Immersed 3D Visualization of the University of Chicago Campus

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Immersed 3D Visualization of University of Chicago Campus

- **Discussion Outline**
  - Objectives of the Project
  - Data Utilized
  - Methods Used to build the Model
  - CAVE2 Visualization Environment
  - Tricks/Lessons Learned
  - Next Steps

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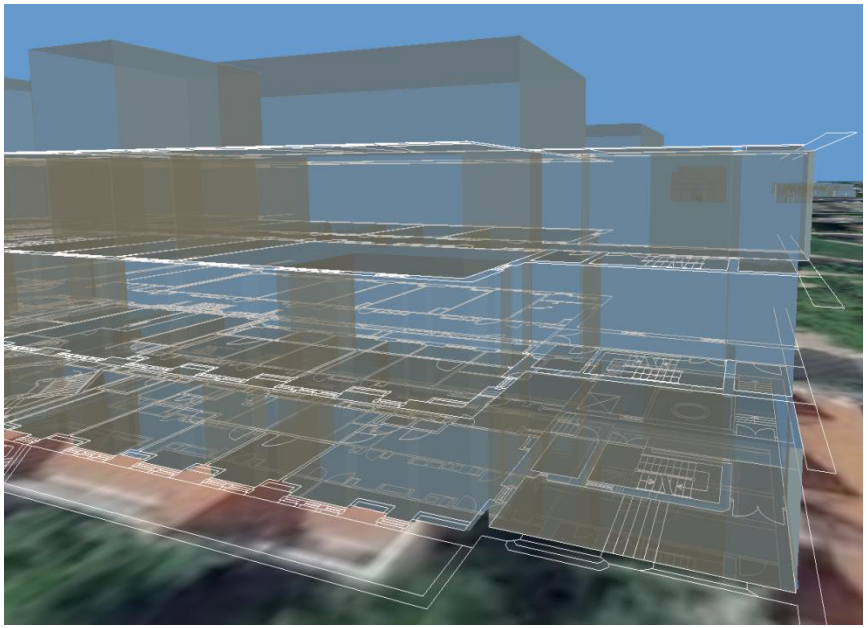
- **Objectives of the Project**
  - **Create a 3D Composite Model of our existing data**
  - **Identify Tools/Methods to Edit/Build the Model**
  - **Model in Immersed Visualization Environment**



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- **Objectives of the Project**
  - **Why do this?**
    - ✓ **Push to the most challenging 3D visualization environment available**
    - ✓ **Impact this environment has on Tools/Models**
    - ✓ **Issues presented will need to be addressed in the final data model - CityGML**
    - ✓ **Important since Visualization will be a key function Central Repository Model (Virtual Campus)**

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- **Data Utilized:**
  - **GIS: Building polygons, roads**
  - **CAD: Building floor plans**
  - **BIM: Detailed Buildings – Exterior/Interior**
  - **SketchUp: building exterior textures/photos**

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- **Methods**
  - **GIS: CityEngine data for the 'Base' of the model roads and buildings - FBX**
  - **CAD: building footprints/ 3D CAD Model - FBX**
  - **BIM: Revit with FBX export into 3ds MAX**
  - **SketchUp: migrated to CityEngine via Collada**
  - **Used Unity Gaming software for final Model**

