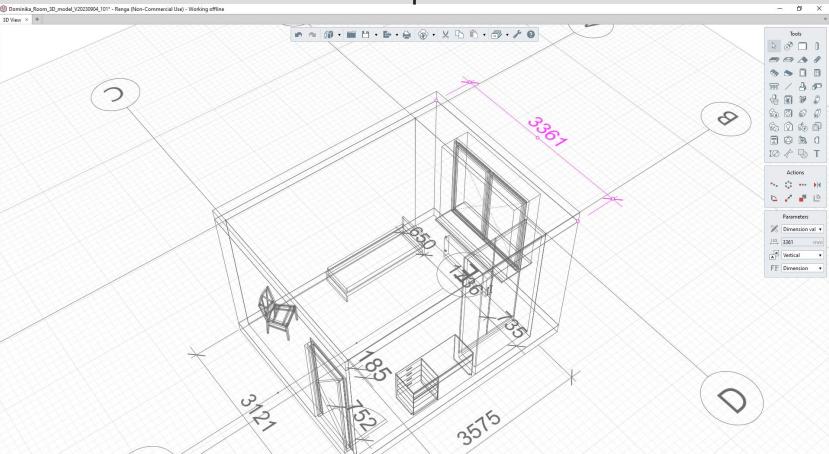
Example workflow graph | CAD to CAD



3D Model in AEC CAD
Renga BIM as example



Example workflow graph | CAD to CAD

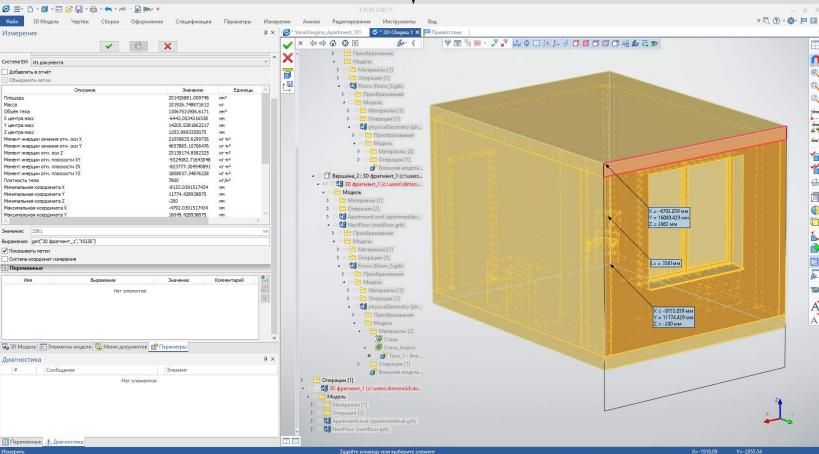


3D Model in AEC CAD
Renga BIM as example

Solid-surfaces Geometry
*.sat
*.stp
*.ifc
*.stl
Parasolid
*.jt



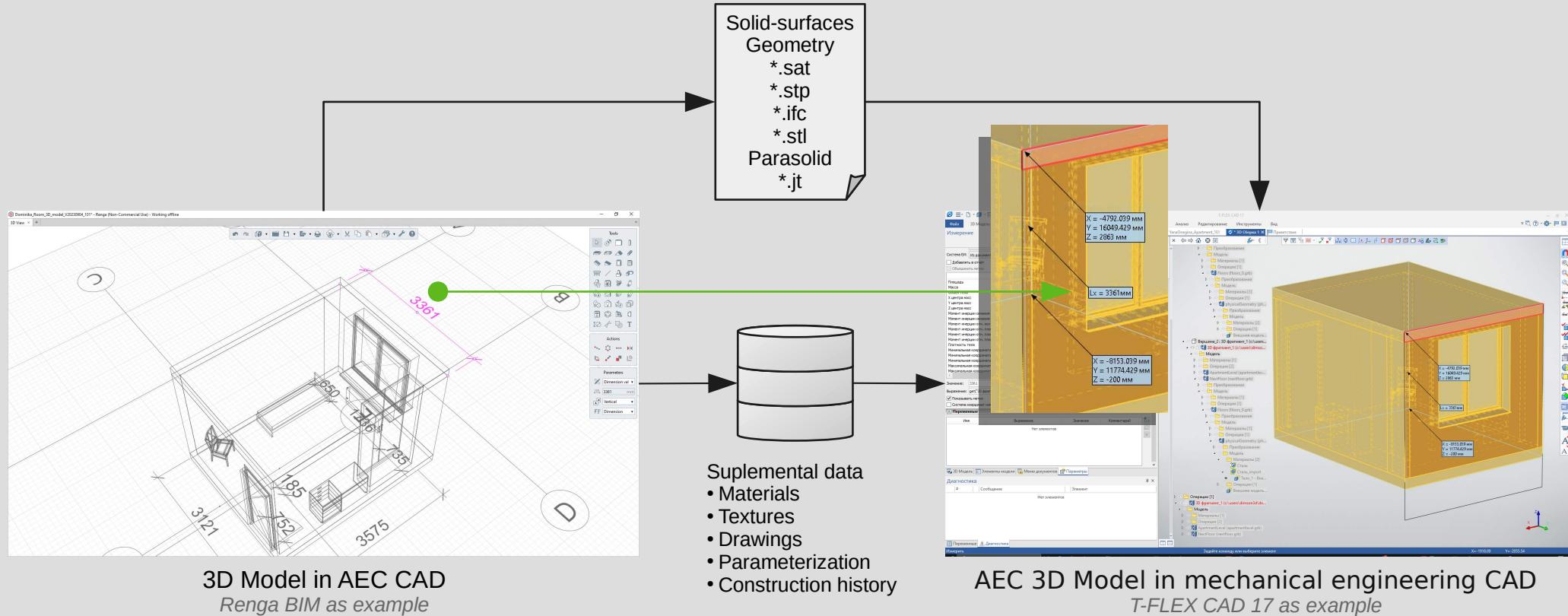
- Supplemental data
- Materials
 - Textures
 - Drawings
 - Parameterization
 - Construction history



