

# Data transfer between CAD and DCC Applications



SUPPORTED BY

"Ghost at Sunrise"  
Photography by Dmitry «dimson3d» Chekhlov  
Location: Russia, Perm Krai, Cherdyn city, Seregovo village  
Summer, 2023

# 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 and Bézier 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.

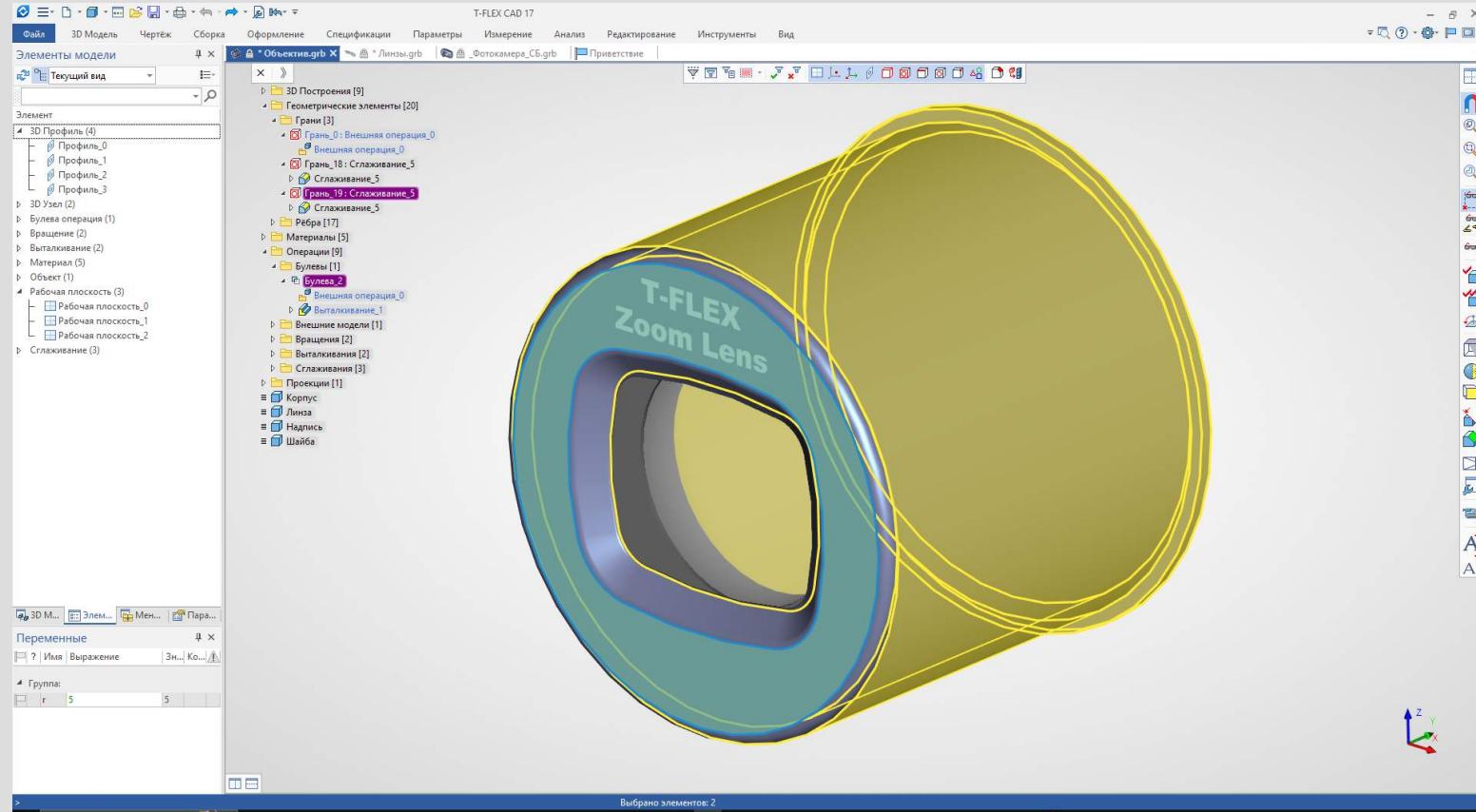
**Key problem in Rendering workflow** — correct transfer 3D geometry model data and it's information (instances, lights, materials, textures etc.) between applications.



# Modern CAD applications



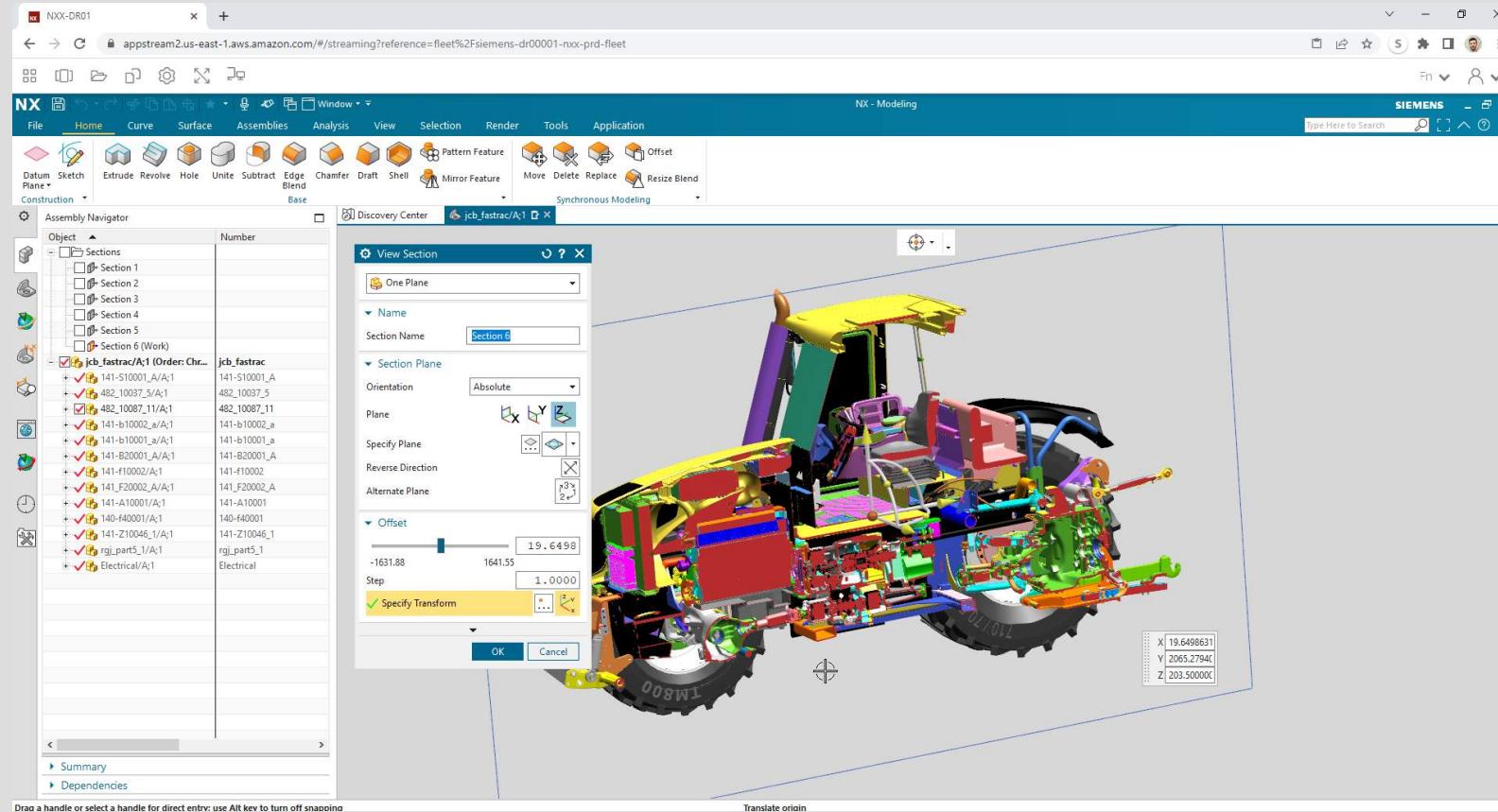
# Modern CAD applications



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

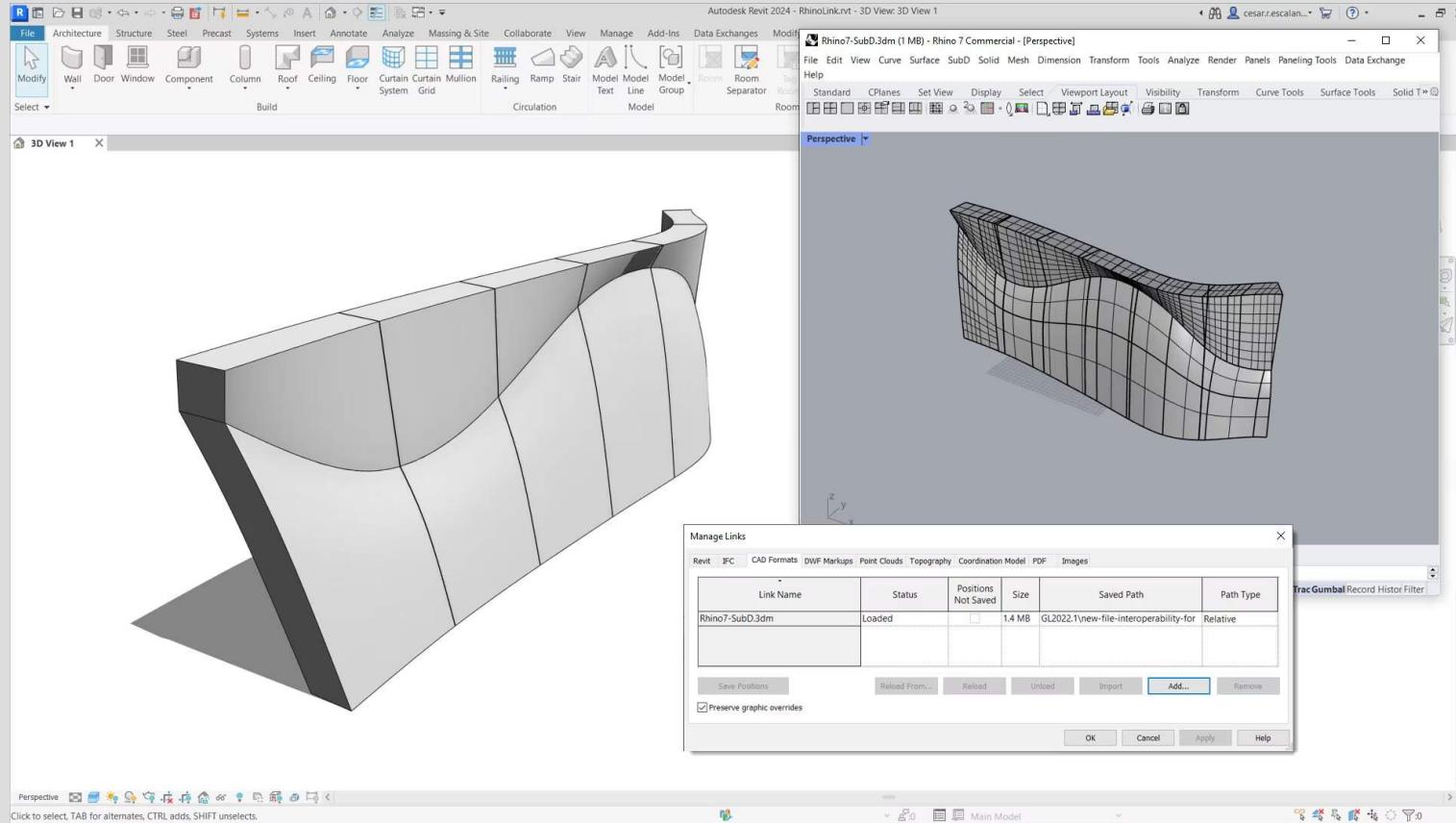


CATIA from Dassault Systèmes SE — CAD for large scale mechanical engineering and industrial design.



