



THE OHIO STATE UNIVERSITY

Your Perfect 3D World (BIM and GIS Integrated)

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Project Objectives

- Standardize Data
 - One Source à BIM Data
- Share Data in a Friendly and Accessible way
- Support the Decision Making Process

Buckeye BIM Initiative

- Medical Center
- complete
- Main Campus
- In Progress

Converted

- 15,525,022 sq ft
- Total
- 34,350,000 sq ft



BIM for Design and Construction

Developing BIM standards and execution plans for the design and construction process.

- The BIM Project Delivery Standard and BIM Implementation Plan have been approved by senior leadership.
- The BIM Project Delivery Standard has been published to the FOD website for use by AEC firms.
- Phase 1 of the Implementation Plan which include, training, updates to the BDS, support for several pilot projects, and finalization of the process to rapidly push data into AIA from the models has begun.

BIM for Existing Buildings

Moving from AutoCAD based floorplans to Revit based building models.

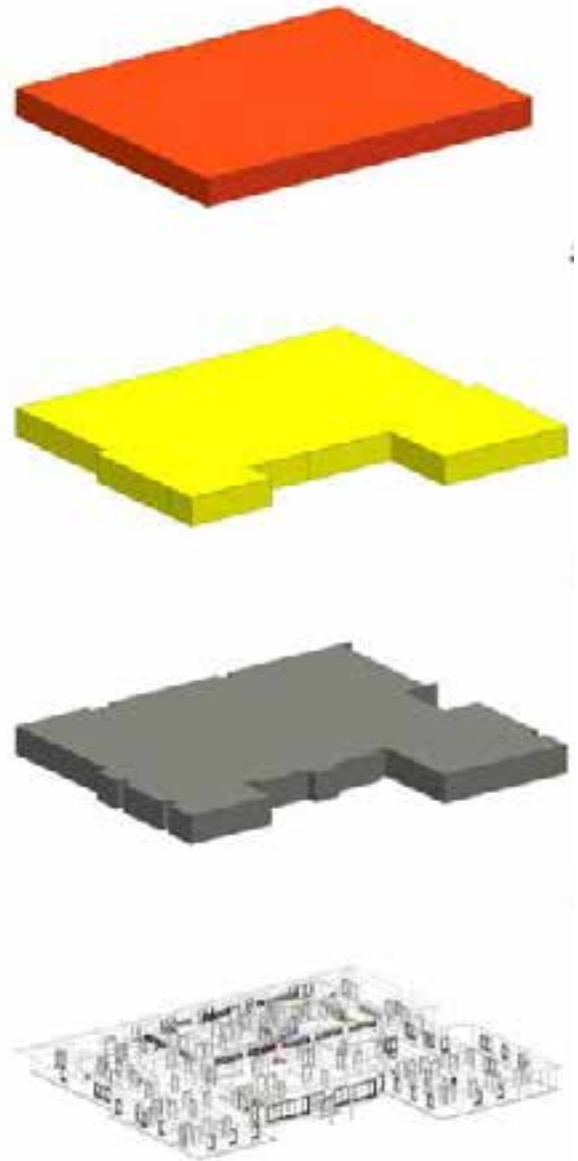


BIM Benefits for Design and Construction

- Improved design process
- 3-D visualization for owner (static only)
- Coordination between disciplines
- Interference checking
- Facilitates energy efficiency and LEED
- Automated quantity take offs
- 4-D scheduling
- Improved documentation of design intent
- Potentially used for fabrication

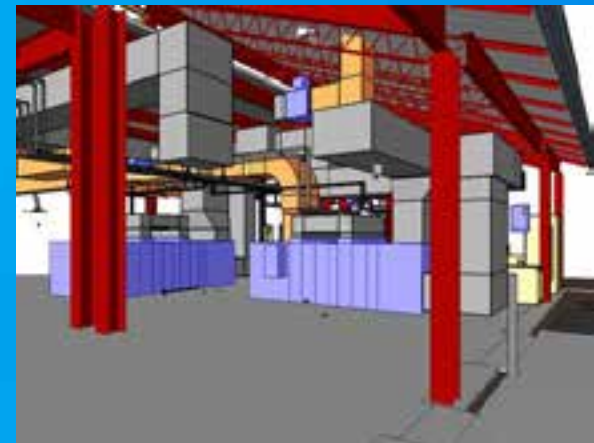


- **Conceptual Model (LOD1)**
 - Spaces, Volumes, approximate shapes
- **Approximate Geometry (LOD2)**
 - Generic elements, materials
 - Specific rooms/spaces
- **Precise Geometry (LOD3)**
 - Specific elements detailed
 - Interference checking
 - Suitable for Construction Documents
- **Fabrication (LOD4)**
 - Contractor/fabricator details
- **As-Built**



BIM to GIS Integration Issues

- BIM is MUCH richer in detail than GIS
- GIS has only recently become fully 3-D
- Design BIM contains all the information needed to construct a building, but not to manage it
 - Space polygons
 - Occupant information
 - Asset details (make, model, etc.)
 - Equipment maintenance data
- Missing tabular data can be supplied by Construction Operations Building Information Exchange (COBie)



IFC- The International Open Standard for BIM

- *IFC can be used to exchange and share BIM data between applications developed by different software vendors without the software having to support numerous native formats.*
- *As an open format, IFC does not belong to a single software vendor; it is neutral and independent of a particular vendor's plans for software development.*