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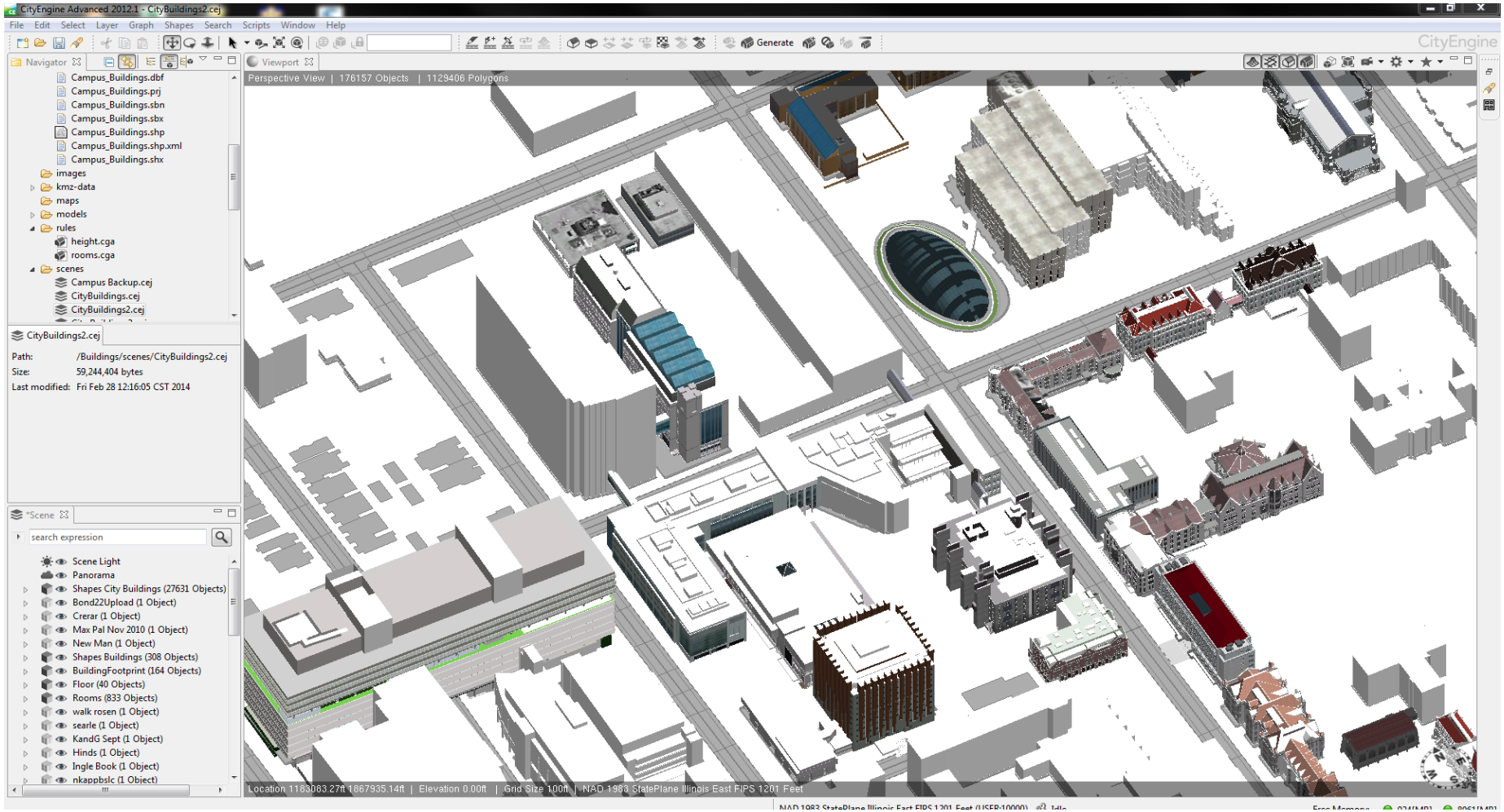
- **Methods: GIS CityEngine**



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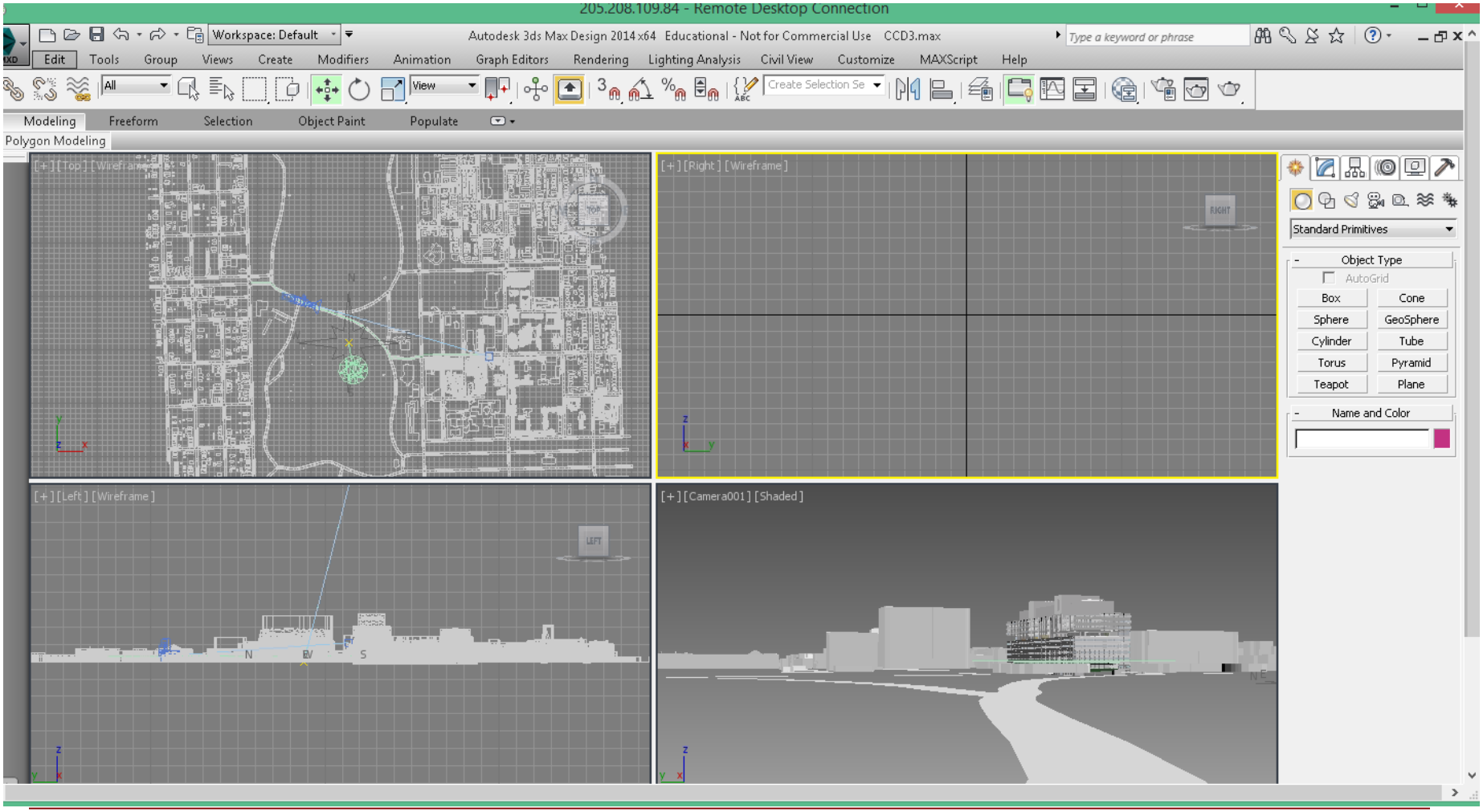
- **Methods: BIM – 3ds MAX**