Image courtesy of Dassault Systèmes SE

# Modern AEC CAD applications

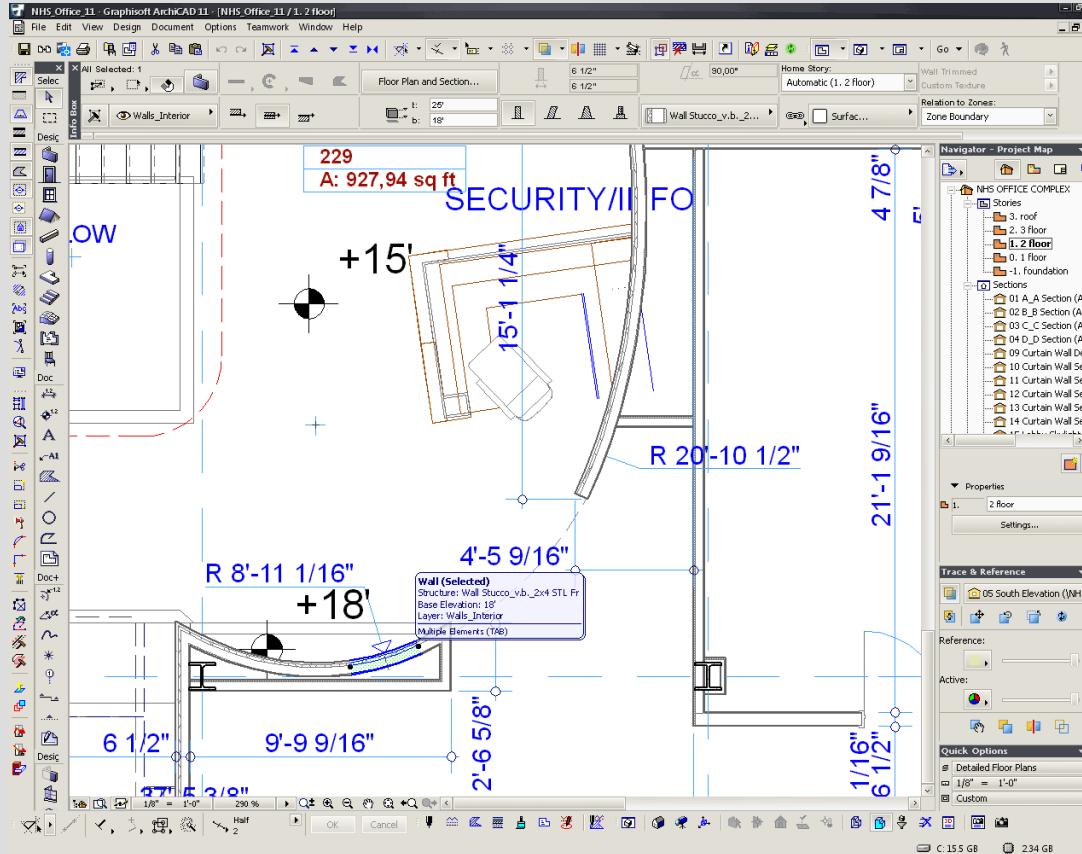


Autodesk Revit – modern 3D architectural modeling and engineering CAD.



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 modelling

## Parametric and procedural modelling

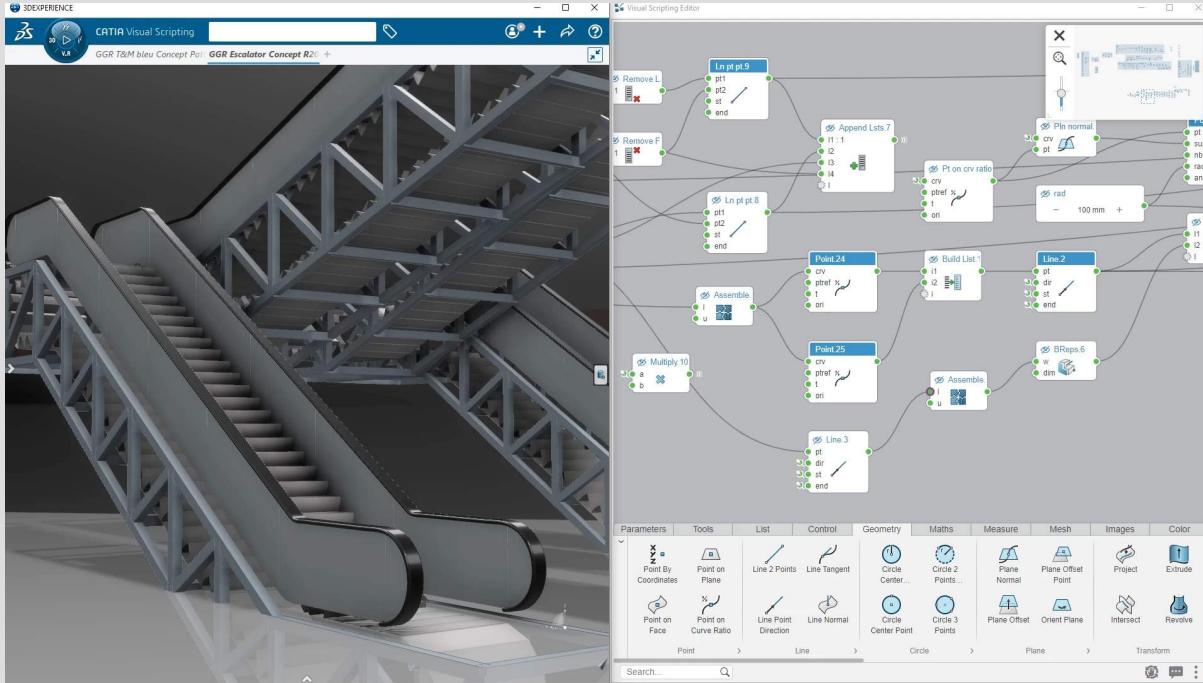


Image courtesy of Dassault Systèmes SE



# Progressive technologies in modern modelling

Parametric and procedural modelling

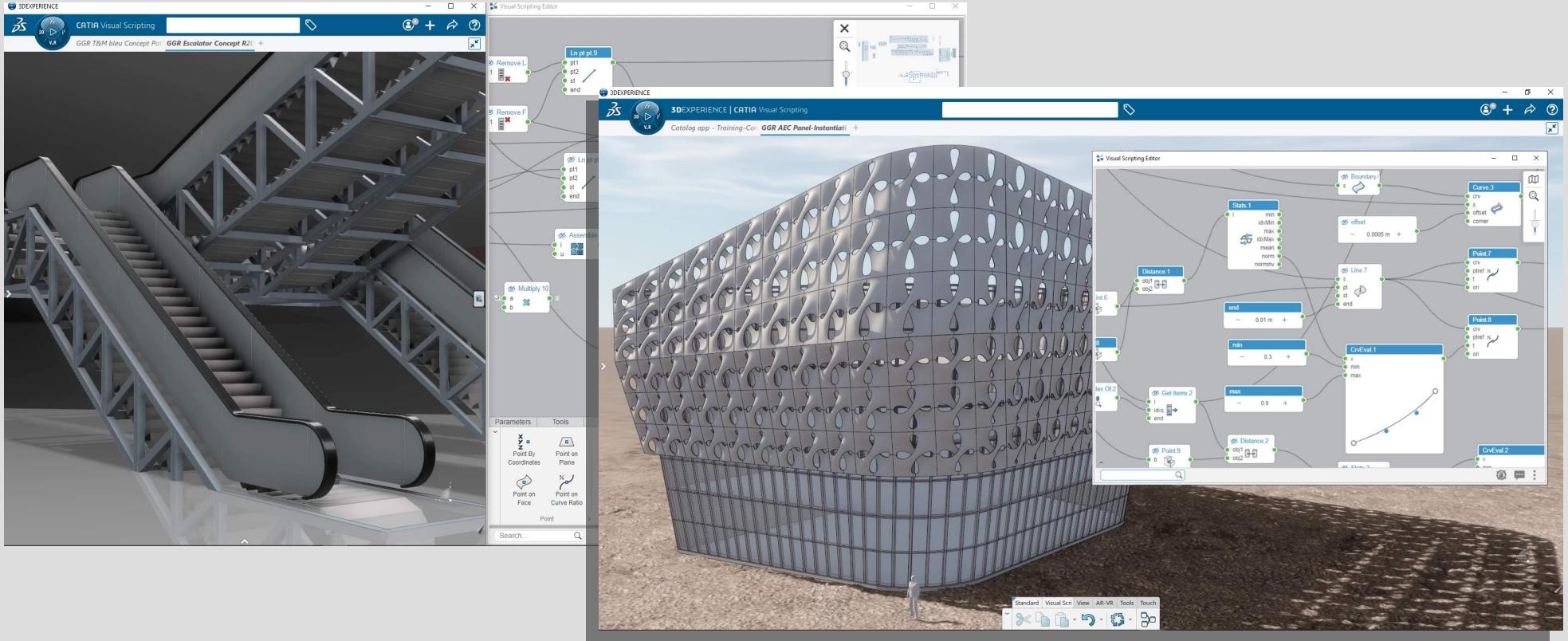


Image courtesy of Dassault Systèmes SE



# Progressive technologies in modern modelling

Parametric and procedural modelling benefits

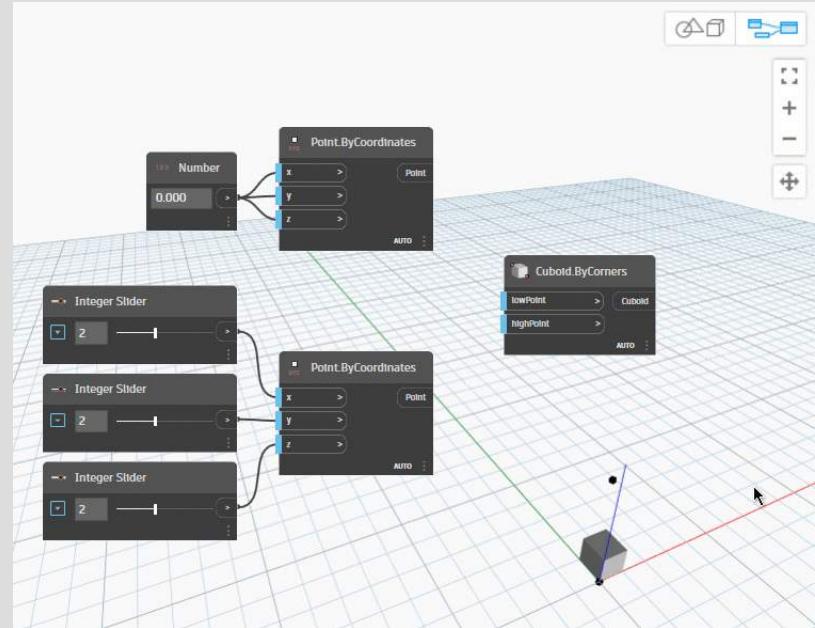
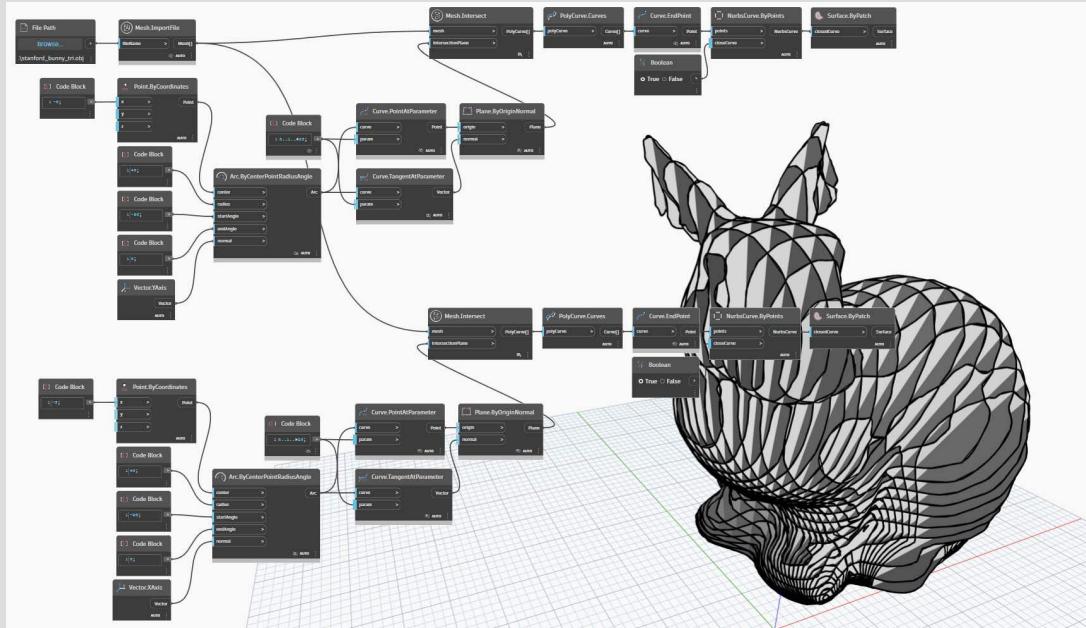


Image courtesy of Autodesk Inc.