IFC

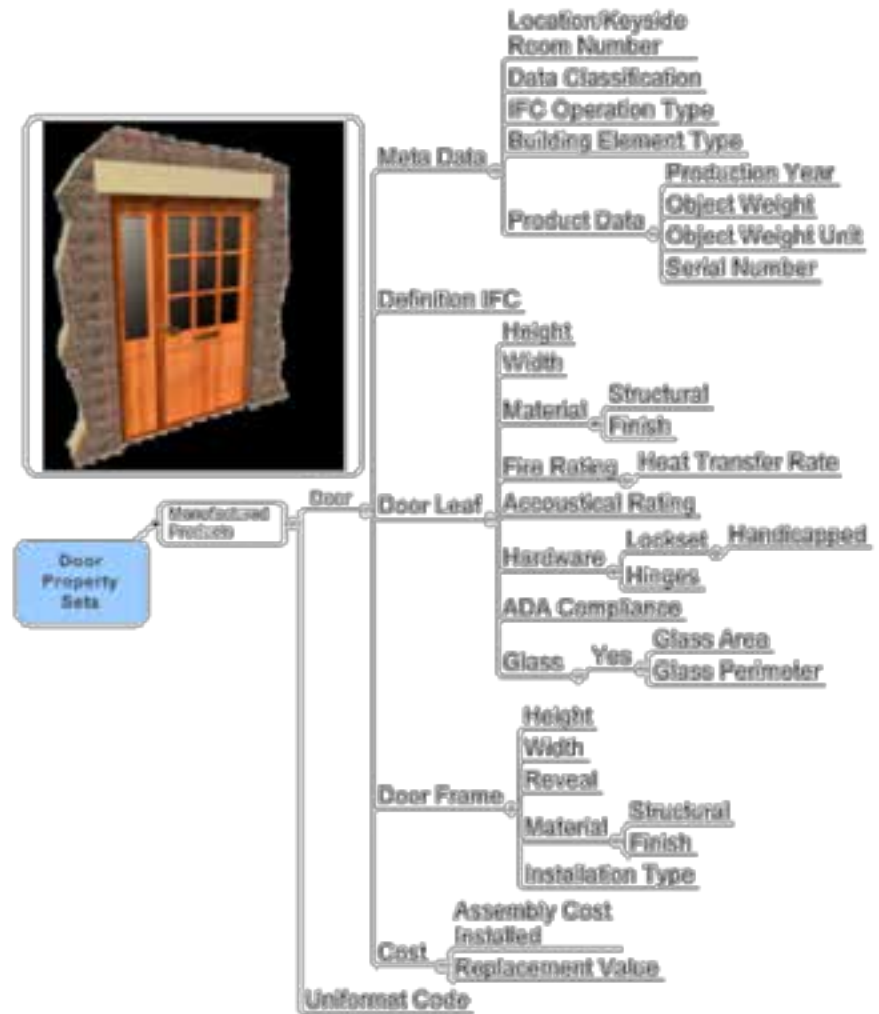


Standards

- *The IFC specification is written using the EXPRESS data definition language, defined as ISO10303-11 by the ISO TC184/SC4 committee.*
 - *It has the advantage of being compact and well suited to include data validation rules within the data specification.*
 - *It is an ASCII file format used to exchange IFC between different applications.*

Elements in BIM are Created in Detail

This data is required to convey the information needed to construct the facility.

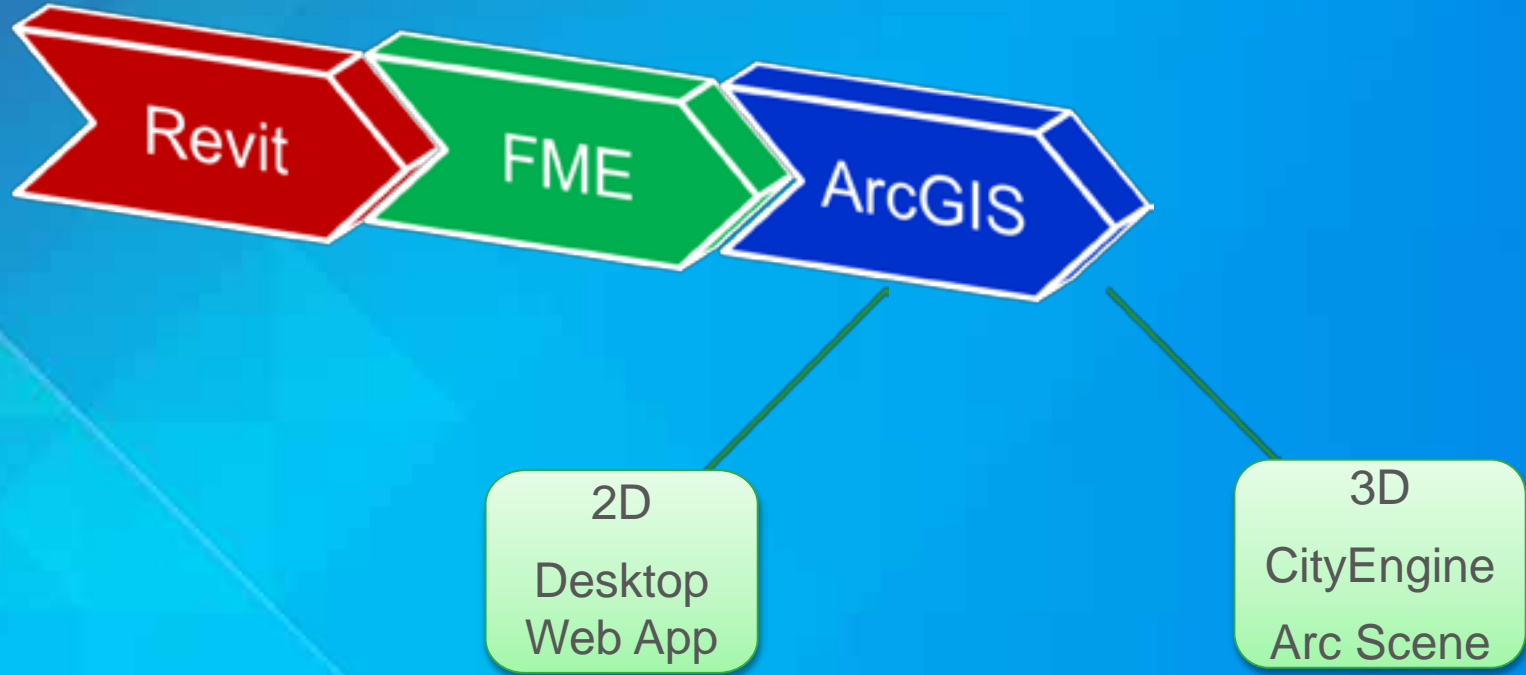


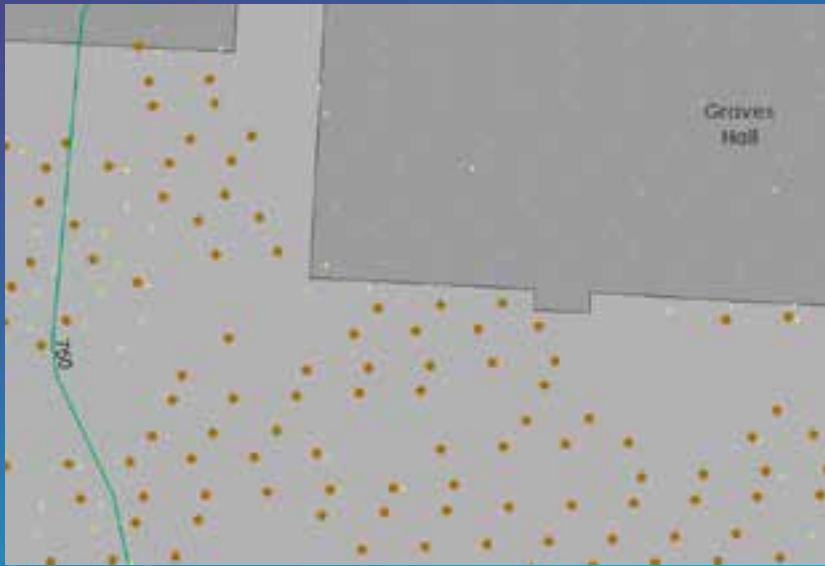
Door Data Property Sets Courtesy AEC Infosystems, Inc.