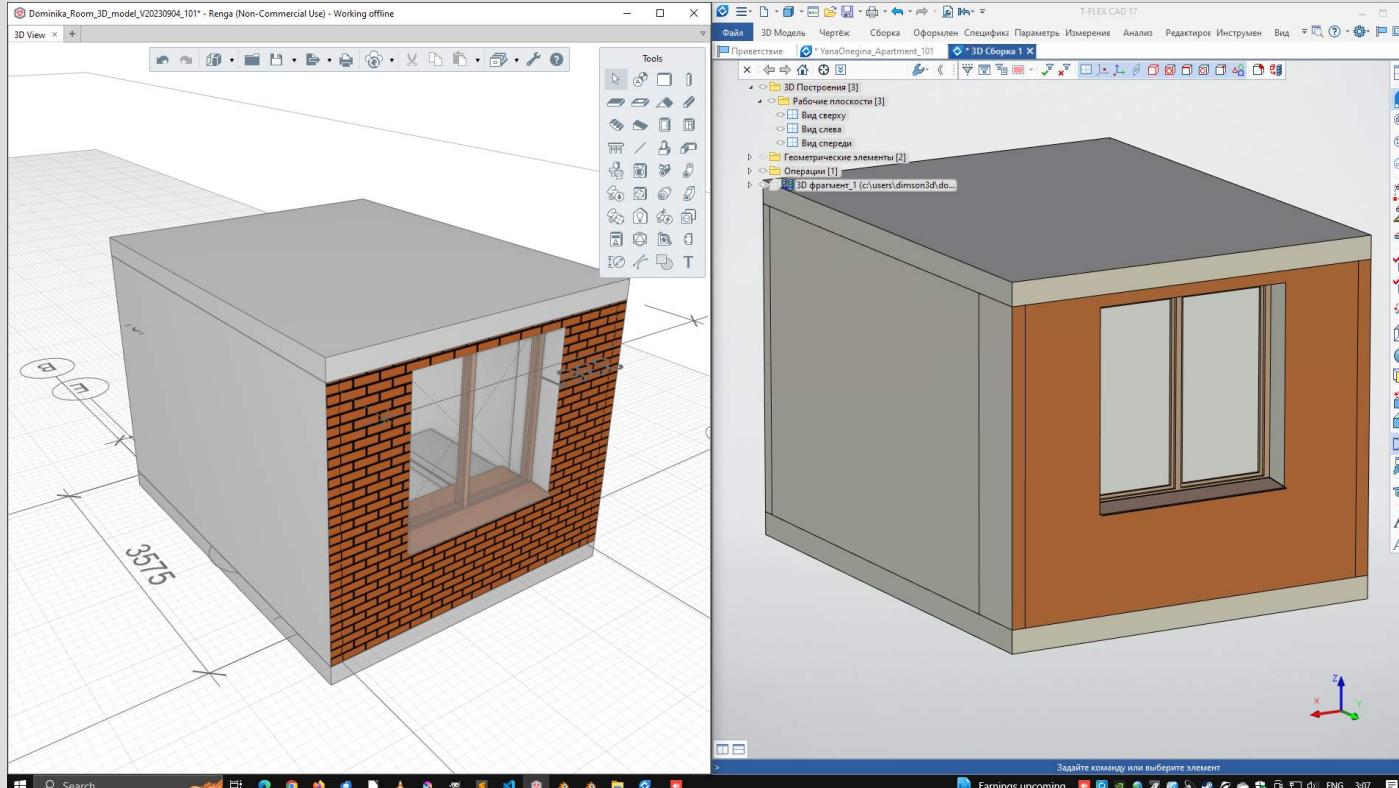
AEC 3D Model in mechanical engineering CAD
T-FLEX CAD 17 as example



