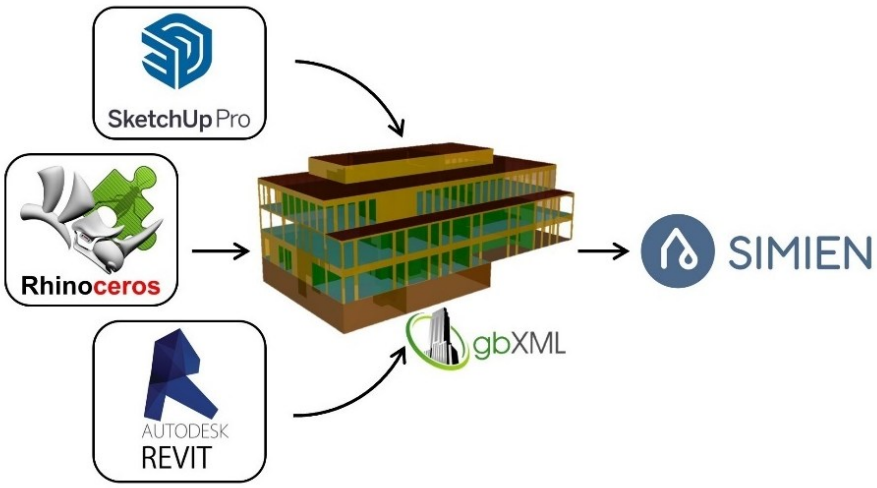
Simien's gbXML 3D geometry import feature
v2.0

Introduction to gbXML

The Green Building XML (gbXML) format is an open data schema developed to facilitate the exchange of information between building design and engineering analysis software tools. It is primarily used in the building energy modelling (BEM) and simulation community, where accurate and interoperable data exchange is critical for the design and optimization of energy-efficient buildings.

The gbXML schema is structured as a hierarchical, tree-based format, which organizes information in a parent-child relationship. This tree structure allows for a clear and logical organization of data, where complex building models can be broken down into smaller, more manageable components. The gbXML schema contains over 500 types of elements and attributes, each designed to capture specific aspects of a building. These elements and attributes describe everything from the overall building geometry and materials to intricate details like HVAC systems, lighting, and occupancy patterns.

The gbXML schema was developed and is maintained by the gbXML Consortium, a collaborative group of software vendors, building professionals, and industry stakeholders. The consortium aims to promote interoperability between different software platforms by maintaining and advancing the gbXML schema, ensuring it meets the evolving needs of the industry. The consortium's efforts support the broader adoption of energy-efficient design practices by making it easier to share data between various software applications used in the building design and analysis process.



Software supporting gbXML

Several leading 3D modelling and BIM software platforms support the export of gbXML files. Here are some of the key programs that offer gbXML export functionality:

- SketchUp + OpenStudio Plugin: SketchUp, a popular 3D modelling software, can export gbXML files using the OpenStudio Plugin. This plugin adds building energy modelling tools to SketchUp, allowing users to model thermal zones, HVAC systems, and material properties directly within the software. The OpenStudio Plugin provides tools to define and edit building spaces, surfaces, and zones, and to assign attributes like insulation, window types, and occupancy schedules. Once the model is complete, the plugin allows users to export all relevant data, including geometry and energy-specific details, in the gbXML format for use in energy simulation tools.

- Revit: Autodesk Revit is a widely used Building Information Modelling (BIM) software that natively supports gbXML export. Within Revit, users can define Rooms and Spaces—critical elements that represent the physical areas and zones within the building. These Rooms and Spaces are used to generate an analytical model that forms the basis for gbXML data export. Revit's analytical model includes surfaces, zones, and thermal properties, which are essential for accurate representation in the gbXML schema. The software allows users to assign detailed attributes to these elements, such as material properties, insulation levels, and internal load parameters like lighting and equipment. Once the model is developed, Revit can export all of this data—including the geometry, Room/Space definitions, analytical surfaces, and systems information—in the gbXML format.

- Rhino + Grasshopper: Rhino, a 3D modelling software, when used with Grasshopper, a visual programming language, allows for the creation of parametric models that can be exported as gbXML files. This setup is often enhanced with plugins like Honeybee and Ladybug, which enable users to define thermal zones, material properties, and building systems within Grasshopper. These models can then be exported in the gbXML format, making them compatible with Simien. This combination is particularly useful for designers and architects who need to integrate parametric design with gbXML-based energy simulation workflows.

gbXML viewer and converter in Simien

Currently, Simien does not have a 3D geometry editor, and developing this capability is one of our major goals for the future. At present, Simien relies on an XML-based input file that organizes data in a tree structure, similar to gbXML.

By integrating a 3D editor that uses gbXML, we plan to enhance Simien's functionality, allowing for more intuitive and detailed building model creation directly within the platform.