3D Formats

Format	Benefits	Limitations
COLLADA	<ul style="list-style-type: none"> • Support advanced material handling, asset instancing, and multiple UV sets • Static Model Import • Shape Import • Open to several software packages 	<ul style="list-style-type: none"> • Machine resource heavy • Light size file
CityGML	<ul style="list-style-type: none"> • OGC compliance • Not Software driven • Scalable modeling (Exterior and interior) • Indoor Modeling (routing) 	<ul style="list-style-type: none"> • Not a straight forward import • Light size file
3DS		<ul style="list-style-type: none"> • Old format (not very efficient)
OBJ	<ul style="list-style-type: none"> • Static Model Import • Shape Import 	<ul style="list-style-type: none"> • No indoor Modeling (routing) • No texture
KML	<ul style="list-style-type: none"> • Static Model Import • Shape Import 	<ul style="list-style-type: none"> • No indoor Modeling (routing)
Shape/Goedatabase [*]	<ul style="list-style-type: none"> • Static Model Import • Shape Import • "Native to the Software" 	<ul style="list-style-type: none"> • No indoor Modeling (routing) • No texture
Autodesk [®] FBX [®]	<ul style="list-style-type: none"> • support advanced material handling, asset instancing, and multiple UV sets 	<ul style="list-style-type: none"> • Some minimal Indoor modeling • Machine resource heavy • Movie driven • Not supported by FME
OSM	<ul style="list-style-type: none"> • Free source of data for the base data (2D only) 	<ul style="list-style-type: none"> • Not a 3D dataset

Data Conversion Workflow





Coordinates and
Elevation from ArcMap



Enter Coordinates in
Revit

Properties

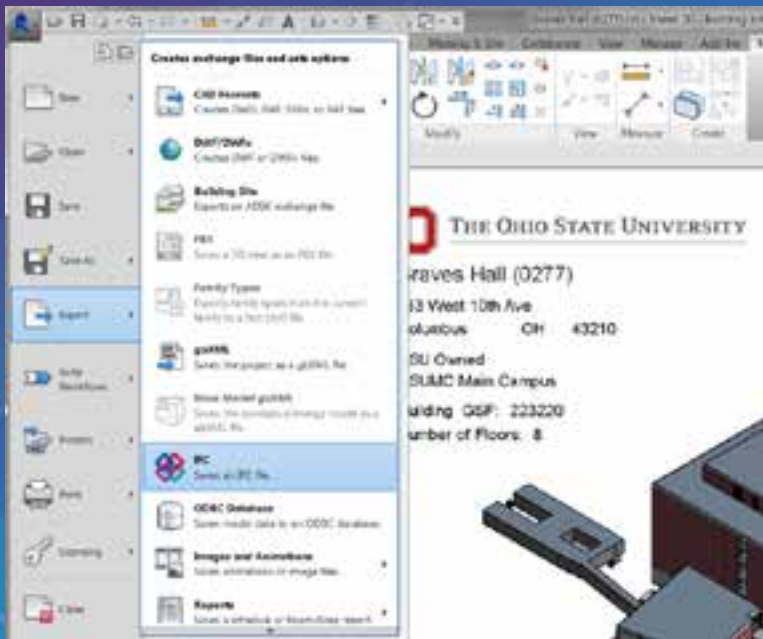
Project Base Point (1) Edit Type

Identity Data

N/S	726595' 4 217/256"
E/W	1823774' 0 77/128"
Elev	751' 0"
Angle to True No...	3.040°

Properties help Apply

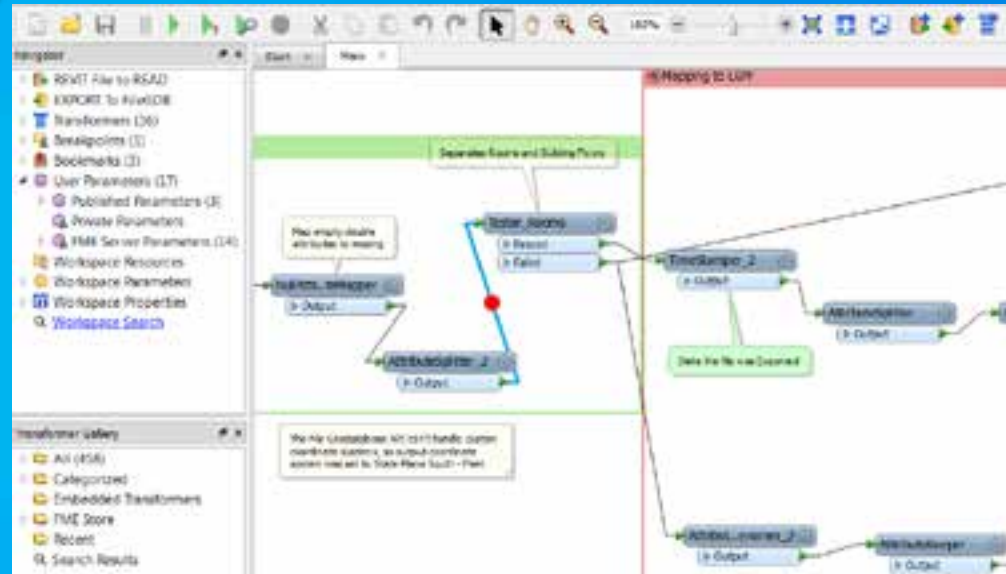
UP
DOWN
Elev 751' 0"
Angle to True North 3.040°



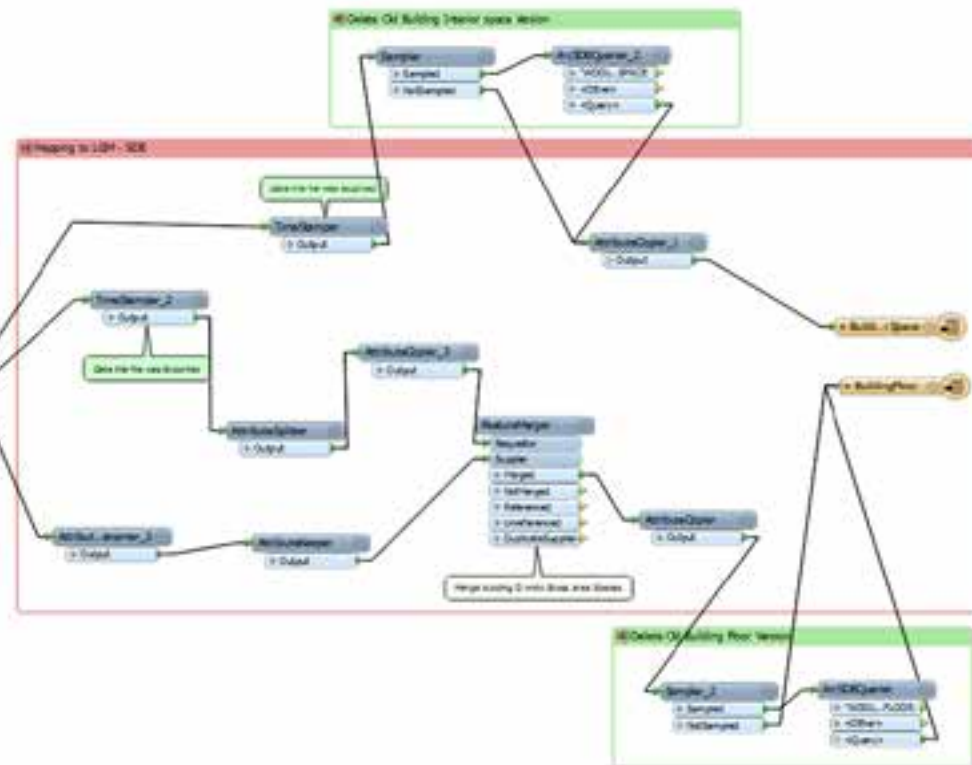
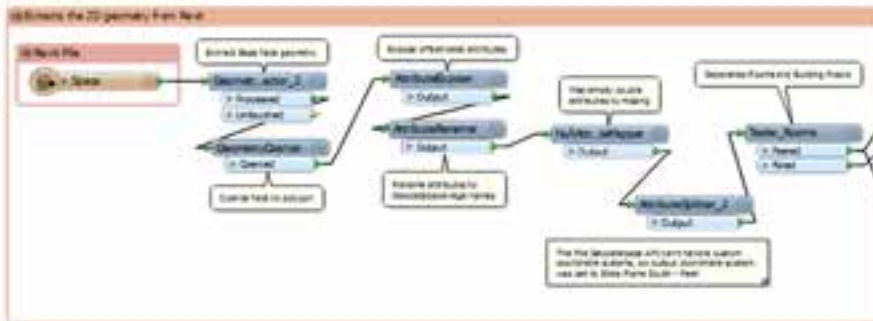
Export to IFC