Example workflow graph | CAD to CAD



Example workflow graph | CAD to CAD



3D Model in AEC CAD
Renga BIM as example

AEC 3D Model in mechanical engineering CAD
T-FLEX CAD 17 as example



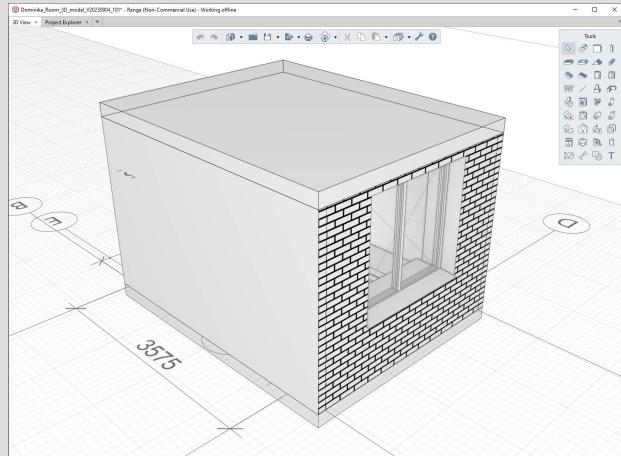
Workflow recommendations | CAD to CAD

Here are some recommendations for transferring data between CAD applications:

- To transfer geometry between CAD systems, use solid geometry formats used in the industry.
 - These formats are: *.stp, *.stl (polygonal), ACIS (*.sat), *.iges, Parasolid, Industry Foundation Classes (*.ifc).
- Check model for duplicates.
- Select the optimal level of detail (LOD's).
 - This is especially important when working with architectural models.
- Try to exclude geometry with high element density.
- If it is possible to export elements as curves, export them!
 - Modern rendering kernels allow you to render curves as polygonal objects.
- Materials can be exported either as part of the model or separately if the CAD system supports exporting materials to a material representation format.
- Other model data can be shared through a single database or collaboration system.
- Before transferring your model to another CAD system, be familiar with the specifics of exporting data to the selected data format.



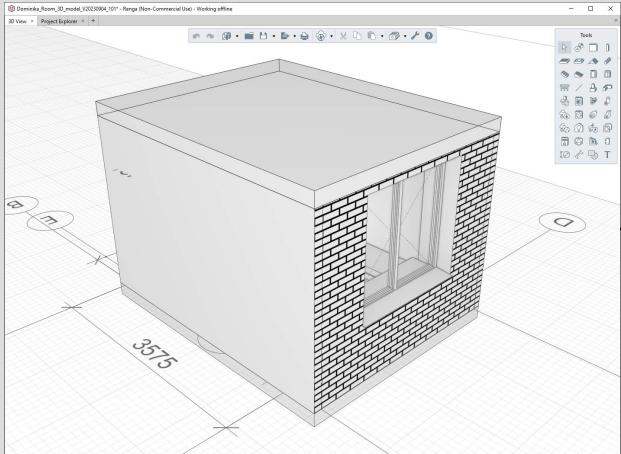
Example workflow graph | CAD to DCC



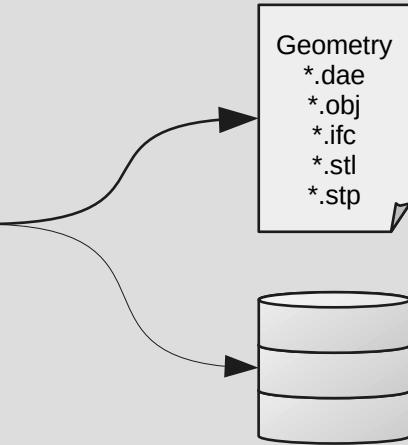
3D Model with data in CAD
Renga BIM as example