# 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.

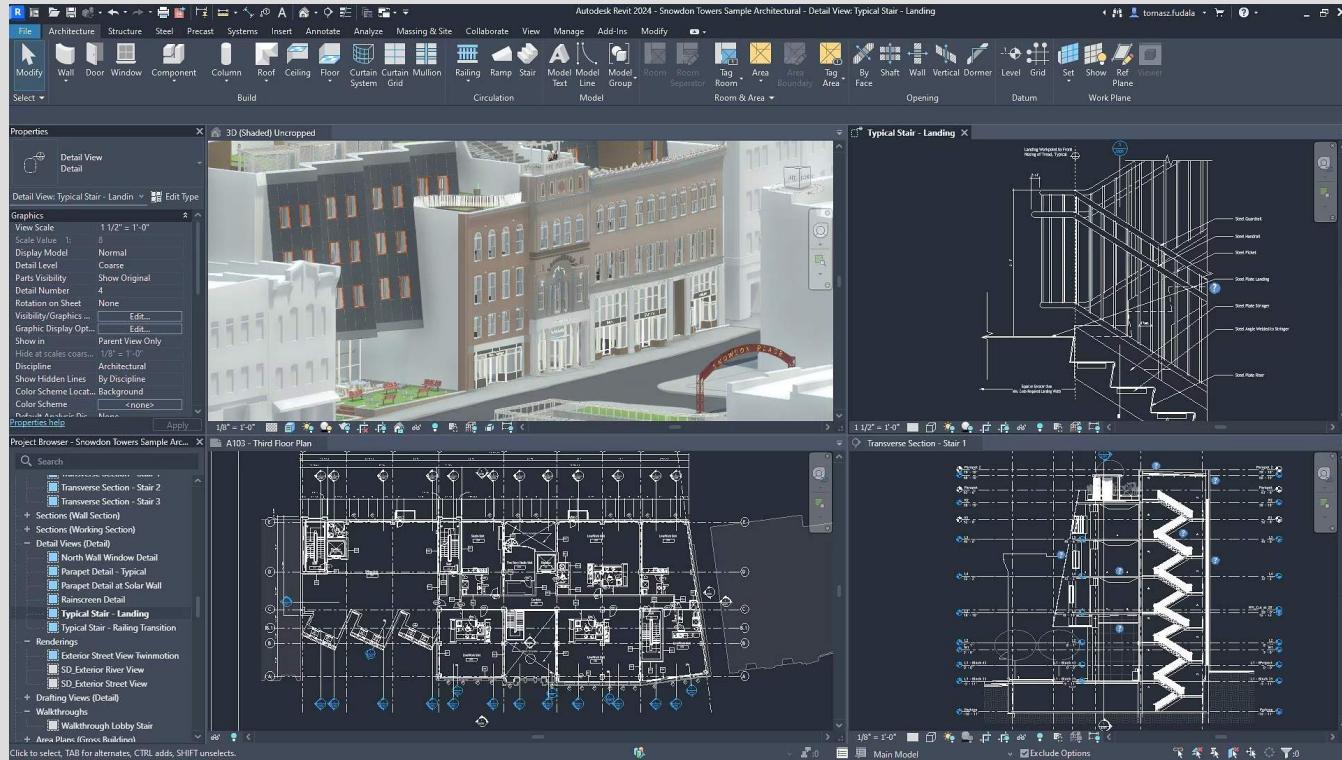


Image courtesy of Autodesk Inc.

# 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.

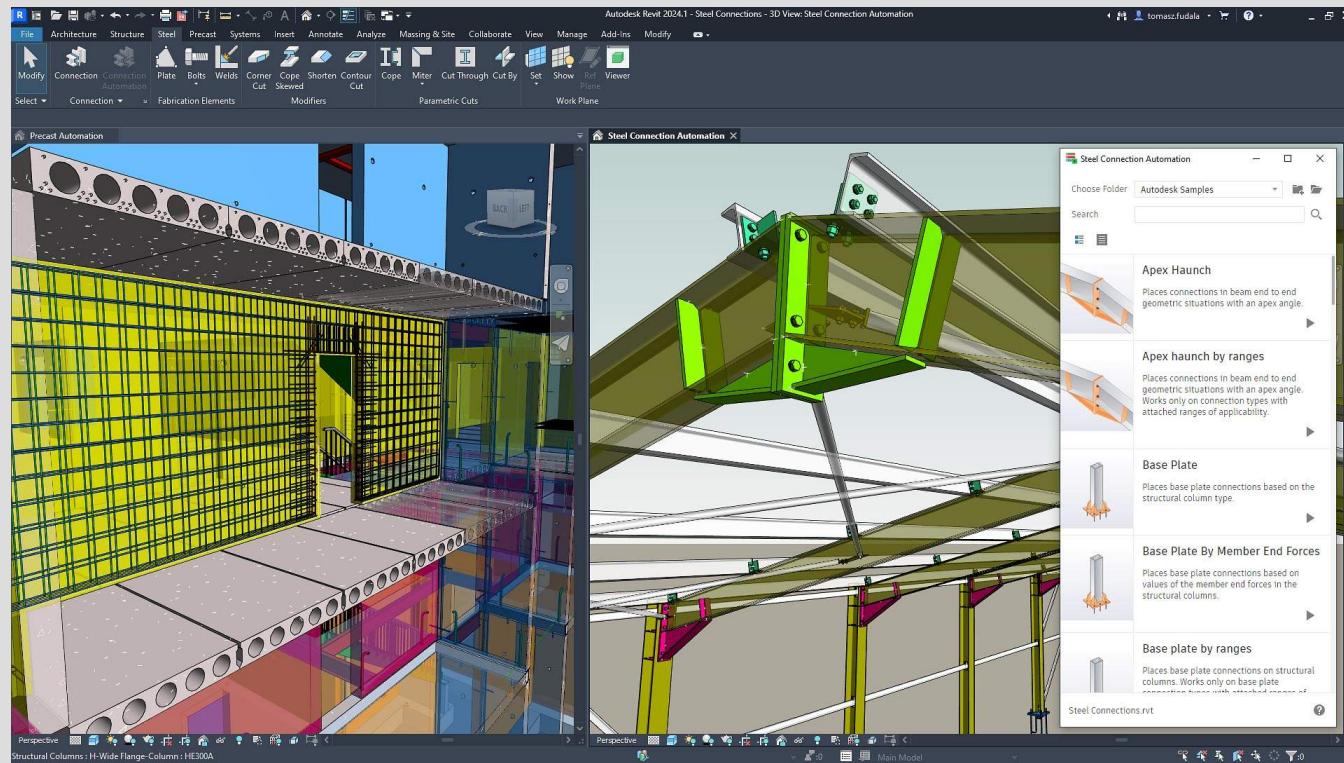


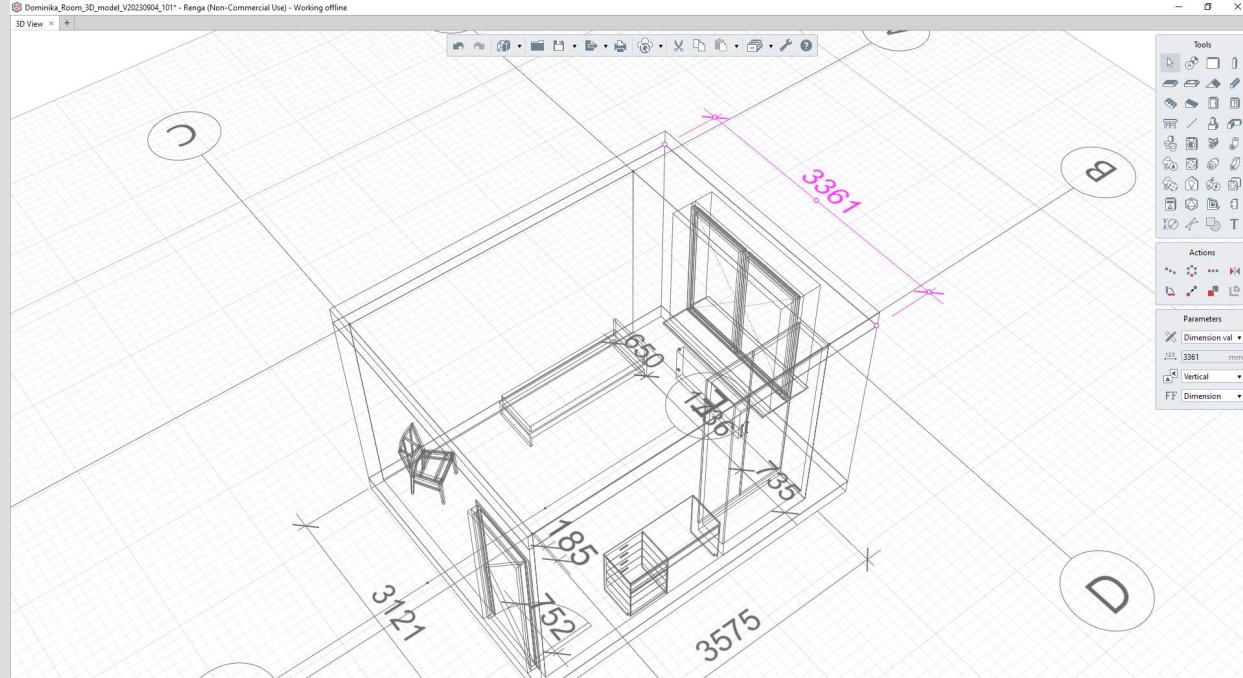
Image courtesy of Autodesk Inc.