Run FME Models



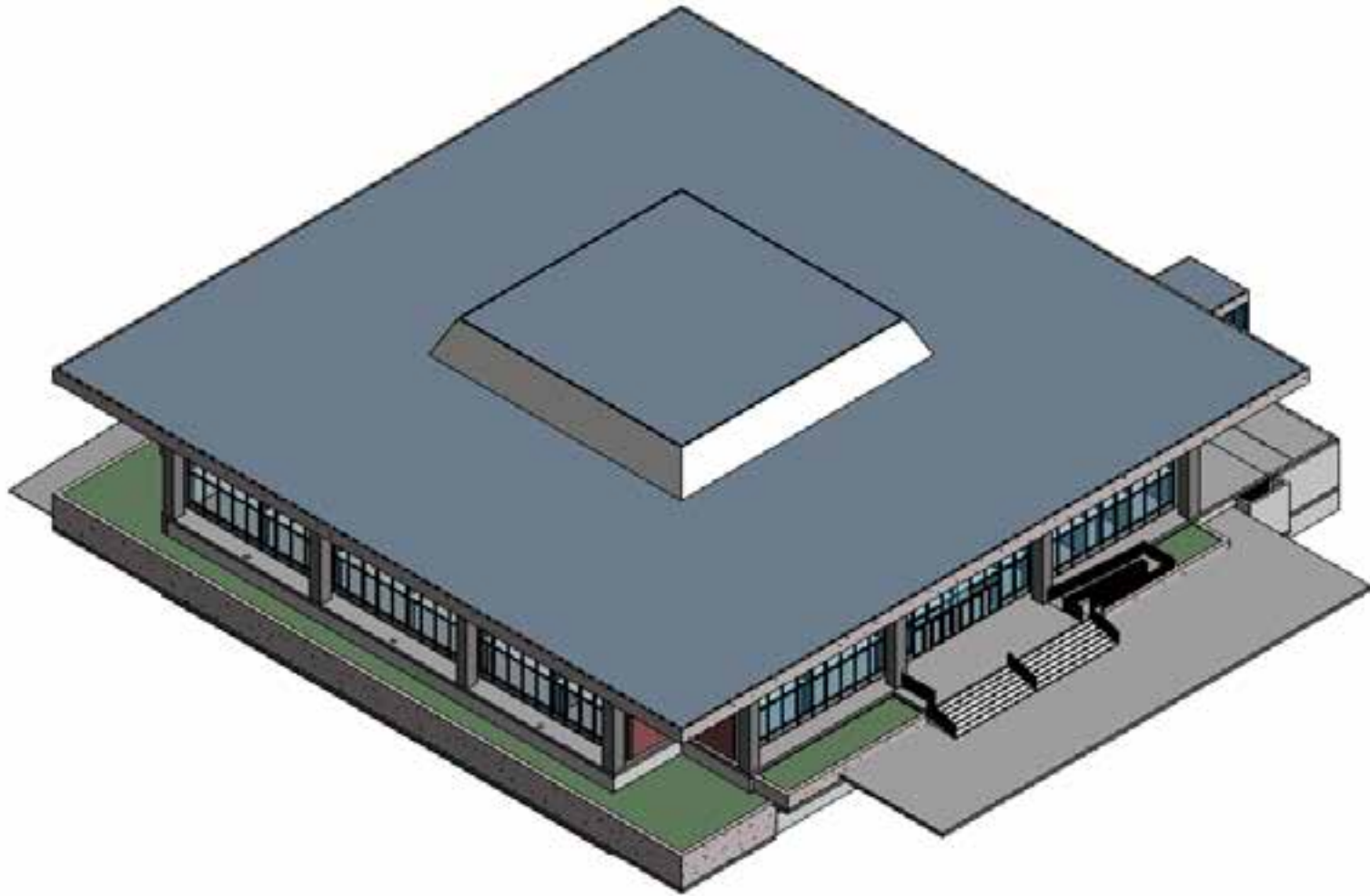
FME Conversion



Challenges- Conversion

- IFC handling of the columns
- Custom Attributes (Room ID) in Revit
- Coordinate System