To understand user acceptance of the gbXML approach, we have created a gbXML viewer (based on the open-source Spider gbXML viewer) and conversion tool. This tool allows users to visualize their gbXML files, which are typically exported from a variety of 3D design programs such as Revit, SketchUp, and Rhino, and convert them into a Simien input file (.SXI)

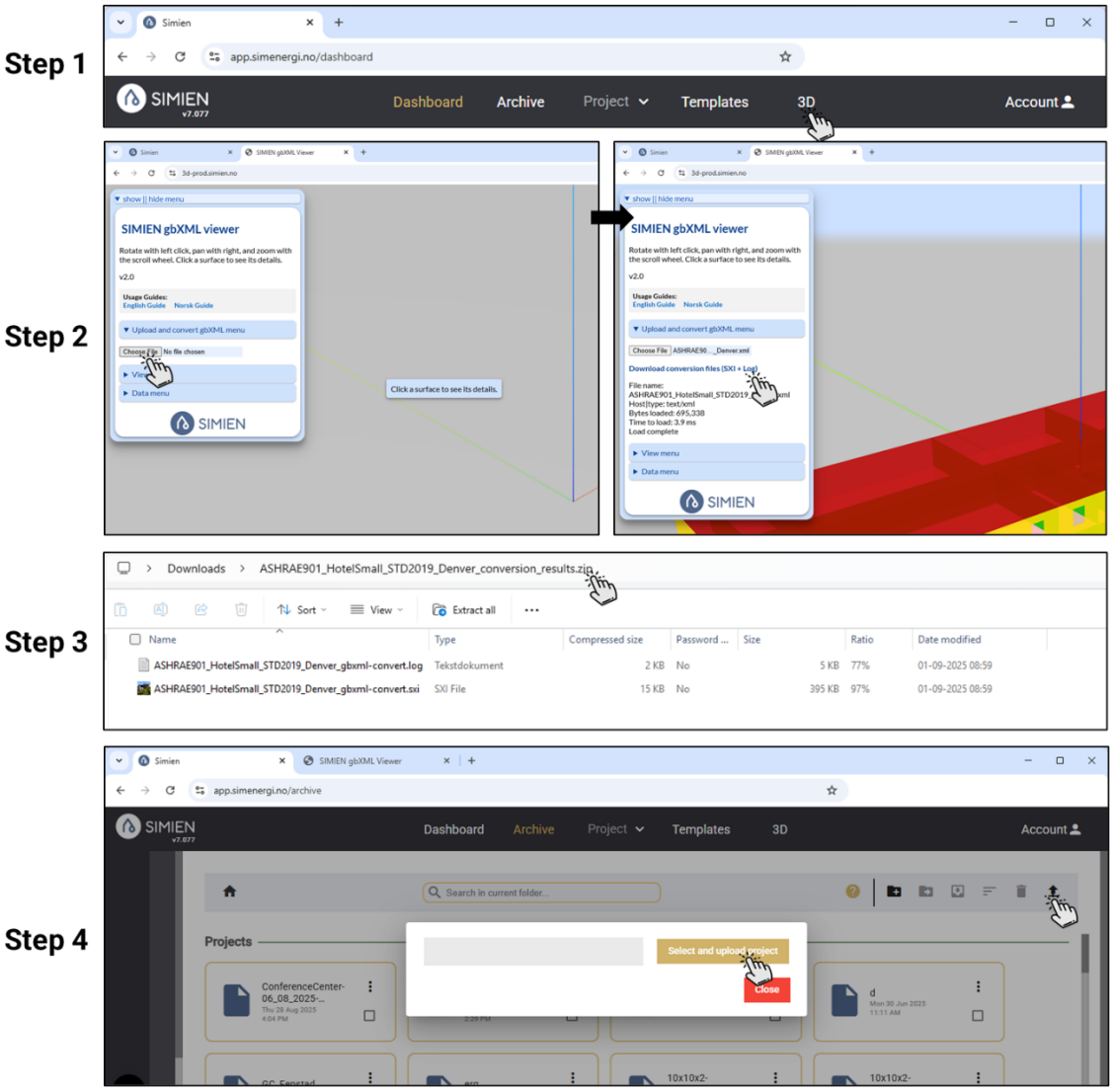


Figure: Steps to load and convert a gbXML file in the Simien viewer:
(1) Access the 3D section of the Simien PRO,
(2) Upload the gbXML file using the viewer interface which will automatically start the conversion,
(3) Download the zip file containing conversion files (Simien .sxi and a .log file), and
(4) Upload the converted .sxi file into the Simien archive for further model filling.