# Example workflow graph



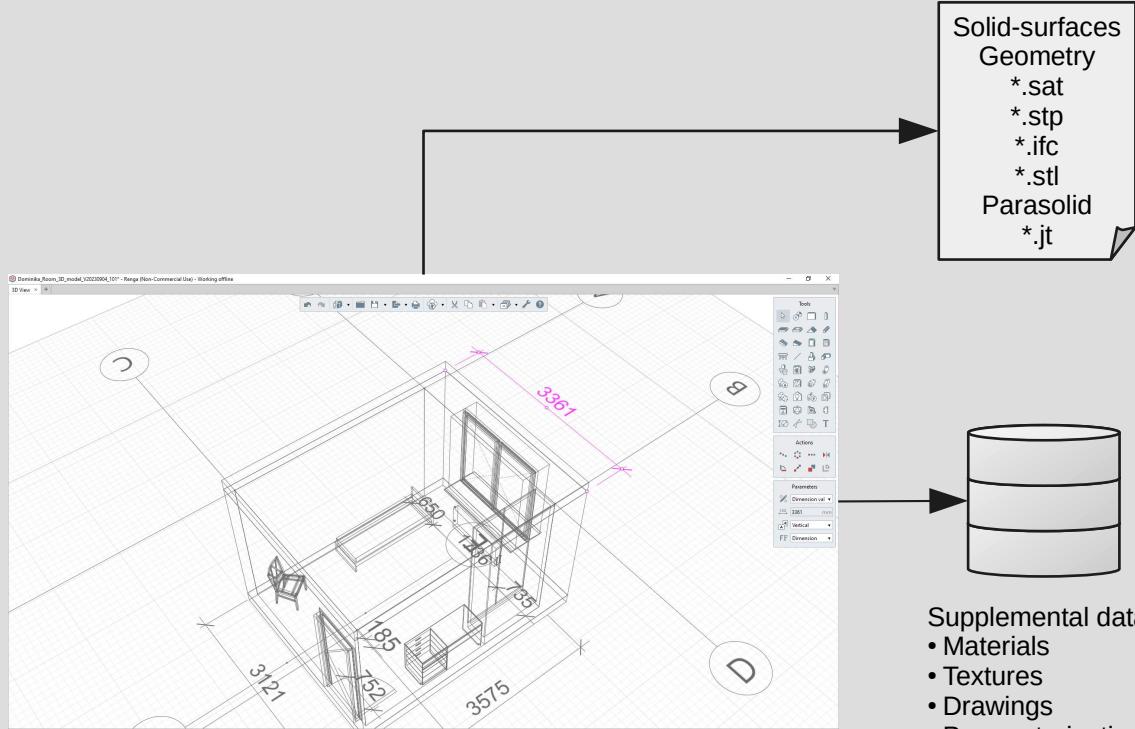
# Example workflow graph | CAD to CAD



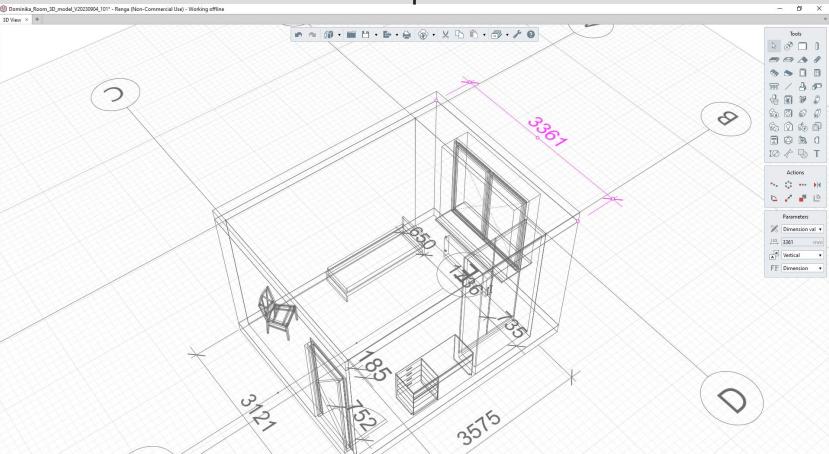
3D Model in AEC CAD  
Renga BIM as example



# Example workflow graph | CAD to CAD



# Example workflow graph | CAD to CAD

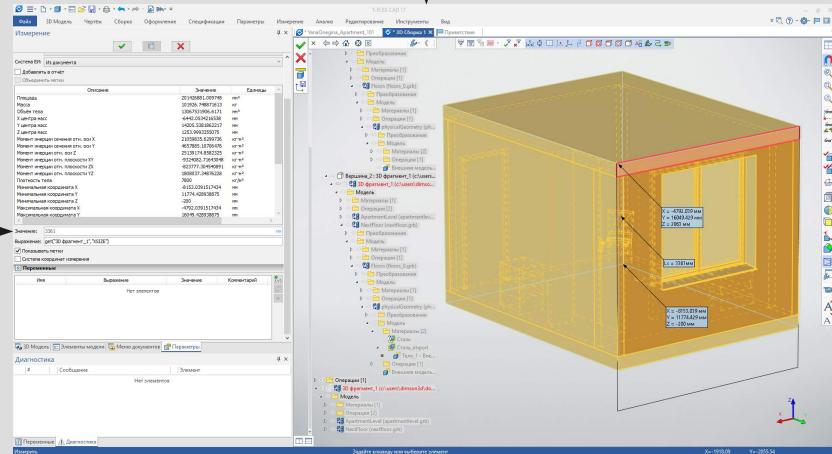


3D Model in AEC CAD  
*Renga BIM as example*

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



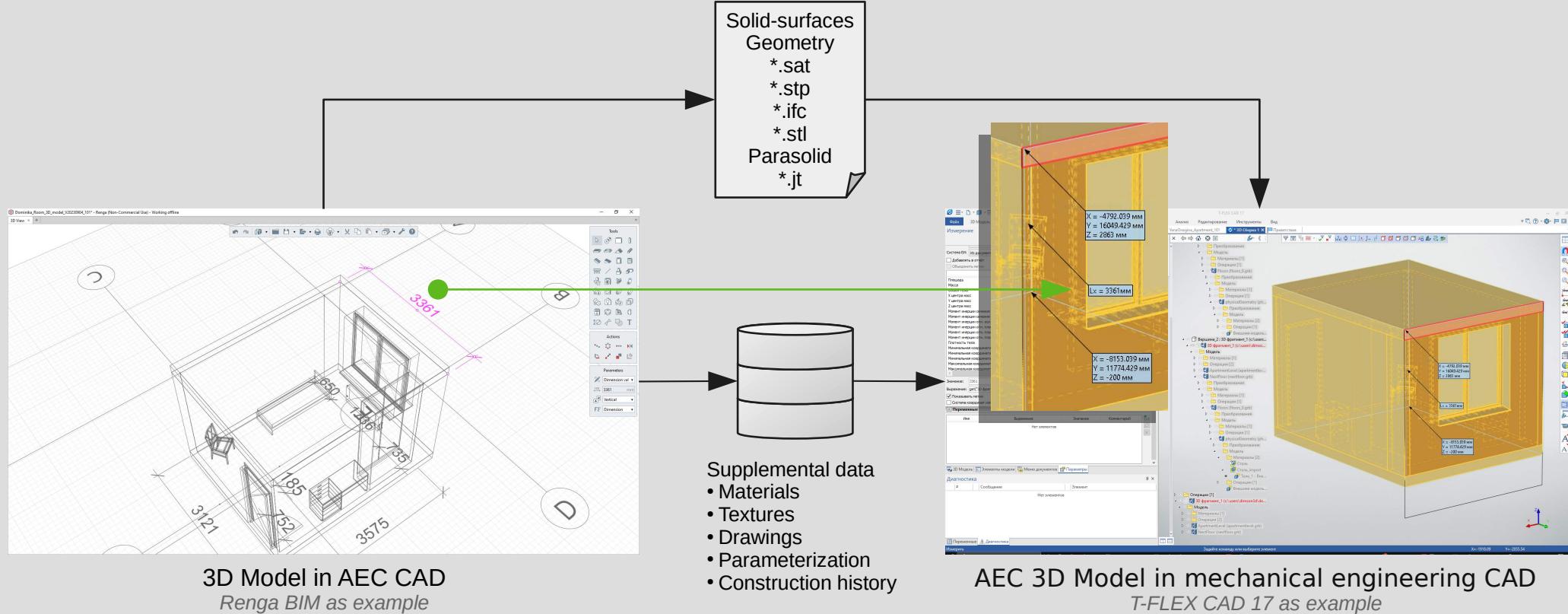
Supplemental data  
• Materials  
• Textures  
• Drawings  
• Parameterization  
• Construction history



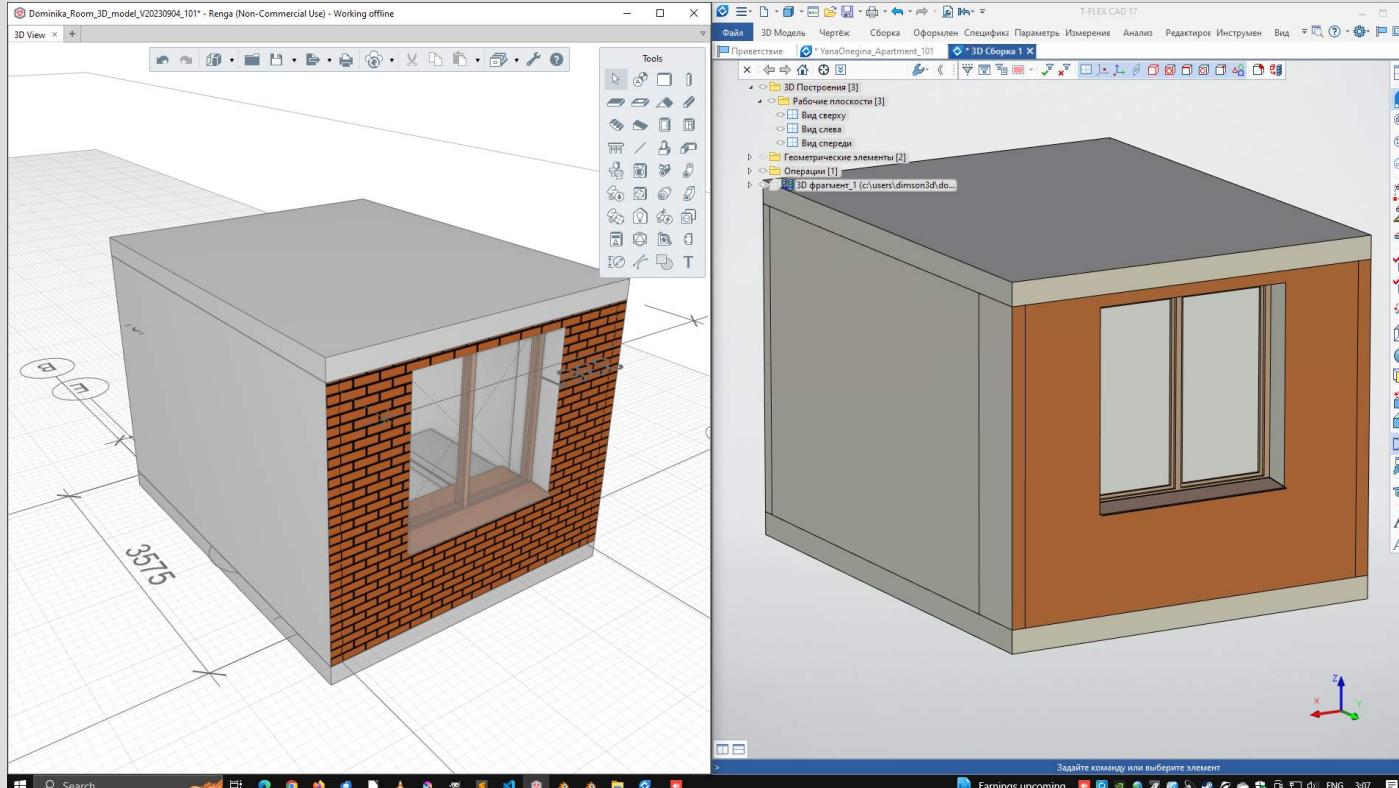
AEC 3D Model in mechanical engineering CAD  
*T-FLEX CAD 17 as example*



# 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



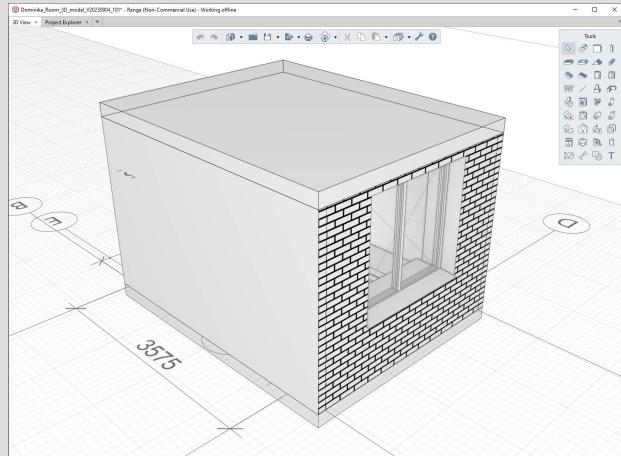
# Workflow recommendations | CAD to CAD

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.