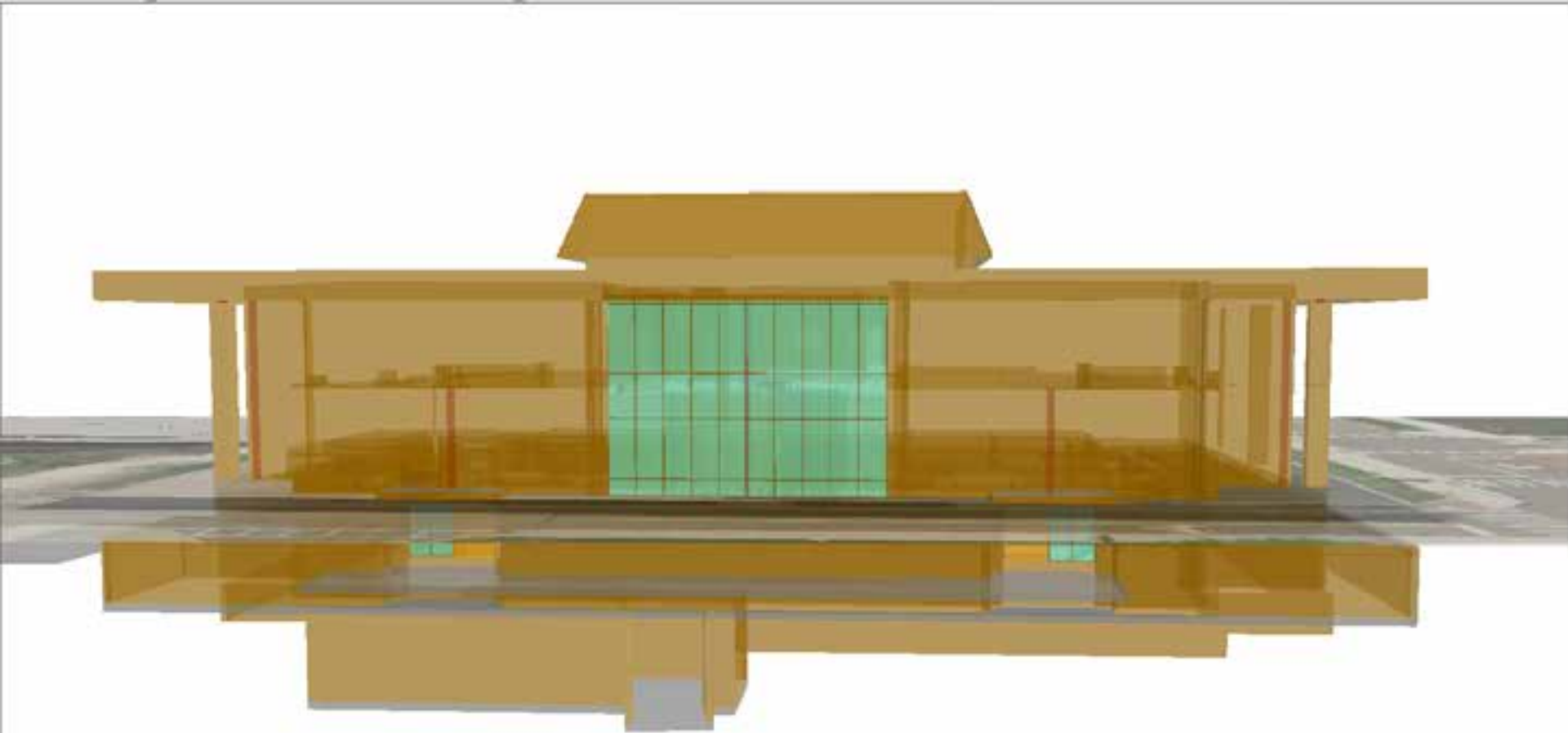
Revit File



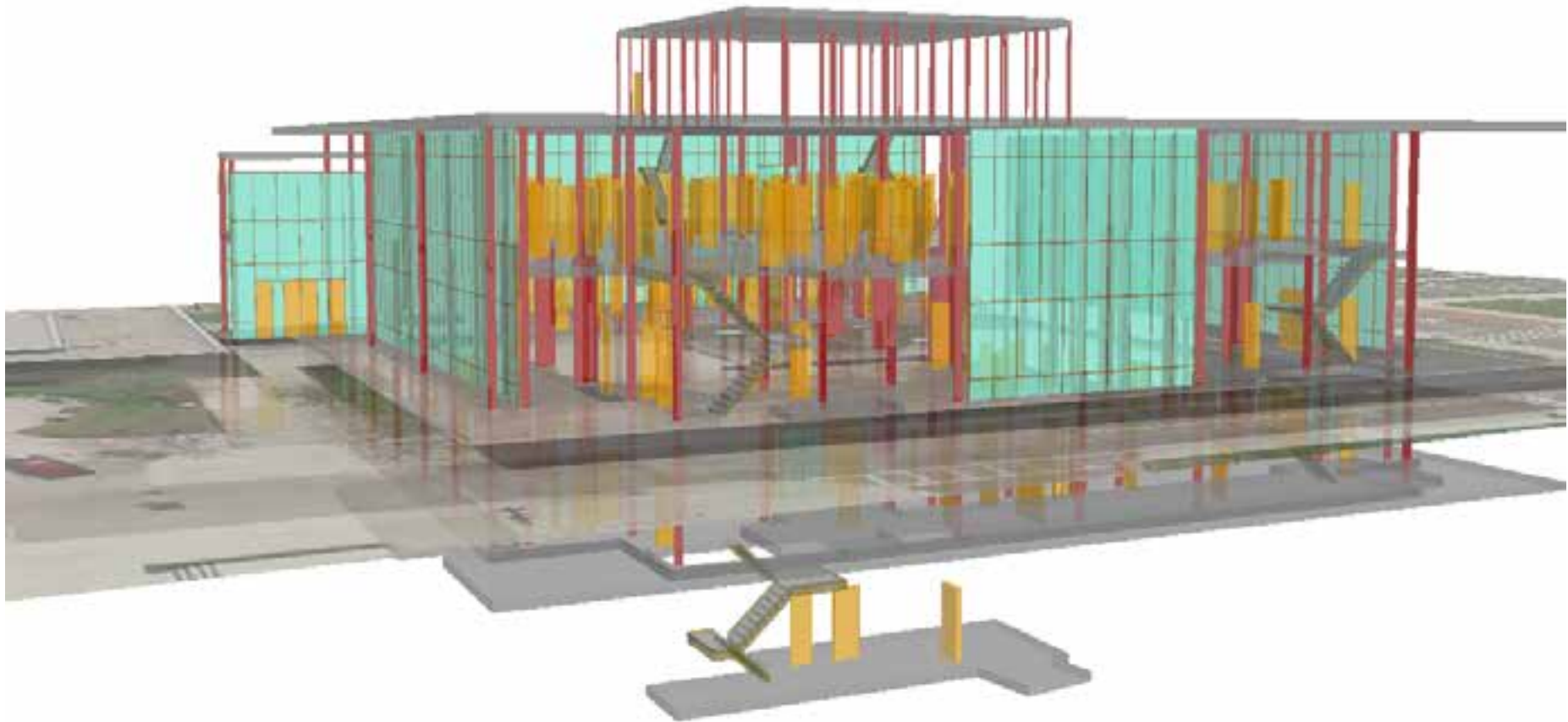
2D Geodatabase



3D Shapefile



3D Shapefile



2D Data Used in Web Application and Desktop

- Display floors around campus
- Find detailed information about a room
 - Organization
 - Department
 - College
 - Room Type
 - Function
 - Sub Room Type
 - Capacity
 - Room Number/Space ID
- Display building assessments
 - Interior Finishes
 - Exterior
 - Life Safety
 - Accessibility
 - Plumbing
 - HVAC
 - Electrical

Floorplans Link to Space Data (SIMS)

Select Layer: 01 ▾

You can choose from the above drop-down if multiple items are selected.

Clear Selection

SPACEID: 281-01-0160

Room Number: 0160

Room Type: 1C-Lecture Hall

Sub Room Type: null

Area: 4575.49

Organization: ADM-Medicine
Administration (100%)

Function: A-Instruction and Instruction
Support

Capacity: 75

Comment: null

Room Number: 0160

Room Type: 1C-Lecture Hall

Sub Room Type: null

Area: 4575.49

Organization: ADM-Medicine
Administration (100%)