Example workflow graph | CAD to DCC



3D Model with data in CAD
Renga BIM as example

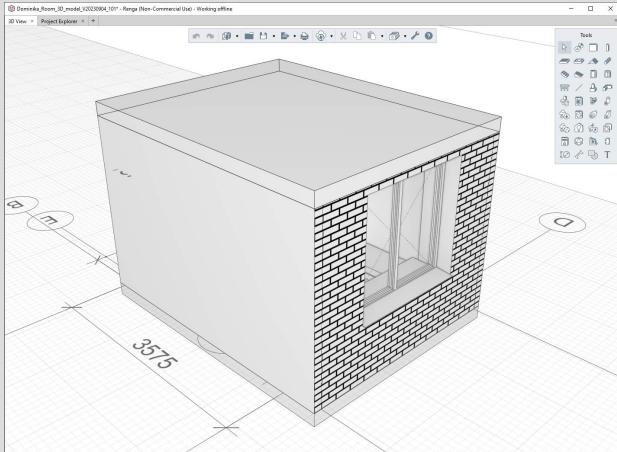


Supplemental data

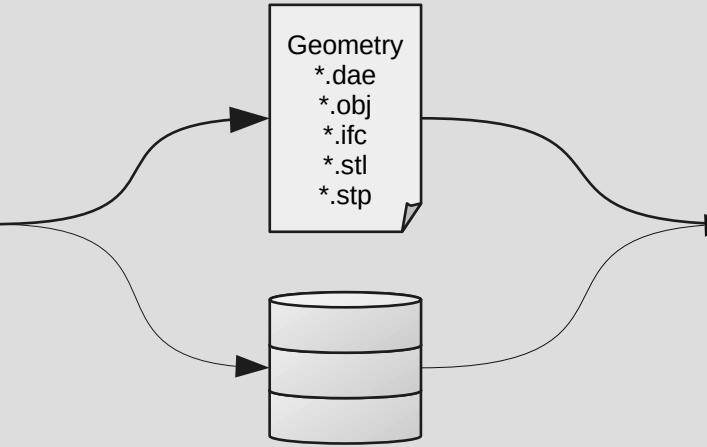
- Materials (*.mtl)
- Textures
- Lights (*.ies)
- Links
- Drawings (*.dxf)
- Parameterization



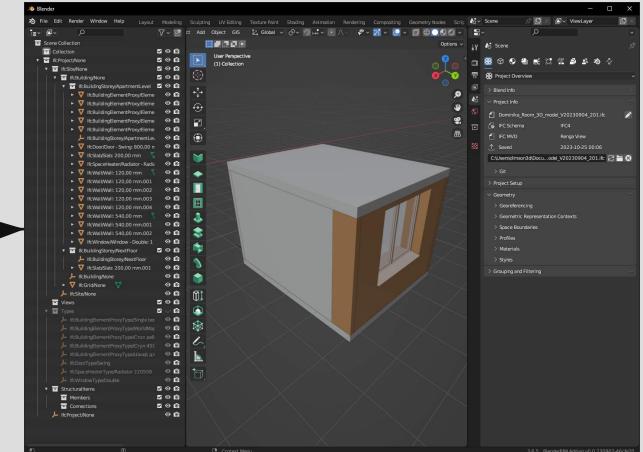
Example workflow graph | CAD to DCC



3D Model with data in CAD
Renga BIM as example



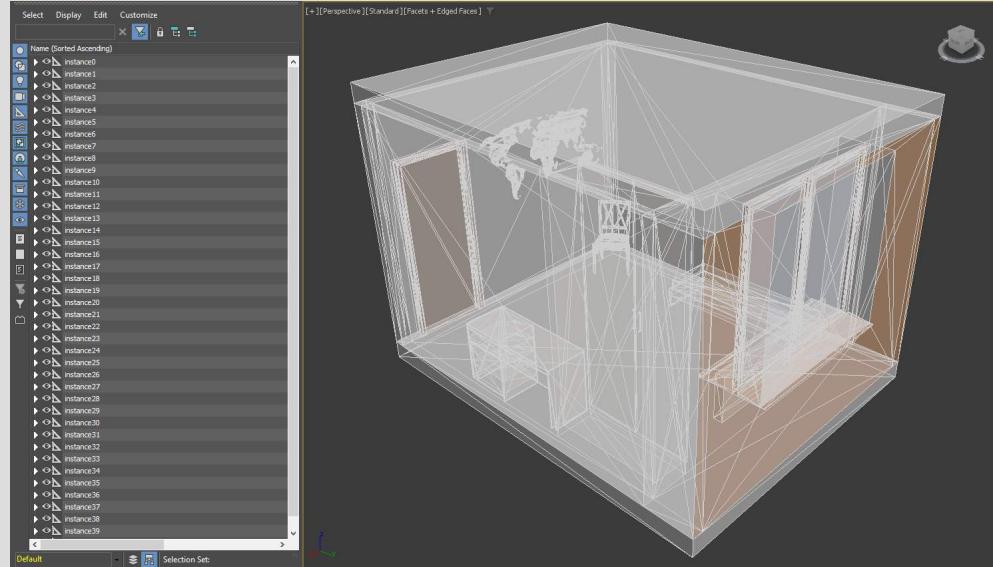
- Supplemental data
- Materials (*.mtl)
 - Textures
 - Lights (*.ies)
 - Links
 - Drawings (*.dxf)
 - Parameterization