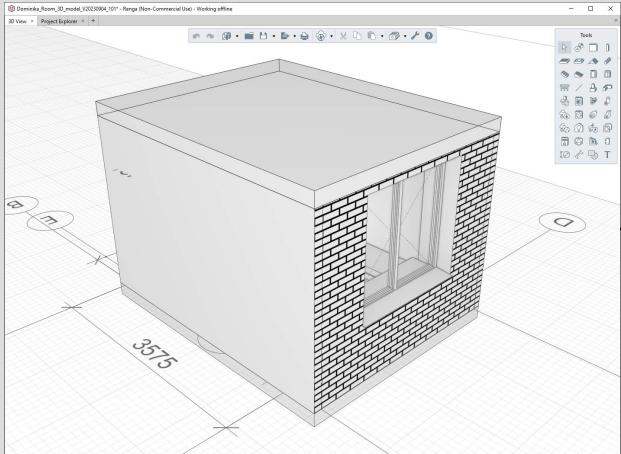
# Example workflow graph | CAD to DCC



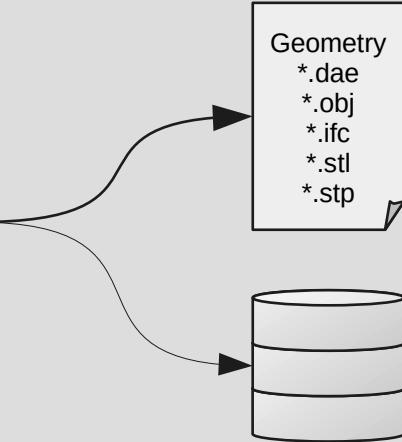
3D Model with data in CAD  
*Renga BIM as example*



# Example workflow graph | CAD to DCC

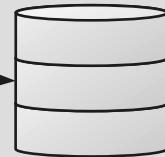


3D Model with data in CAD  
*Renga BIM as example*



Geometry

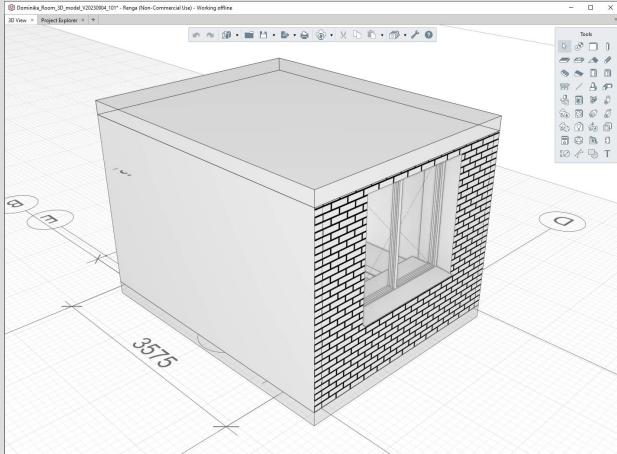
- \*.dae
- \*.obj
- \*.ifc
- \*.stl
- \*.stp



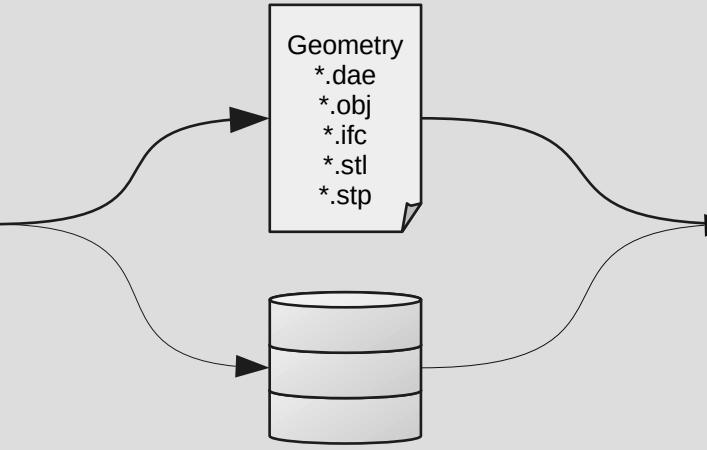
Supplemental data

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

# Example workflow graph | CAD to DCC

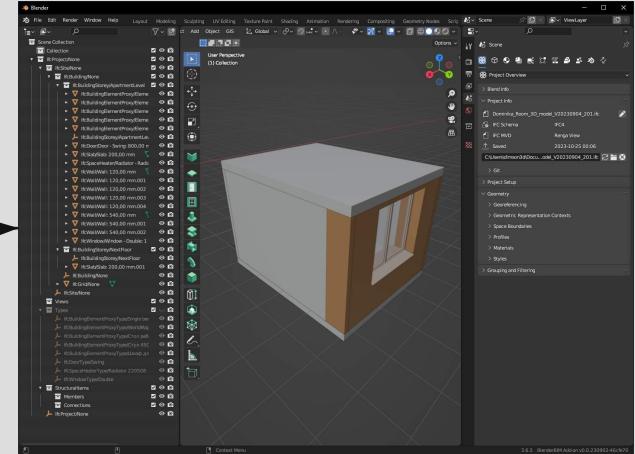


3D Model with data in CAD  
*Renga BIM as example*



Supplemental data

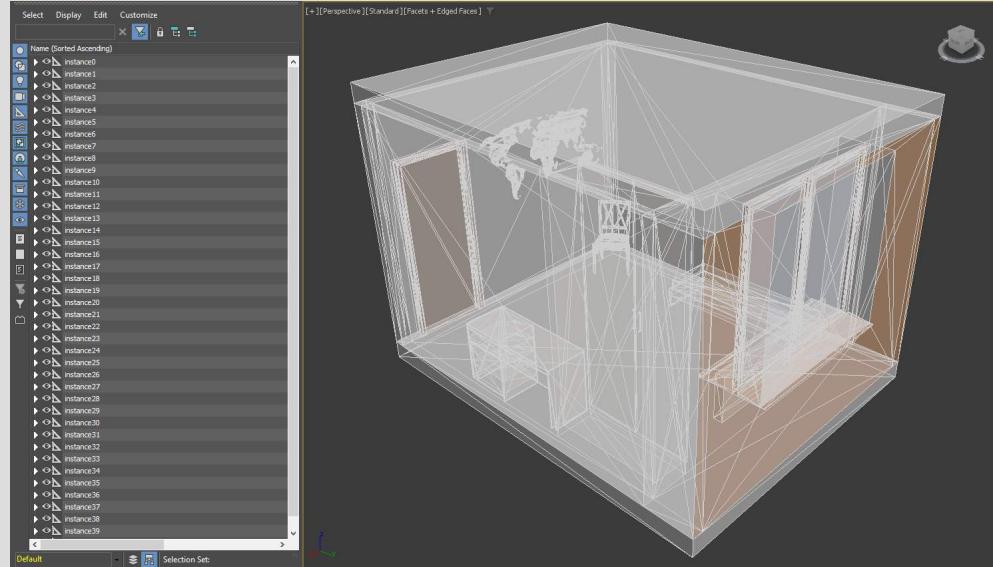
- Materials (\*.mtl)
- Textures
- Lights (\*.ies)
- Links
- Drawings (\*.dxf)
- Parameterization



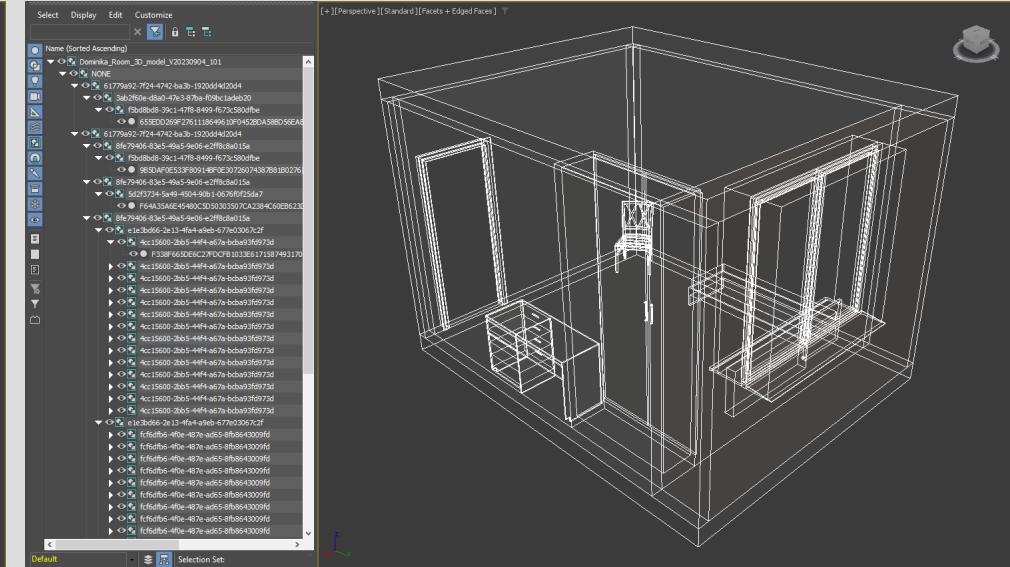
3D Model in Blender with data in IFC format  
*BlenderBIM add-on used for example*



# Example data transfer result | CAD to DCC



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



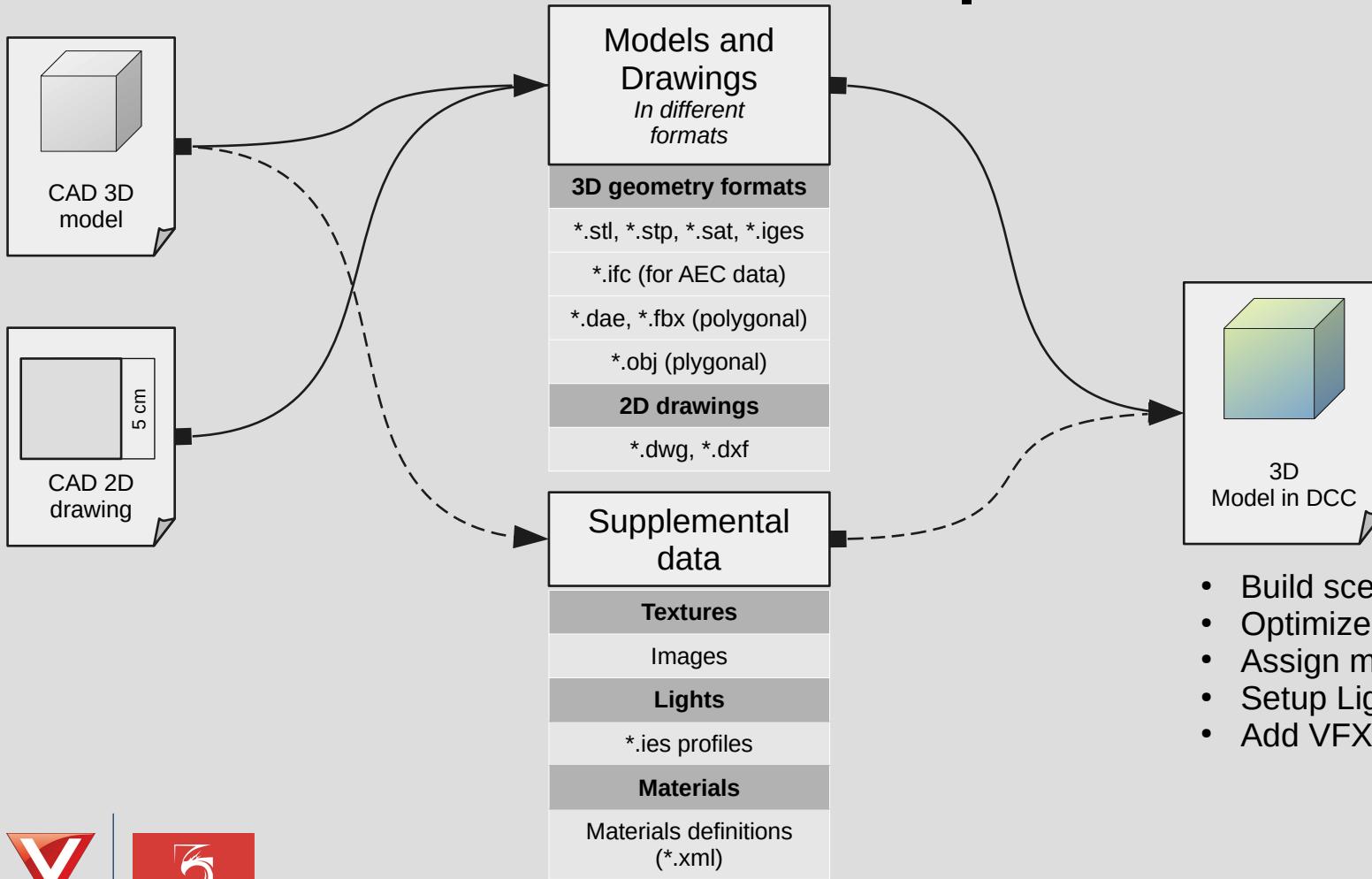
Result import model from ISO 10303-21 \*.stp format  
*Renga BIM to 3ds Max*