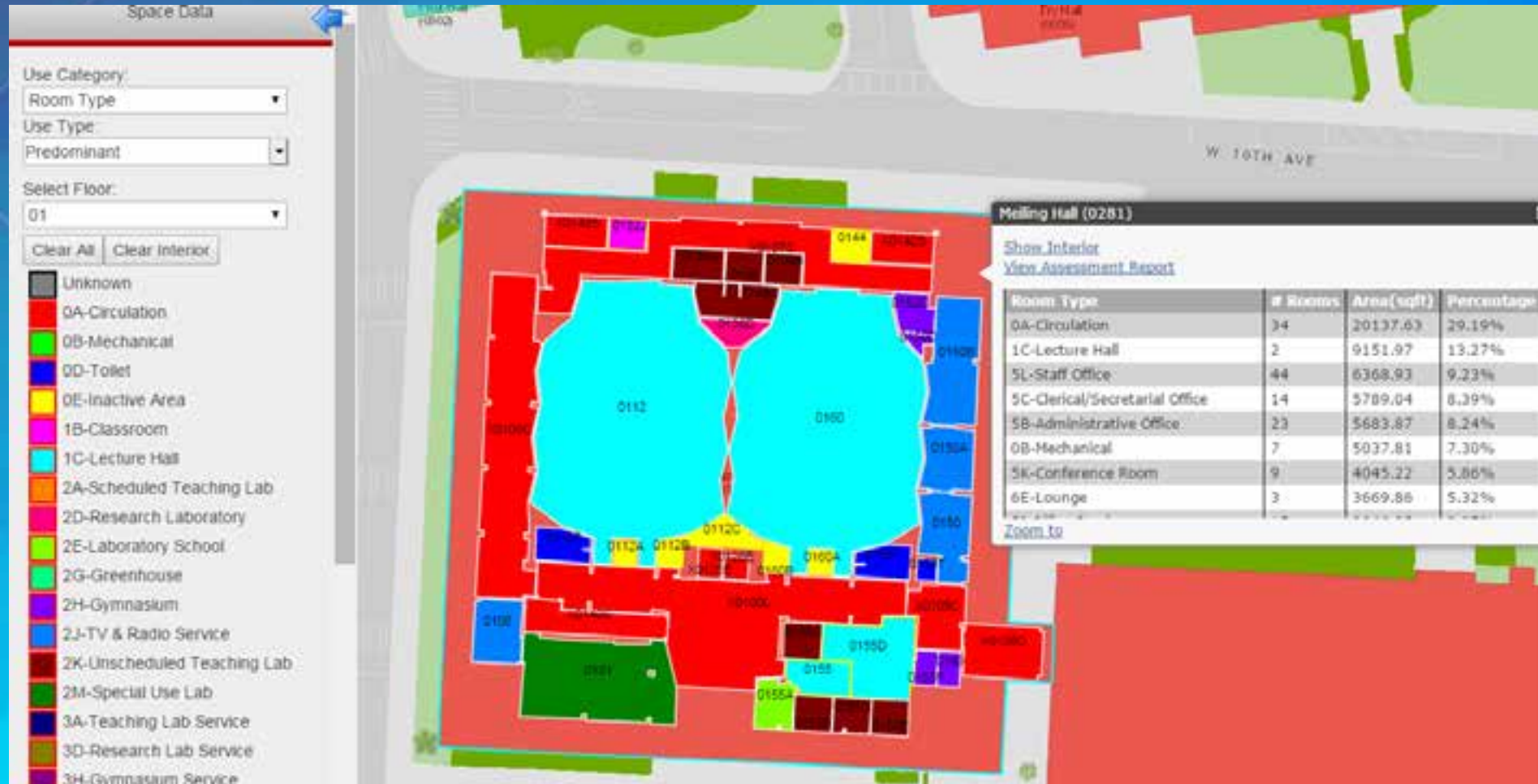
Function: A-Instruction and Instruction
Support