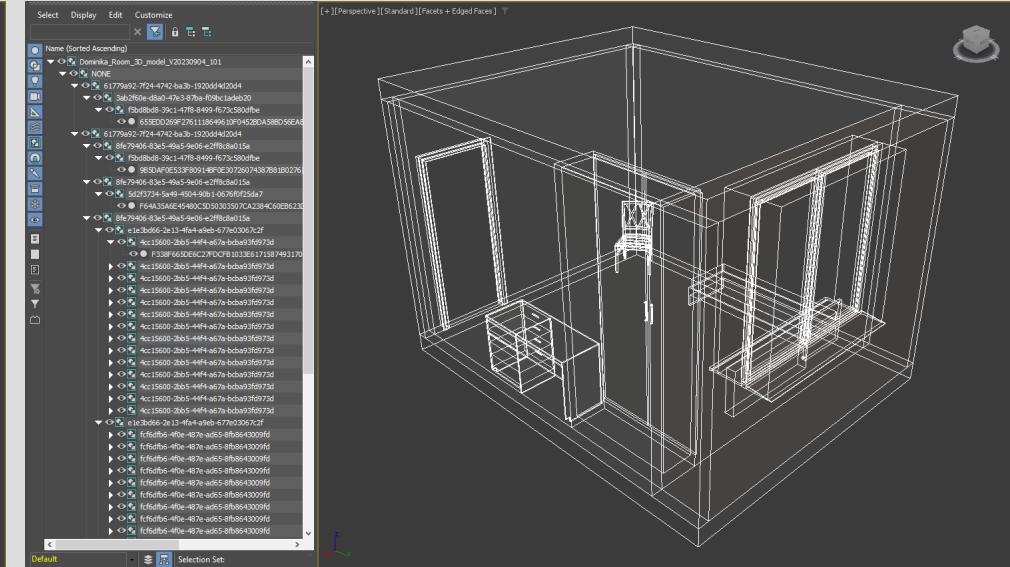
3D Model in Blender with data in IFC format
BlenderBIM addon used for example



Example data transfer result | CAD to DCC



Result import model from Collada *.dae format
Renga BIM to 3ds Max



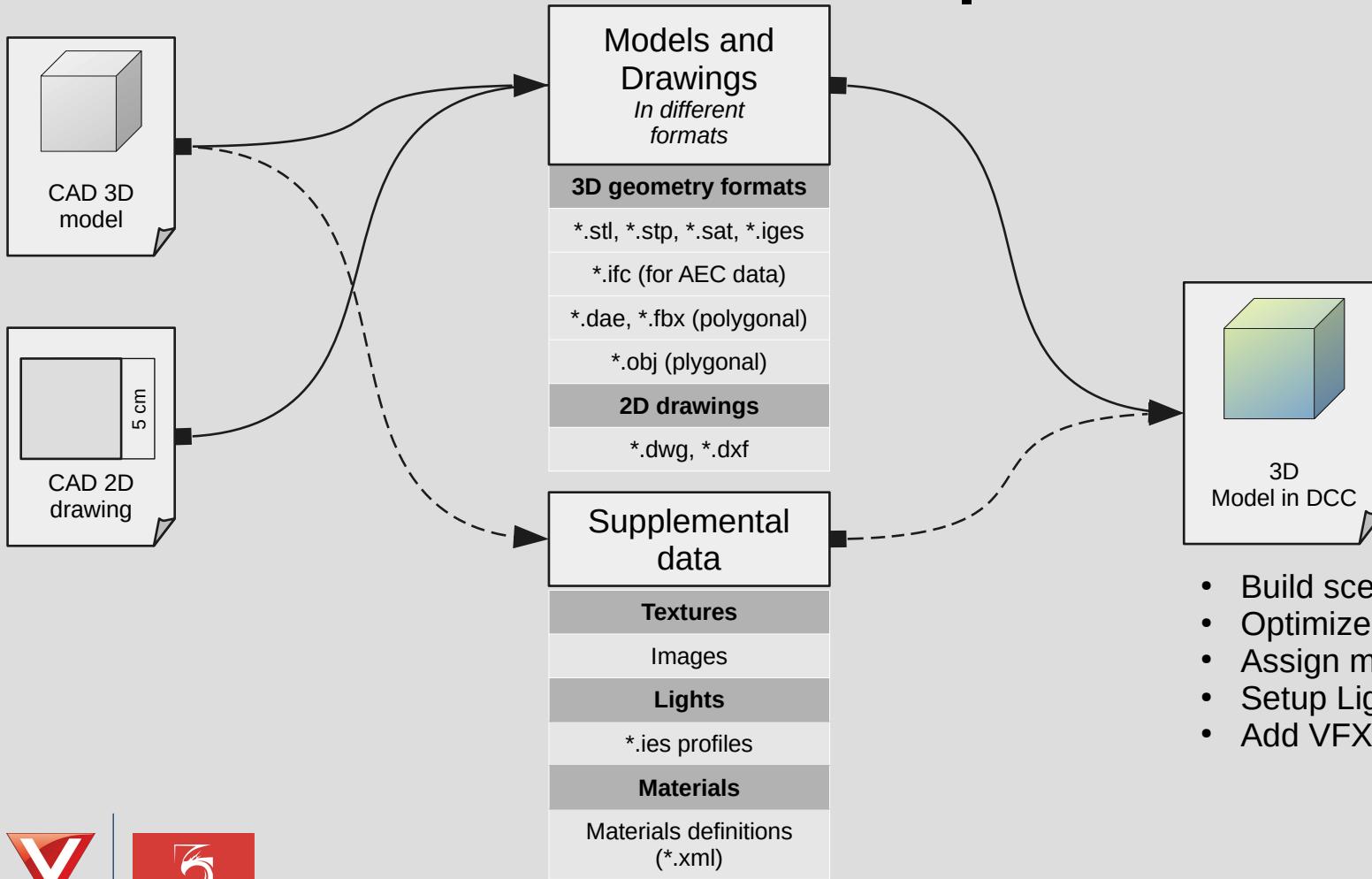
Result import model from ISO 10303-21 *.stp format
Renga BIM to 3ds Max