# Workflow recommendations



# Workflow recommendations | CAD to DCC



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



# Workflow recommendations | CAD to DCC

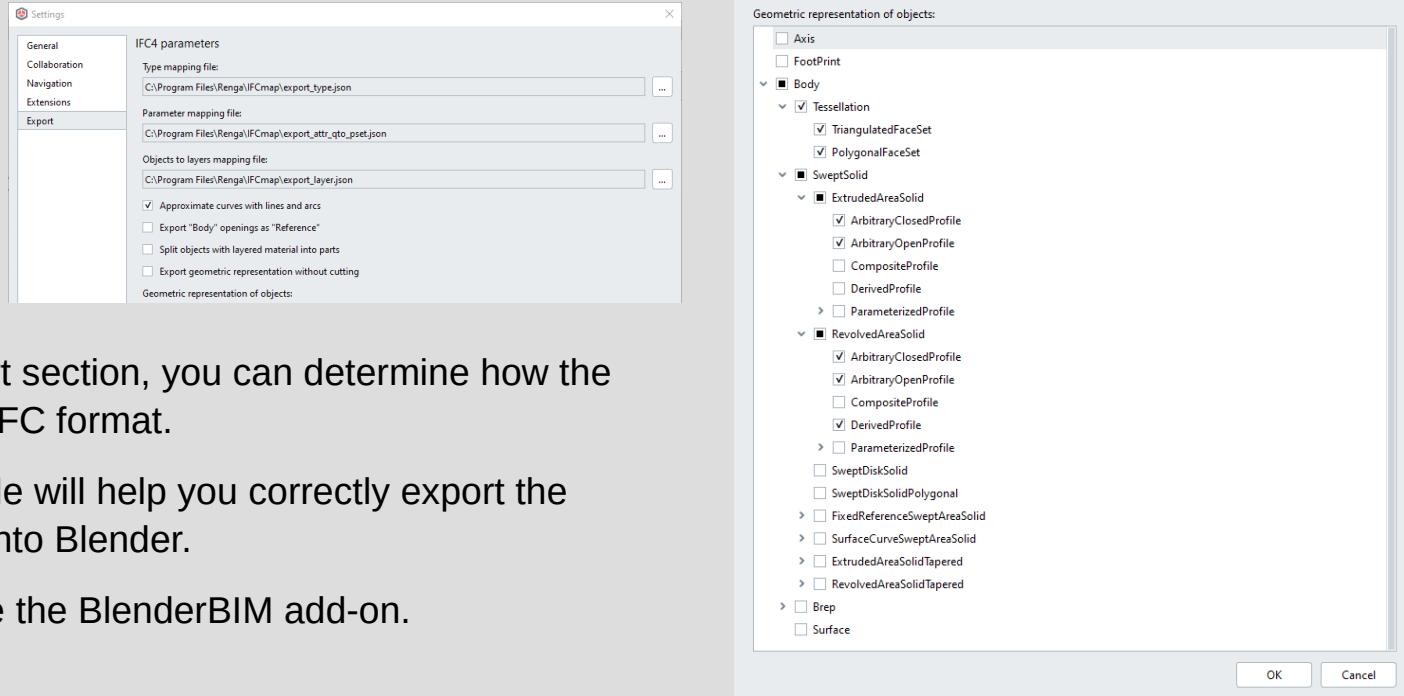
Table below compare few different formats and its result after import in DCC application

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



# 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 under the 'Export' tab. 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'). There are also 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 primitives and profiles. It includes checkboxes for categories like 'Axis', 'FootPrint', 'Body' (which is expanded to show 'Tessellation' and 'SweptSolid' sub-options), 'ExtrudedAreaSolid' (which is expanded to show 'ArbitraryClosedProfile', 'ArbitraryOpenProfile', 'CompositeProfile', 'DerivedProfile', and 'ParameterizedProfile' sub-options), 'RevolvedAreaSolid' (which is expanded to show 'ArbitraryClosedProfile', 'ArbitraryOpenProfile', 'CompositeProfile', 'DerivedProfile', and 'ParameterizedProfile' sub-options), 'SweptDiskSolid', 'SweptDiskSolidPolygonal', 'FixedReferenceSweptAreaSolid', 'SurfaceCurveSweptAreaSolid', 'ExtrudedAreaSolidTapered', 'RevolvedAreaSolidTapered', 'Brep', 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 add-on.

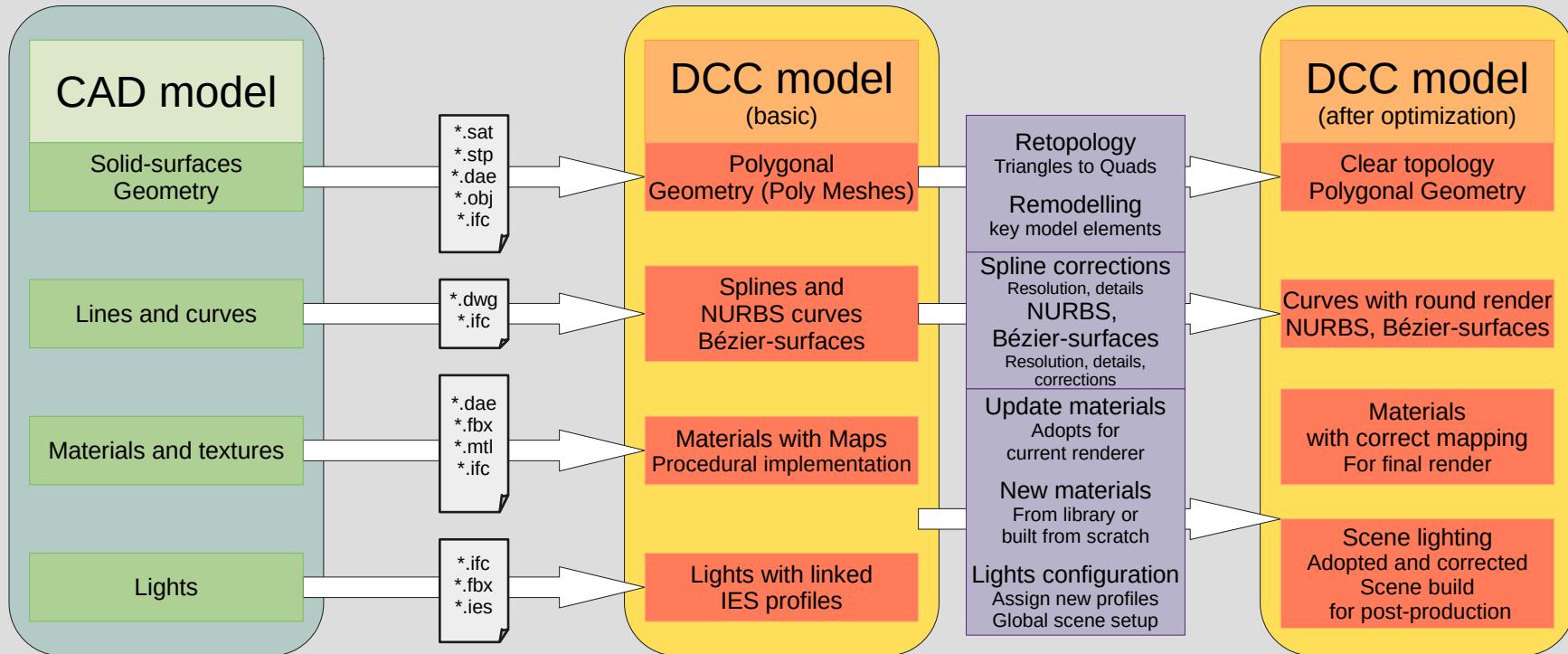


# Pipeline data transfer



# Pipeline for data transfer | CAD to DCC

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

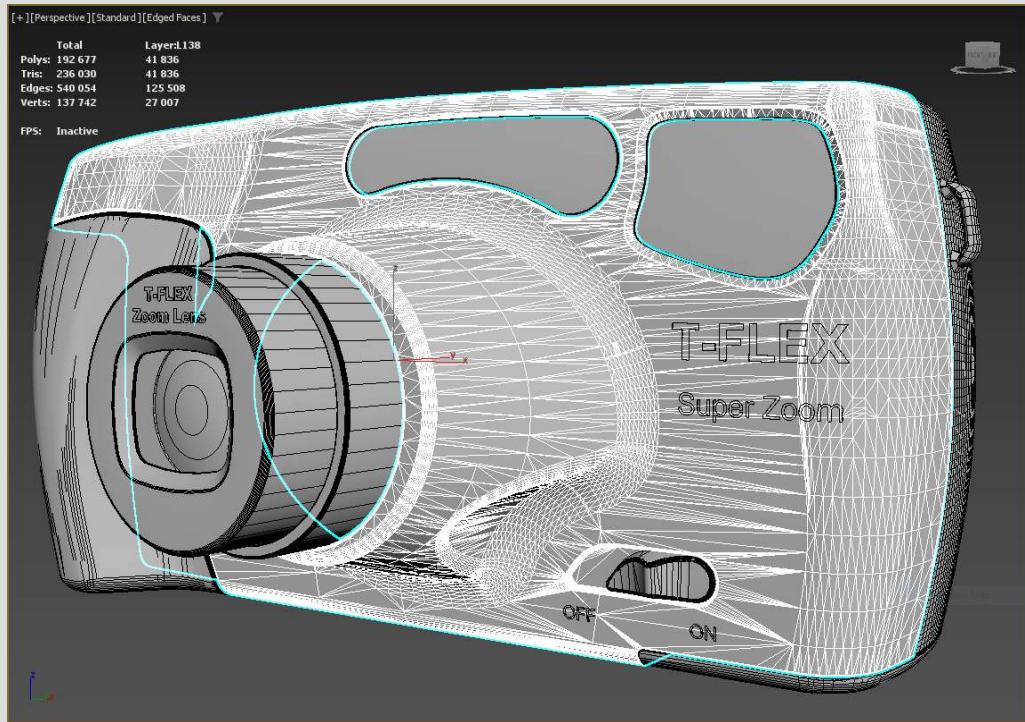


# Geometry retopology examples

Modern DCC applications have special tools for rebuilding geometry with more correctly topology.

All triangulated geometry or with different topology geometry can be rebuilt with more correct topology.

Retopology tools are used to restore the geometry of objects from CAD and digital sculpting.