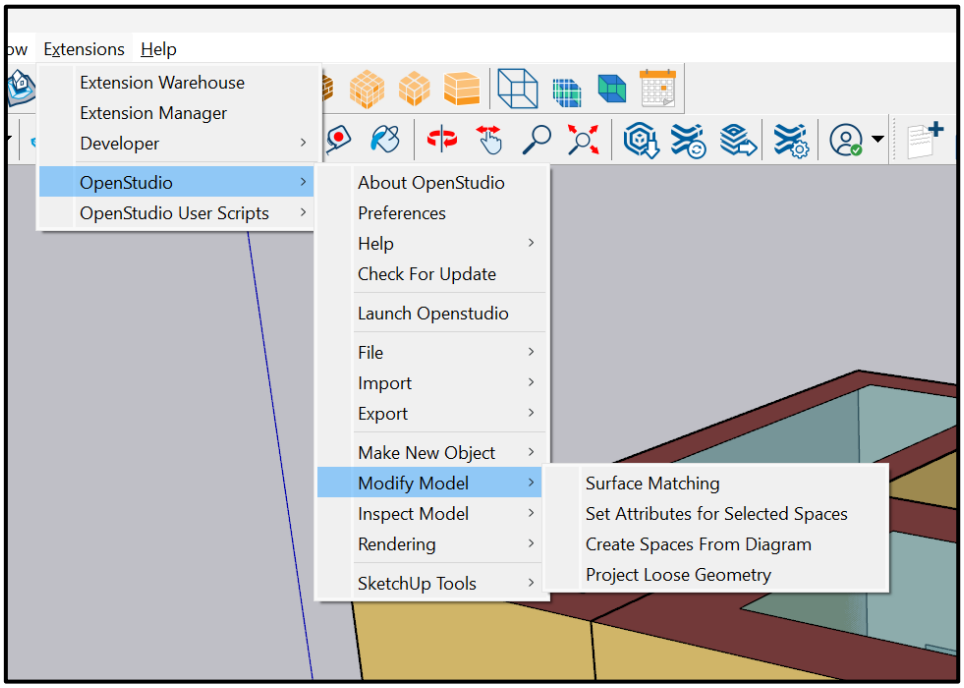
Currently following gbXML elements are imported from gbXML file and translated into to the Simien input file:

- gbXML Space → Simien Zone (default building type as “Housing”)
- gbXML Surface: ExteriorWall → Simien Façade
- gbXML Surface: InteriorWall → Simien Partition or Zone Connection
- gbXML Surface: InteriorFloor → Simien Partition or Zone Connection
- gbXML Surface: Ceiling → Simien Partition or Zone Connection
- gbXML Surface: Roof → Simien Roof
- gbXML Surface: RaisedFloor → Simien Floor (type: uoppvarmet)
- gbXML Surface: ExposedFloor → Simien Floor (type: friluft)
- gbXML Surface: SlabOnGrade → Simien Floor (type: grunn)
- gbXML Openings: FixedWindow → Simien Window or Zone connection (type: vindu) *)
- gbXML Openings: FixedDoor → Simien Window or Zone connection (type: Vegg/dør)
- gbXML Shade → Simien Window Overhang or Building protrusion on the right/left side
- gbXML Surface: Roof → Simien Roof
- gbXML Openings: FixedSkylight → Simien Window

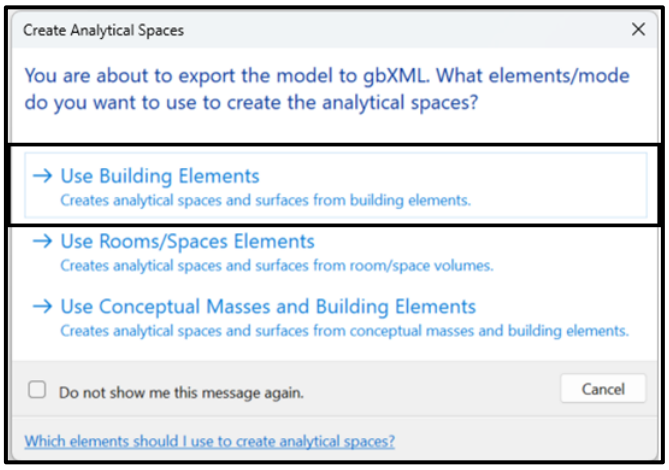
*) A non-rectangular Simien:Window will be converted into a gbXML RectangularGeometry, i.e., a rectangle with same area.

Common errors

- In SketchUp remember to do Surface Matching before exporting as gbXML



- In Revit only use “Use Building Elements” options for exporting 3D model as gbXML.



- Depending on how shading objects are created in the 3D program where the gbXML is made, i.e., Revit, Sketchup or Rhino, separate empty zones could be made in the exported Simien model. These zones have no effect on the model and can be deleted.