Workflow recommendations



Workflow recommendations | CAD to DCC



- Build scene
- Optimize geometry
- Assign materials
- Setup Lighting
- Add VFX



Workflow recommendations | CAD to DCC

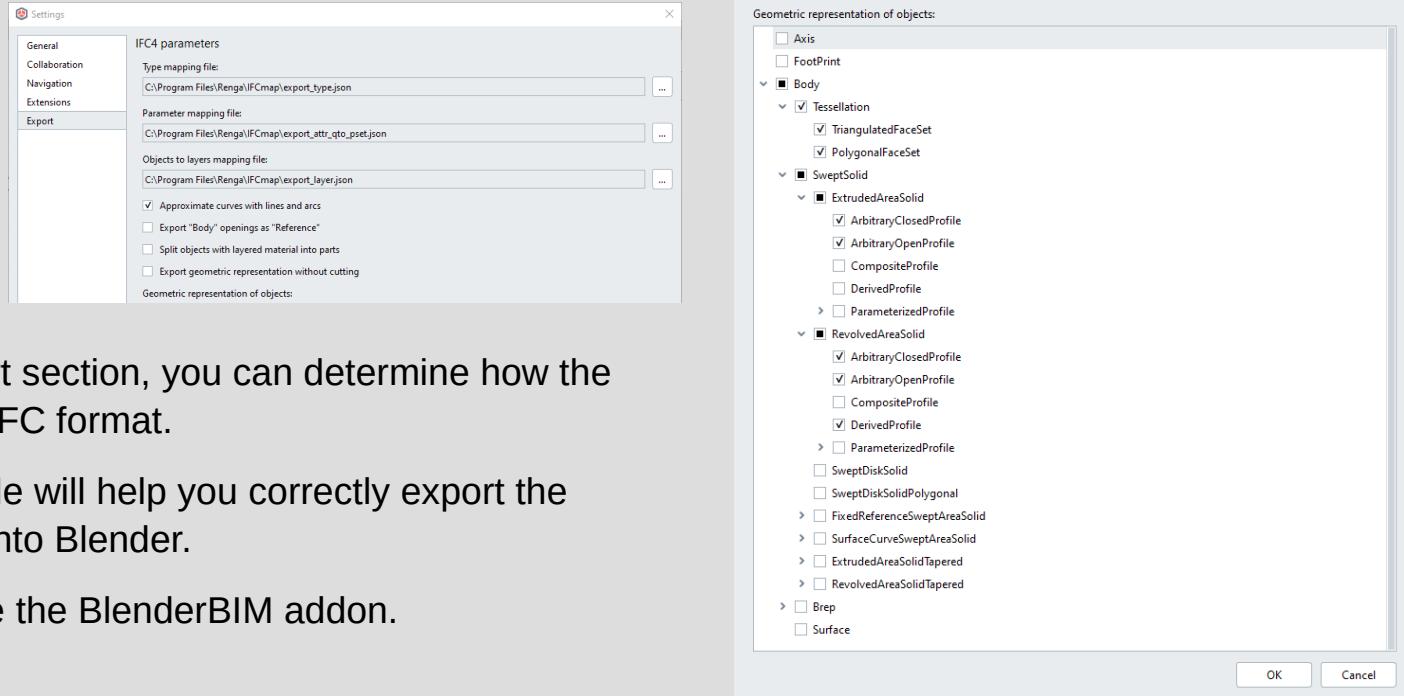
In table below I`m compare few different formats and its result after import in DCC app.