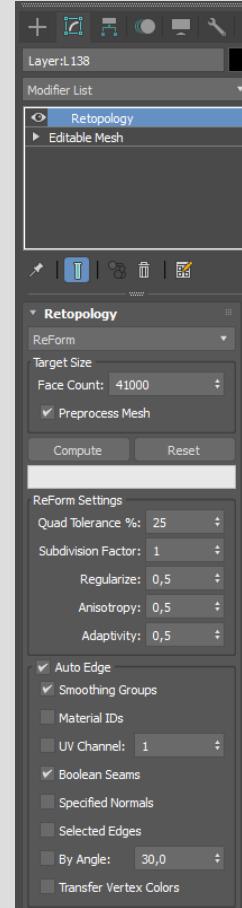


Model imported from T-FLEX CAD in to Autodesk 3ds Max with Autodesk DXF format.



# Geometry retopology examples

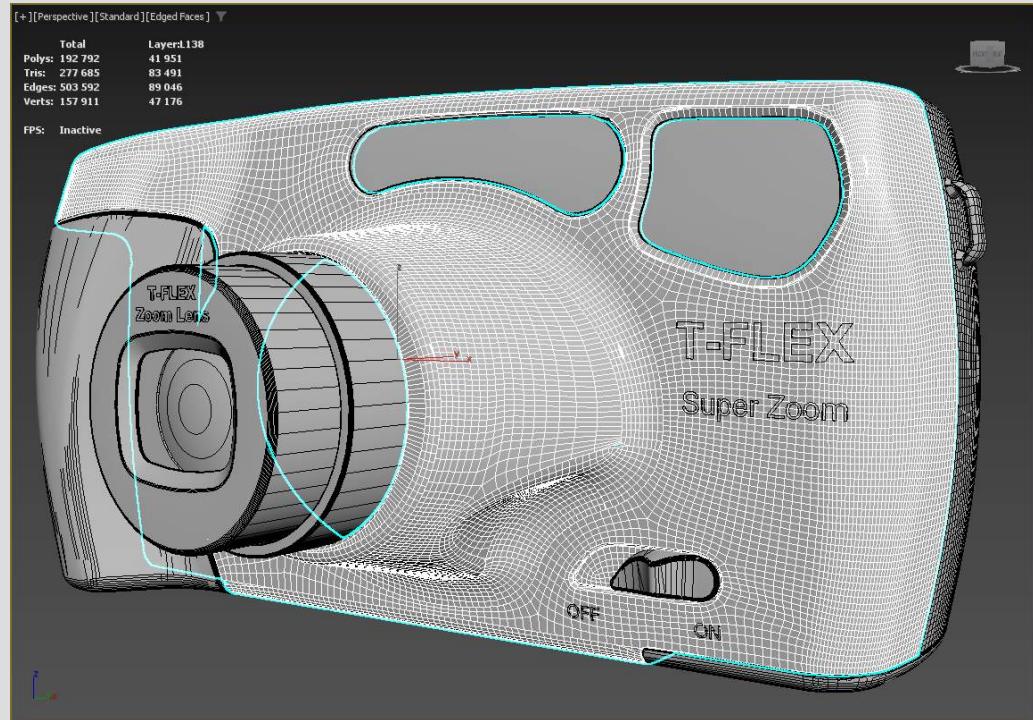
Use Retopology Tools to automatically optimize the geometry of your high-resolution model to create a clean, quad-based mesh. Useful for removing artifacts and other mesh issues for animation and rigging, these tools can also be used to apply textures and manipulate objects.



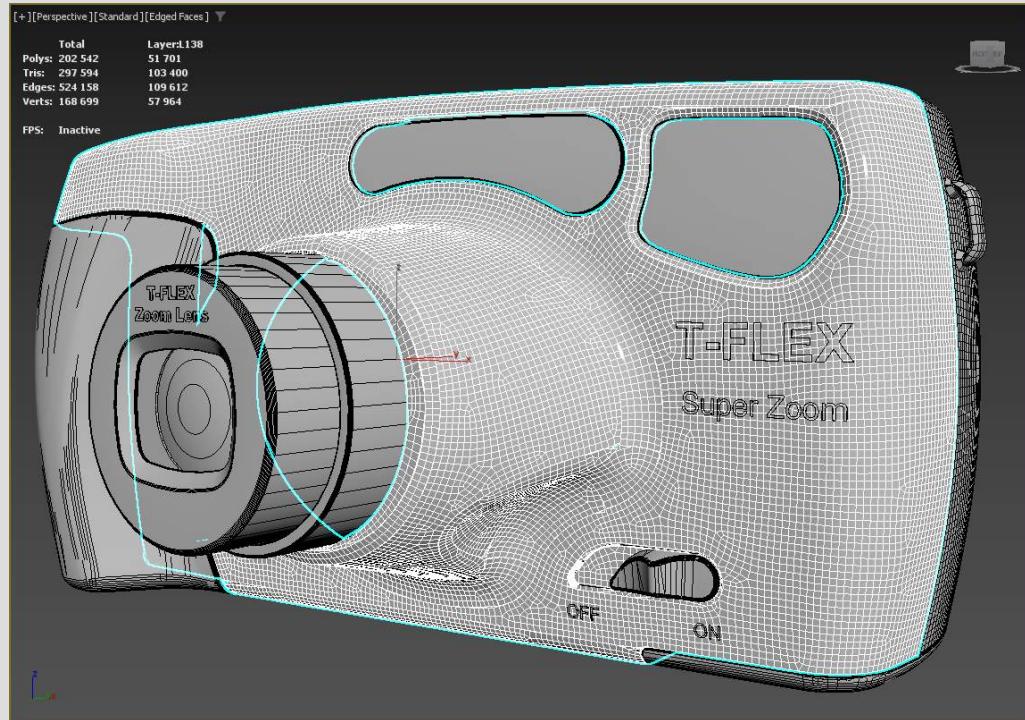
Retopology modifier in Autodesk 3ds Max.



# Geometry retopology examples



Result geometry created with Retopology modifier using ReForm retopology algorithm.



Result geometry created with Retopology modifier using Instant Mesh retopology algorithm.



# Geometry retopology examples

Blender provides a set of tools for retopology of geometry with incorrect geometry.

In the Properties panel, Data tab, the geometry topology can be recreated using the Remesh toolkit.

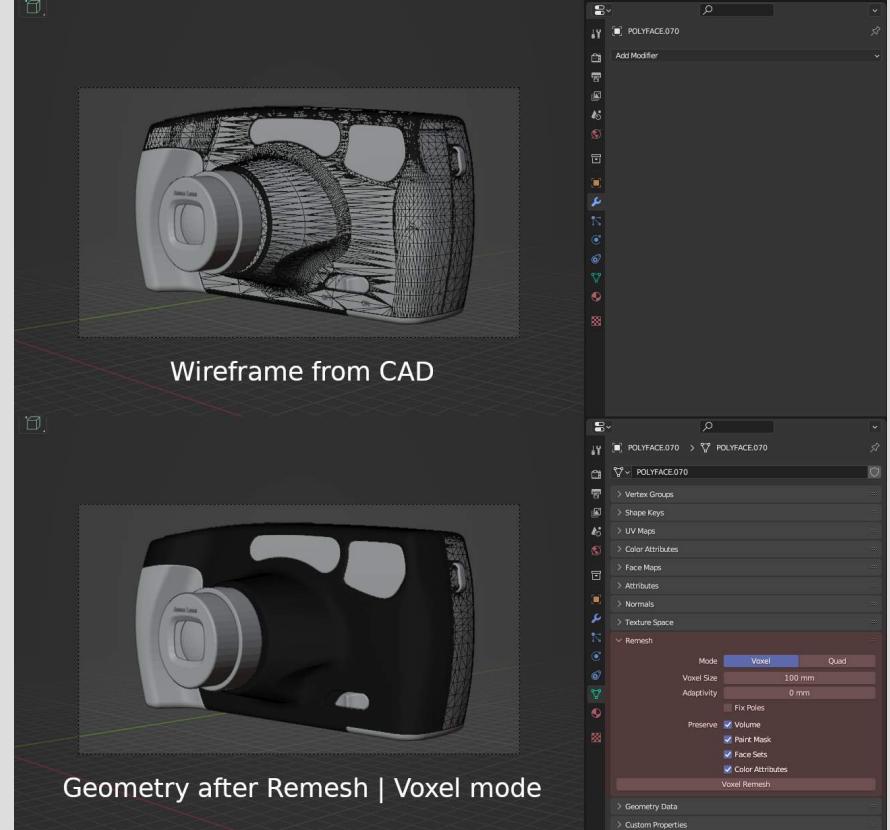
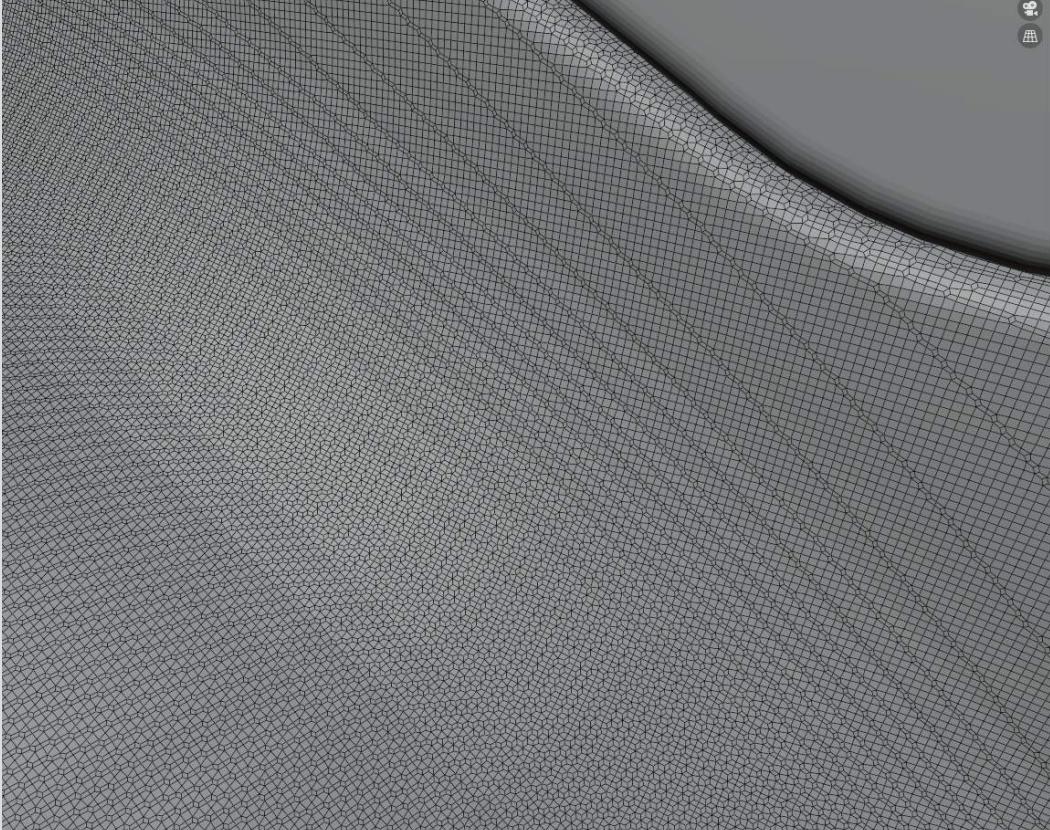
The Remesh supports several algorithms for generating geometry with optimal topology.



Result geometry created with Remesh rollout using Voxel retopology algorithm.