Capacity: 75

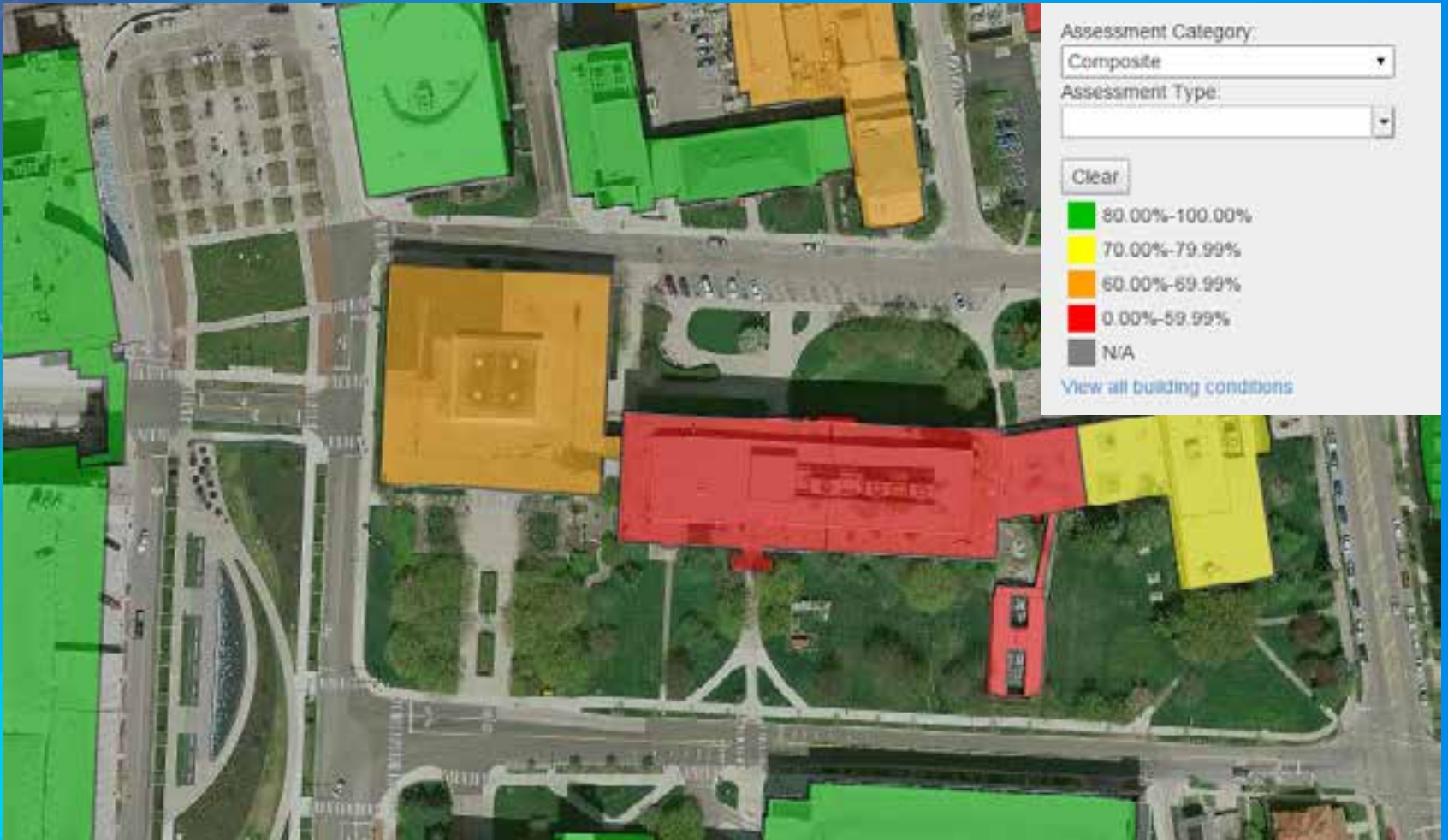
Comment: null



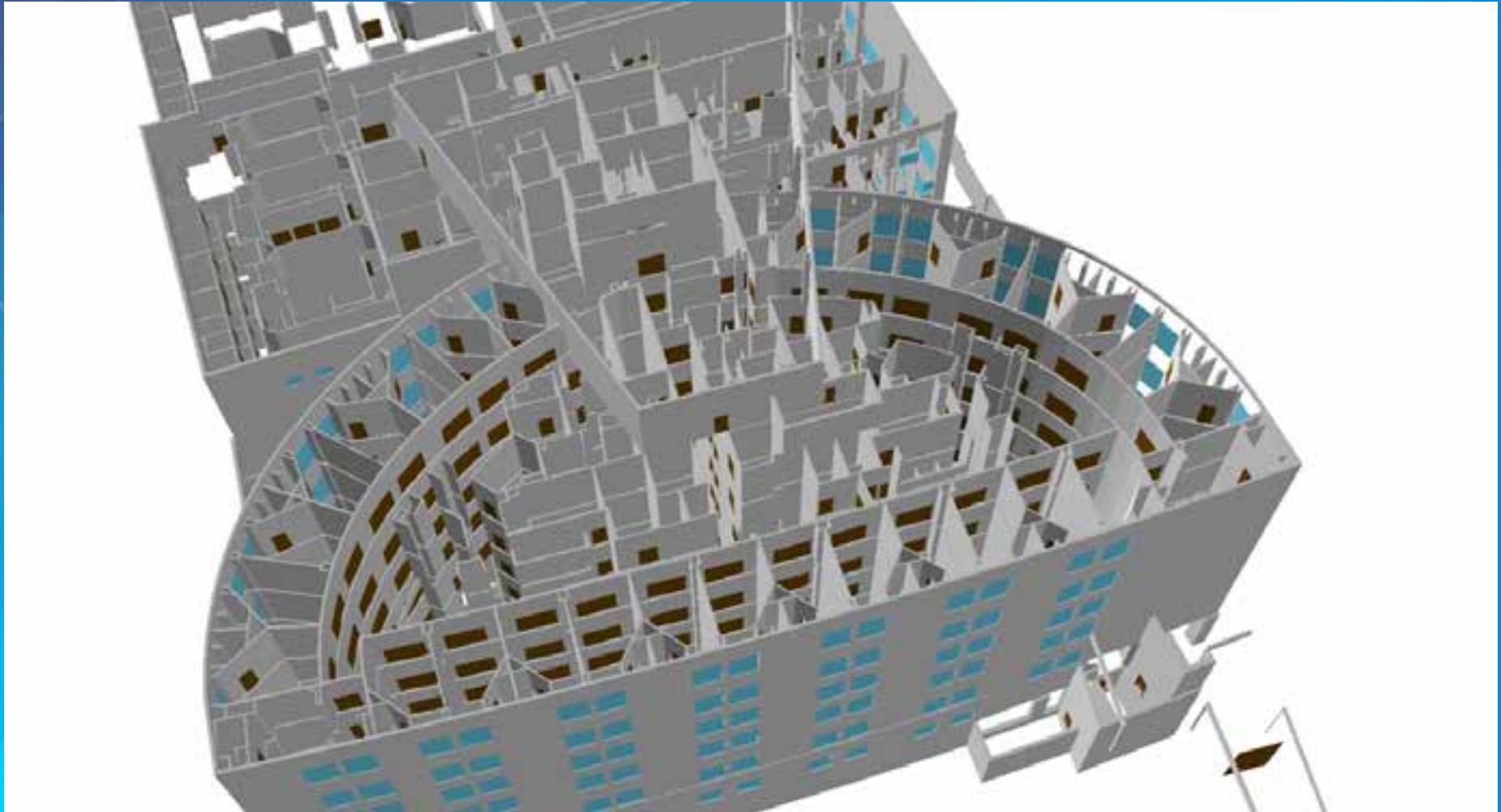
Categorization and Query of Space Utilization



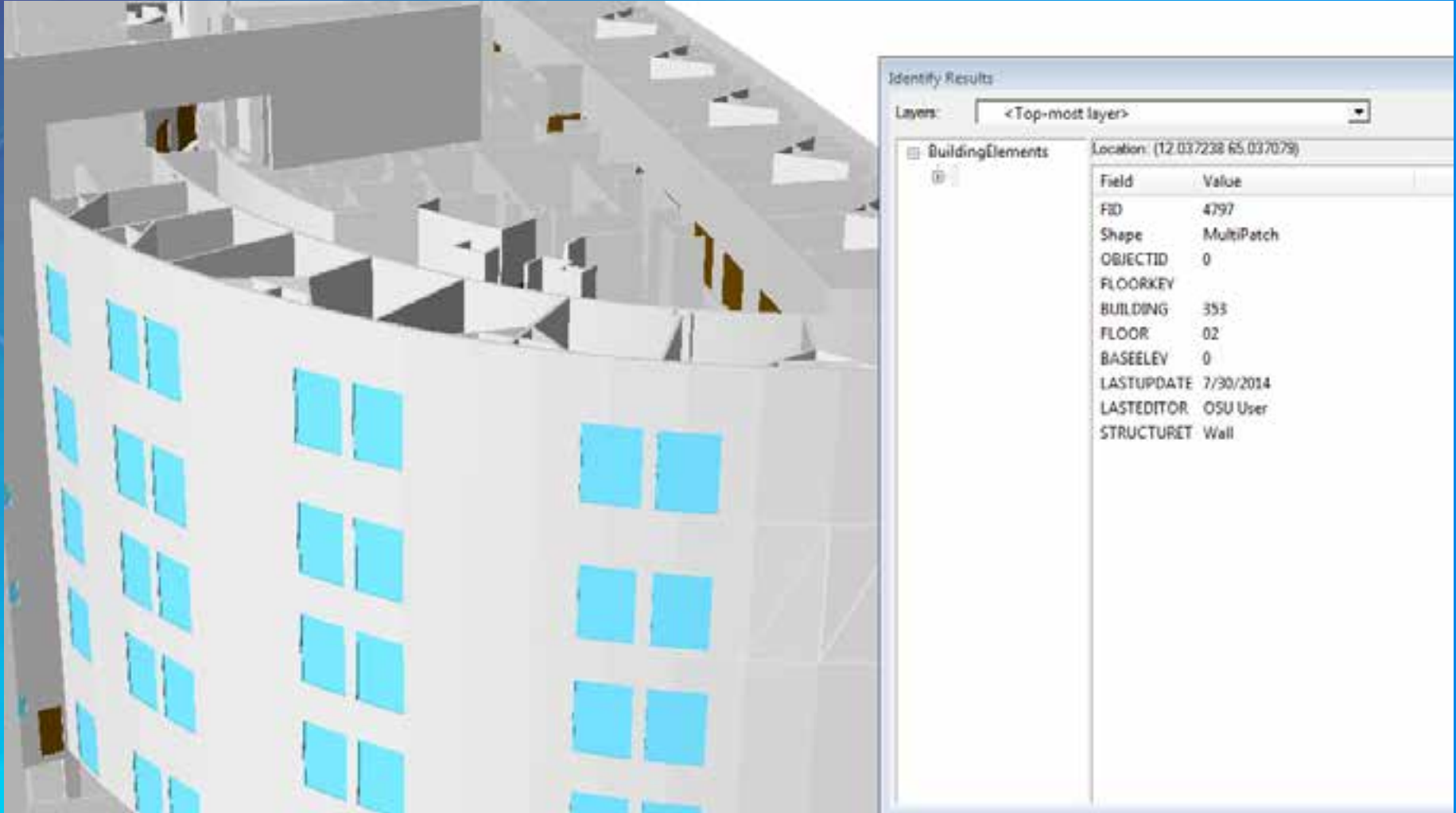
Buildings Link to Building Assessment Database