Data format	Type of geometry	Import geometry types
*.dwg	<ul style="list-style-type: none">• Solids• 2D Curves (lines)• 3D Curves (lines)	<ul style="list-style-type: none">• Splines• PolyGeometry (triangulated)
*.stp	<ul style="list-style-type: none">• Solids	<ul style="list-style-type: none">• SolidGeometry• PolyGeometry (triangulated, after conversion)
*.obj and *.mtl	<ul style="list-style-type: none">• Solids• Materials description• Textures	<ul style="list-style-type: none">• PolyGeometry (triangulated)• UV coords• Materials description
*.dae, *.fbx	<ul style="list-style-type: none">• Solids• Textures• Materials description• Lights• Light profiles	<ul style="list-style-type: none">• PolyGeometry (triangulated)• UV coords• Textures• Materials• Lights with IES profiles
*.ifc	<ul style="list-style-type: none">• Solids• 3D Curves (lines)• Materials• Textures	<ul style="list-style-type: none">• PolyGeometry (triangulated)• Curves• UV coords• Materials• Textures



Workflow recommendations | CAD to DCC

In this section we will look at the Renga configuration for exporting IFC to a Blender with the BlenderBIM add-on.



The image displays two software configuration windows side-by-side. The left window is titled 'Settings' and specifically shows the 'IFC4 parameters' section. It includes fields for 'Type mapping file' (set to 'C:\Program Files\Renga\IFCmap\export_type.json'), 'Parameter mapping file' (set to 'C:\Program Files\Renga\IFCmap\export_attr_qto_pset.json'), and 'Objects to layers mapping file' (set to 'C:\Program Files\Renga\IFCmap\export_layer.json'). Below these are several checkboxes: 'Approximate curves with lines and arcs' (checked), 'Export "Body" openings as "Reference"' (unchecked), 'Split objects with layered material into parts' (unchecked), and 'Export geometric representation without cutting' (unchecked). The right window is titled 'Geometric representation of objects:' and lists various 3D object types under a tree view. Checked items include 'Axis', 'FootPrint', 'Body' (which has 'Tessellation' checked with 'TriangulatedFaceSet' and 'PolygonalFaceSet' checked), 'SweptSolid' (which has 'ExtrudedAreaSolid' checked with 'ArbitraryClosedProfile' and 'ArbitraryOpenProfile' checked), 'RevolvedAreaSolid' (which has 'ArbitraryClosedProfile' and 'ArbitraryOpenProfile' checked), and 'Brep'. Unchecked items include 'CompositeProfile', 'DerivedProfile', 'ParameterizedProfile', 'SweptDiskSolid', 'SweptDiskSolidPolyg', 'FixedReferenceSweptAreaSolid', 'SurfaceCurveSweptAreaSolid', 'ExtrudedAreaSolidTapered', 'RevolvedAreaSolidTapered', and 'Surface'. At the bottom right of this window are 'OK' and 'Cancel' buttons.

In the program settings, Export section, you can determine how the model will be exported to the IFC format.

The settings shown on the slide will help you correctly export the model for subsequent import into Blender.

To support the IFC format, use the BlenderBIM addon.