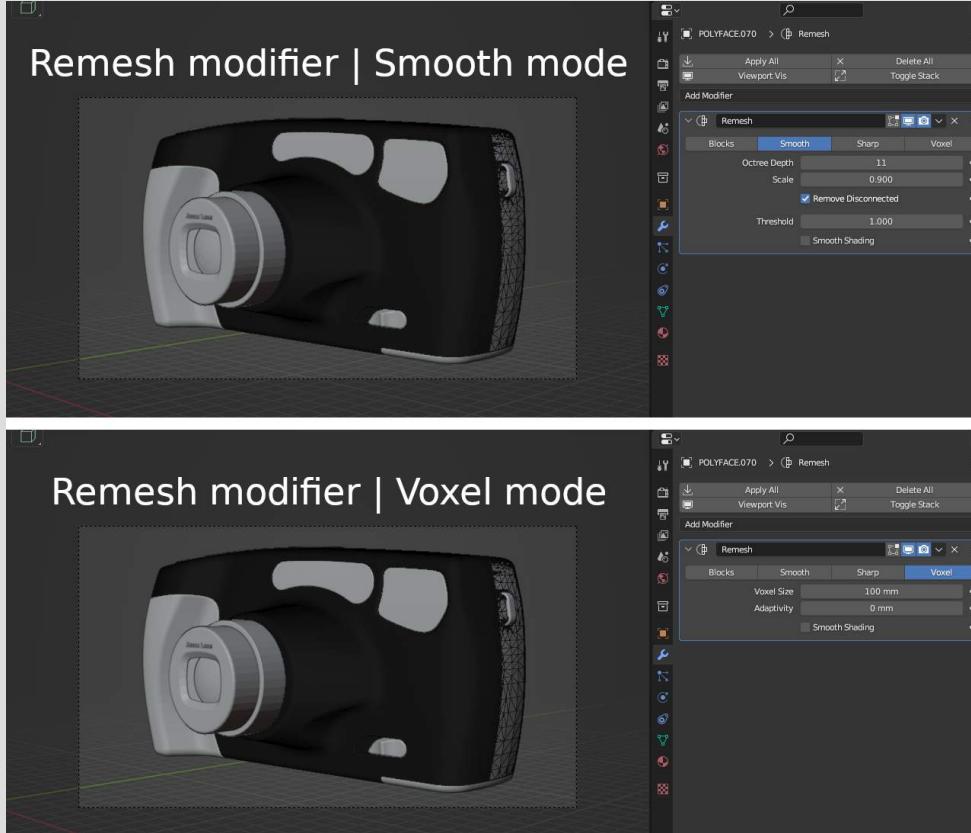
# Geometry retopology examples



Result geometry created with Remesh rollout using Voxel retopology algorithm.



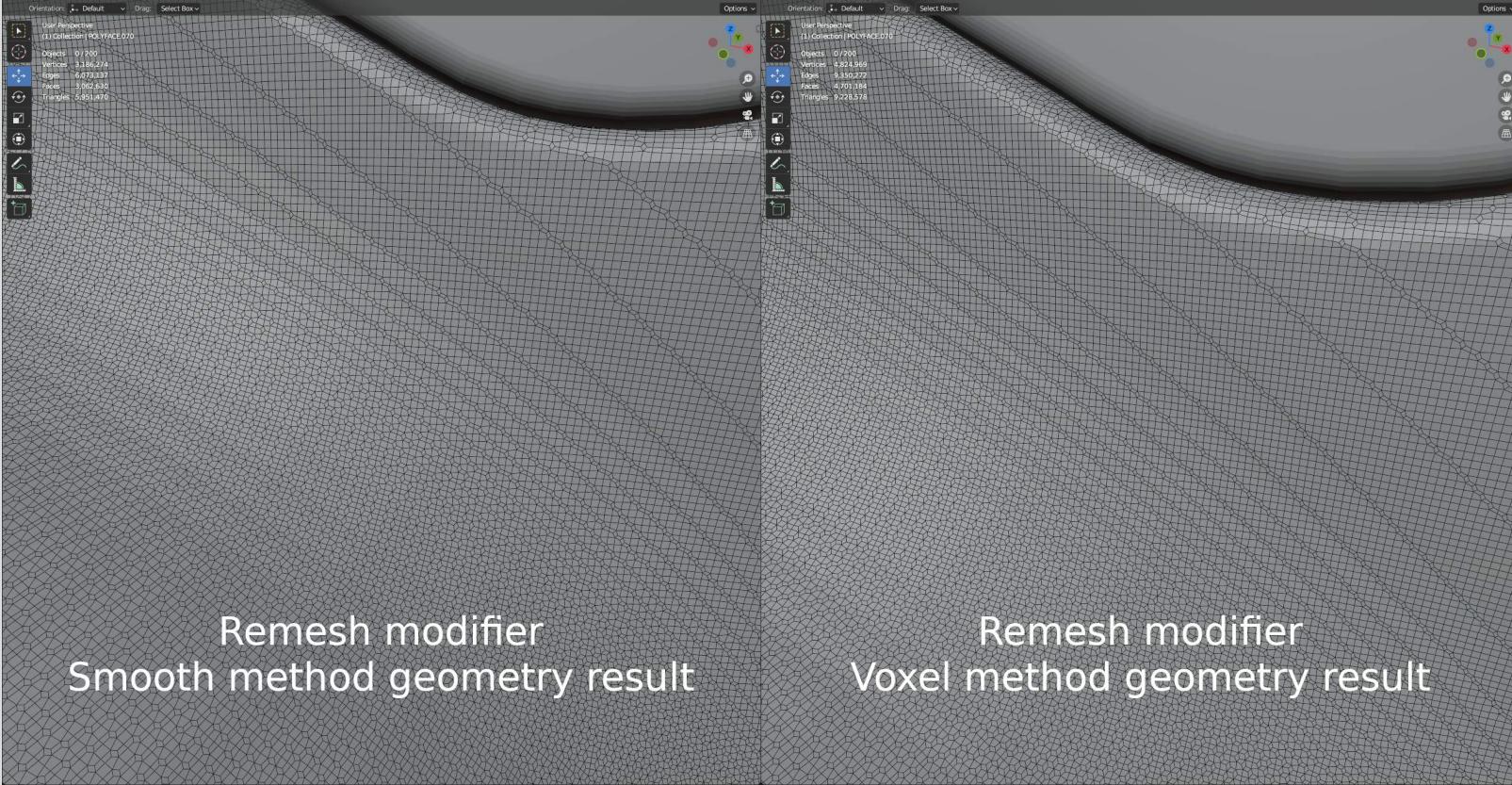
# Geometry retopology examples



Result geometry created with Remesh modifier using Smooth and Voxel retopology algorithm.



# Geometry retopology examples



Result geometry created with Remesh modifier using Smooth and Voxel retopology algorithm.



# *DEMO*



# IN NEXT VIDEO

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

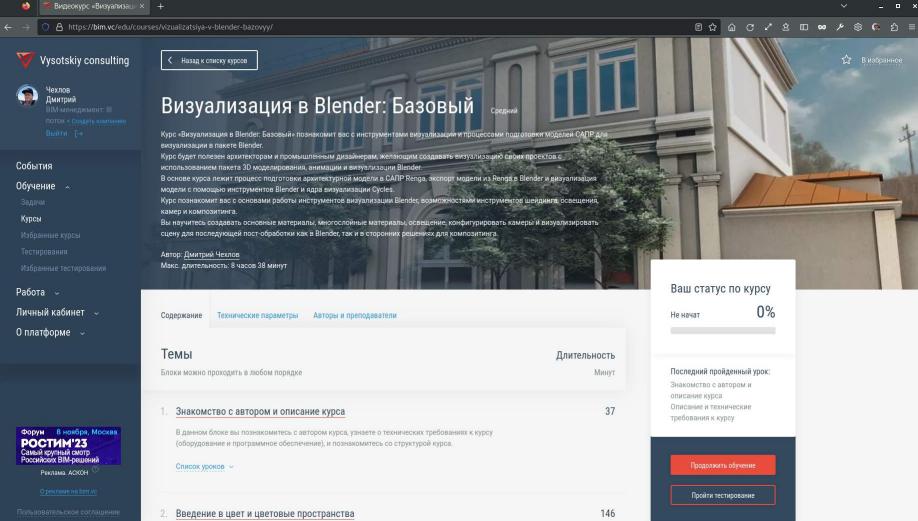


## Working with Cryptomatte pass Blender Cycles Workflow

ПРИ ПОДДЕРЖКЕ



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.

Визуализация в Blender: Базовый

Курс «Визуализация в Blender: Базовый» познакомит вас с инструментами визуализации и процессами подготовки моделей САПР для визуализации в пакете Blender.

Курс будет подавать основы работы с базовыми и продвинутыми инструментами, помогая создавать визуализации самых проектов с помощью инструментов 3D моделирования, анимации и визуализации Blender.

Курс поможет вам с основами работы с инструментами Blender и идея визуализации Cycles.

Курс познакомит вас с основами работы инструментами Blender, возможностями инструментов шейдеров, освещения, камеры и композитинга.

Вы научитесь создавать основные материалы, металлические материалы, освещение, конфигурировать камеры и визуализировать сцену для последующей пост-обработки как в Blender, так и в сторонних решениях для композитинга.

Автор: Дмитрий Чехлов

Макс: Дмитрий Чехлов

Время: 8 часов 38 минут

Содержание Технические параметры Авторы и преподаватели

Темы	Длительность
Блоки можно проходить в любом порядке	Минут
1. Знакомство с автором и описание курса	37
В данном блоке вы познакомитесь с автором курса, узнаете о технических требованиях к курсу (ободорудование и программное обеспечение), и познакомитесь со структурой курса.	
<a href="#">Список уроков</a>	
2. Введение в цвет и цветовые пространства	146

Ваш статус по курсу

Не начат 0%

Последний пройденный урок:

Знакомство с автором и описание курса

Описание и технические требования к курсу

[Продолжить обучение](#)

[Пройти тестирование](#)



Image by Dmitry «dimson3d» Chekhlov from Course Project



You can support author with subscription on Boosty.

## My Boosty page.



dimson3d - эксклюзивный контент на Boosty - Google Chrome

boosty.ru dimson3d

мои подписки сообщения

ОБНОВИТЬ ОБЛОЖКУ

dimson3d Computer Graphics, Education, Writing

ОБ АВТОРЕ

Привет, меня зовут Дмитрий в сети известен как «dimson3d». Я родился в 1986 году, в городе Свердловске (ныне Екатеринбург), все детство что-то рисовал и сочинял, записывая всякие истории. Работаю в сфере компьютерной графики и технологий визуализации, изучаю различные инструменты и создаю решения на их основе или просто выполняю визуализацию :). На протяжении последних лет, публикую множество статей по компьютерной графике и технологиям, и продолжаю публиковаться на страницах известного on-line журнала по компьютерной графике — RENDER.RU.

УРОВНИ ПОДСКАЗКИ

BASIC - На почитать 300 ₽ в месяц

C помощью подписки BASIC вы получаете доступ ко всем постам блога и анонсам с превью.

Редактировать

EXTENDED 450 ₽ в месяц

C подпиской EXTENDED включено все что есть в подписке BASIC, а также вы будете упоминаться в моих видео и получать дополнительные материалы к публикациям. Сможете следить за созданием нового контента.

Редактировать

CONSULT & EDUCATION 750 ₽ в месяц

Page in Work In Progress edition.

Написать пост

Создать трансляцию

ДОНАТЫ

Поделитесь ссылкой на вашу страницу сбора донатов

Скопировать ссылку

ПРОГРЕСС ОБУЧЕНИЯ 88%

Первые шаги 5/5 >

Цели и подписки 1/1 >

Первый пост 1/1 >

Выход средств 0/1 >

Выполните все пункты, и вы будете готовы привлечь деньги от своих фанатов!

ЦЕЛИ

0 из 30 000 ₽ собрано

Разработка контента требует много времени и хорошего оборудования, благодаря вашей поддержке, я улучшу свои компьютеры и буду чаще радовать контентом.

=====

- В январе 2015 года прошел экзамен по сертификации Autodesk. Являюсь сертифицированным профессиональным пользователем Autodesk Maya, удостоенным сертификатом Autodesk Maya 2015 Certified Professional.

- В 2015 году из под пера вышла моя первая книга **ВИЗУАЛИЗАЦИЯ В AUTODESK MAYA. MENTAL RAY RENDERER**. ISBN: 978-5-97060-368-0 <https://dnkpress.com/catalog/computer/3d/978-5-97060-368-0/>

- В 2021 году была опубликована моя вторая книга **V-RAY ДЛЯ AUTODESK MAYA. РУКОВОДСТВО**.