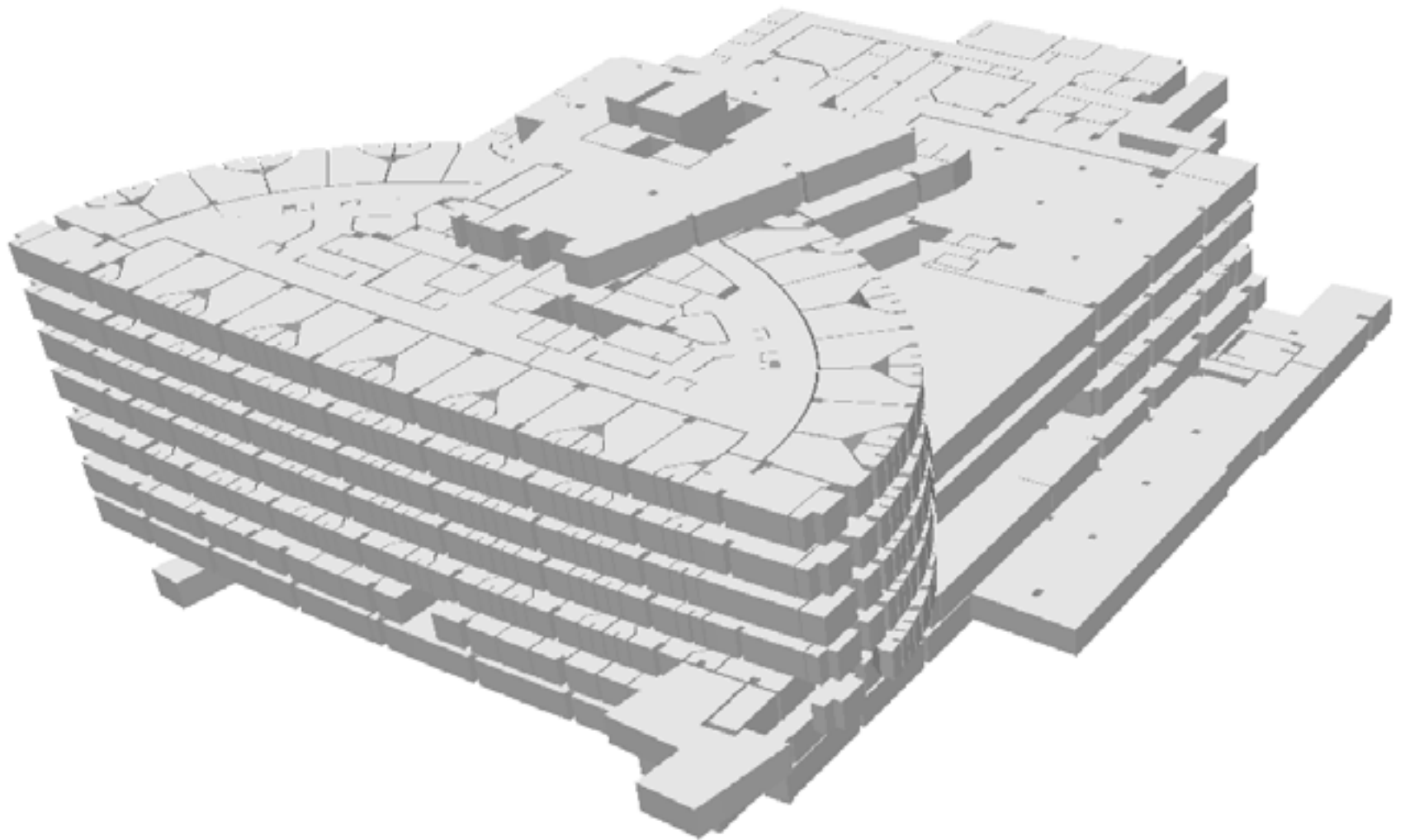
3D Data



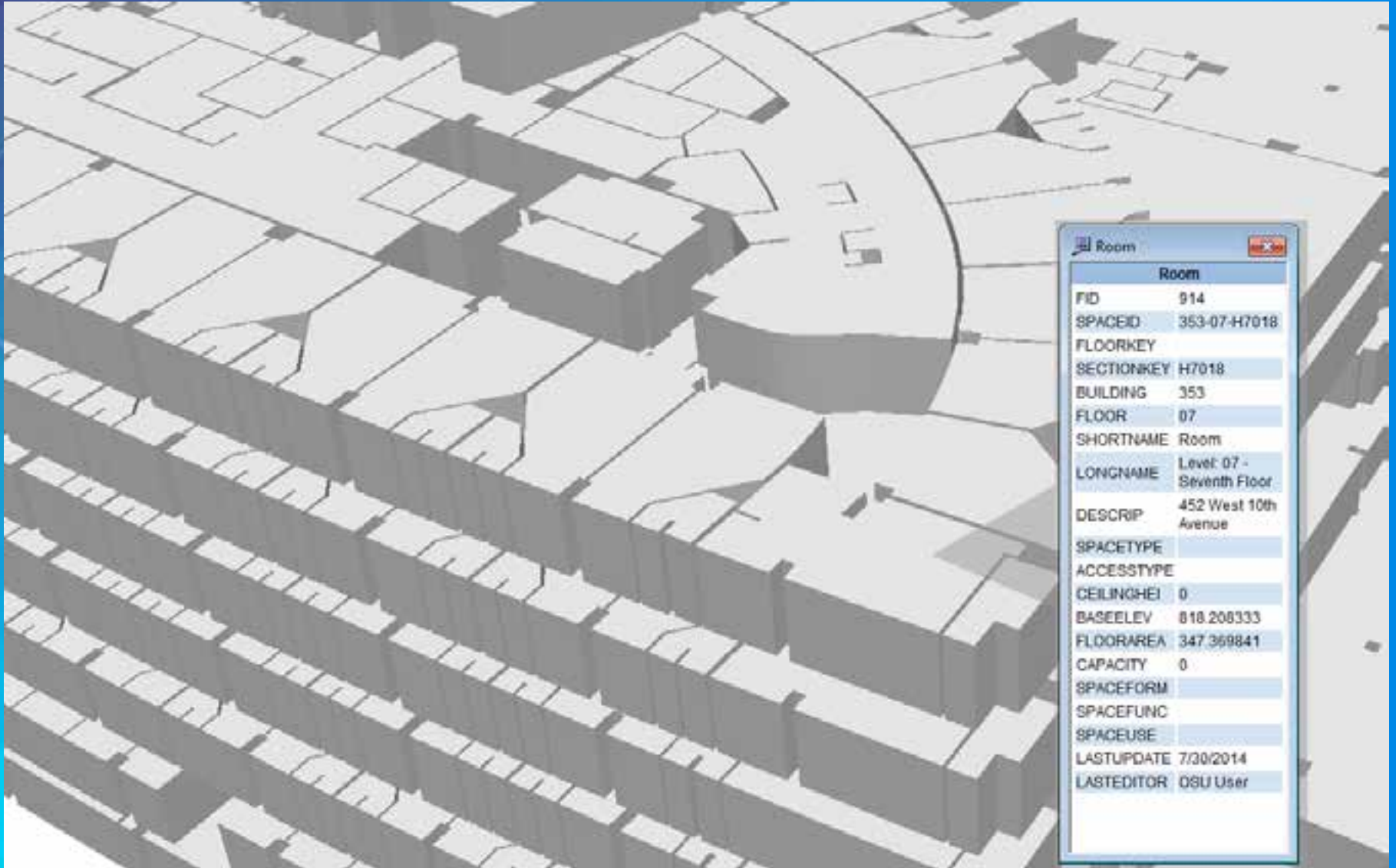
3D Data



3D Data



3D Data



LiDAR Extracted Buildings & 3D Shapes From BIM



3D Web App (City Engine)



Questions?

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