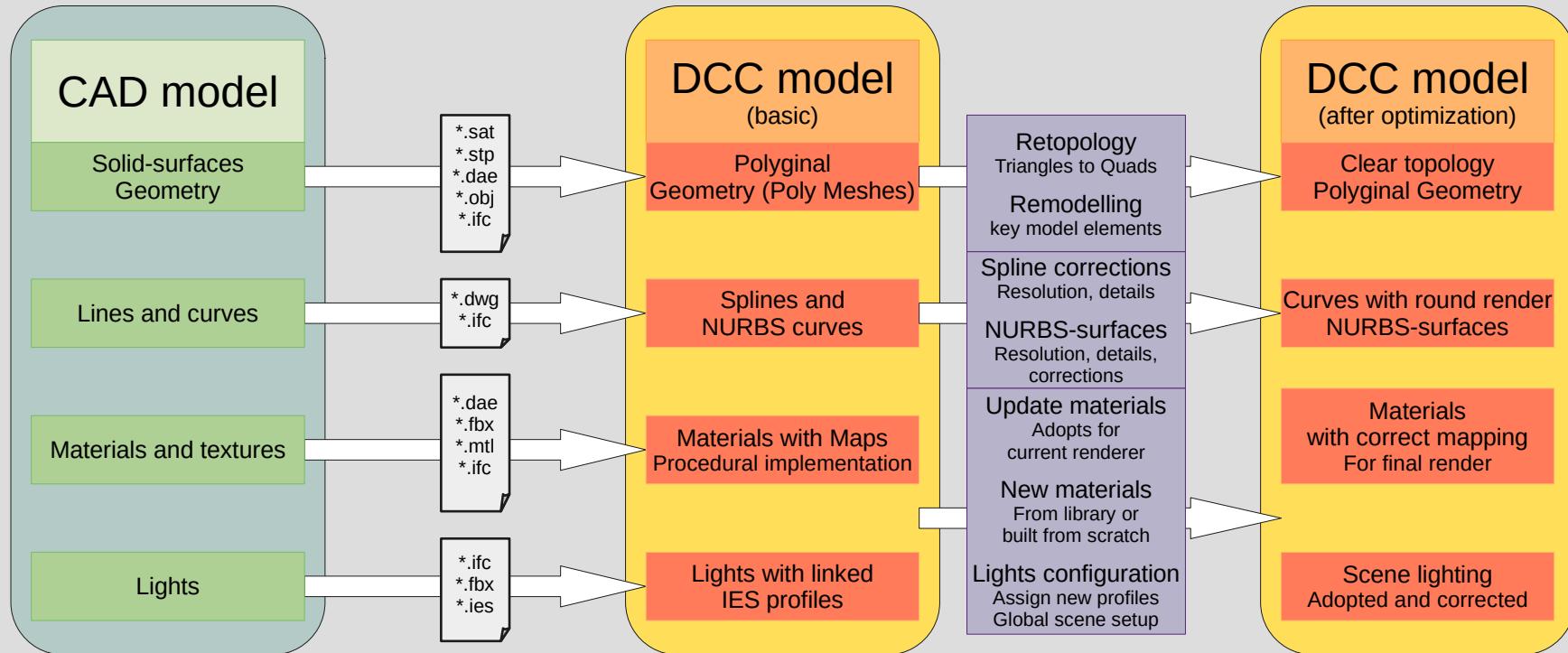


Pipeline data transfer



Pipeline for data transfer | CAD to DCC

Pipeline in below, demonstrate basic process of transfer data between CAD and DCC applications.



DEMO



IN NEXT VIDEO

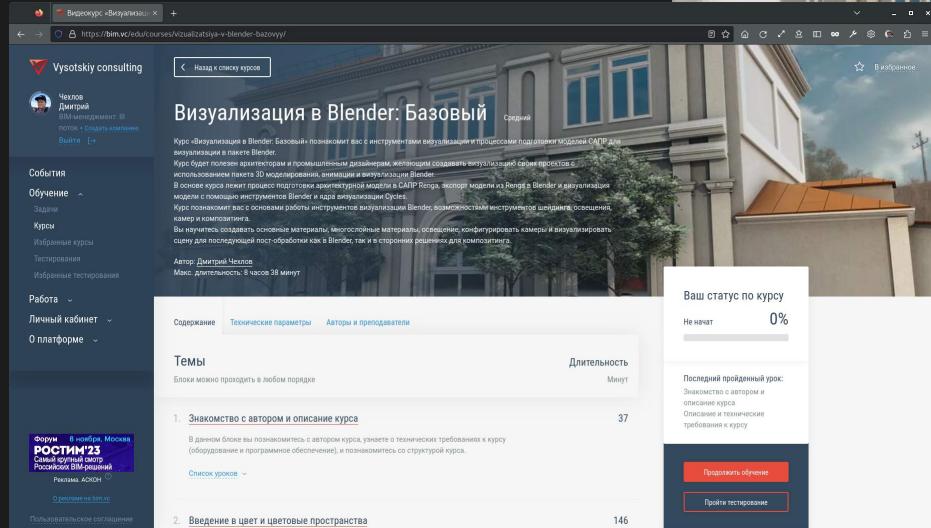
In next video we talk about work with Matte ID's and Cryptomatte passes in Blender Cycles renderer.

Working with Cryptomatte pass

Blender Cycles Workflow



Visit my complete on-line course
«Rendering in Blender with Cycles Renderer»
on Vysotskiy Consulting — BIM.VC.



The screenshot shows a web browser displaying a course page. The title is 'Визуализация в Blender: Базовый'. The page includes a large image of a building's exterior, a sidebar with user information and navigation links, and a central content area with course details, a table of contents, and a progress bar indicating 0% completion.



Image by Dmitry «dimson3d» Chekhlov from Course Project