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- **Methods: GOOD, BAD and UGLY**
  - ***The GOOD:***
    - ✓ **3ds MAX was a staging environment for FBX exports of BIM models**
    - ✓ **Unity is 'easy' to use, Advanced Visualization tools**
  - ***The BAD:***
    - ✓ **3ds MAX tough to use with very large models**
    - ✓ **Software support for imports/export & results???**
  - ***The UGLY:***
    - ✓ **Texture mapping is an Art!**
    - ✓ **Spatial placement of models is a manual process**

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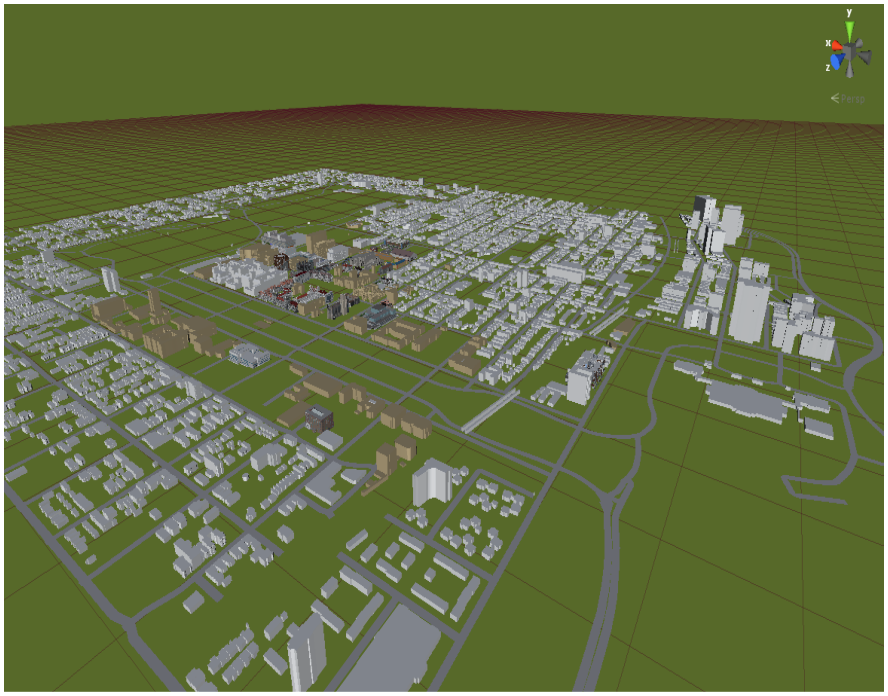
- **Methods: Unity – 3D editing environment**
  - **Can handle large imported models in FBX**
  - **Strong editing tools for 3D data**
  - **Used within advanced Visualization Environments**



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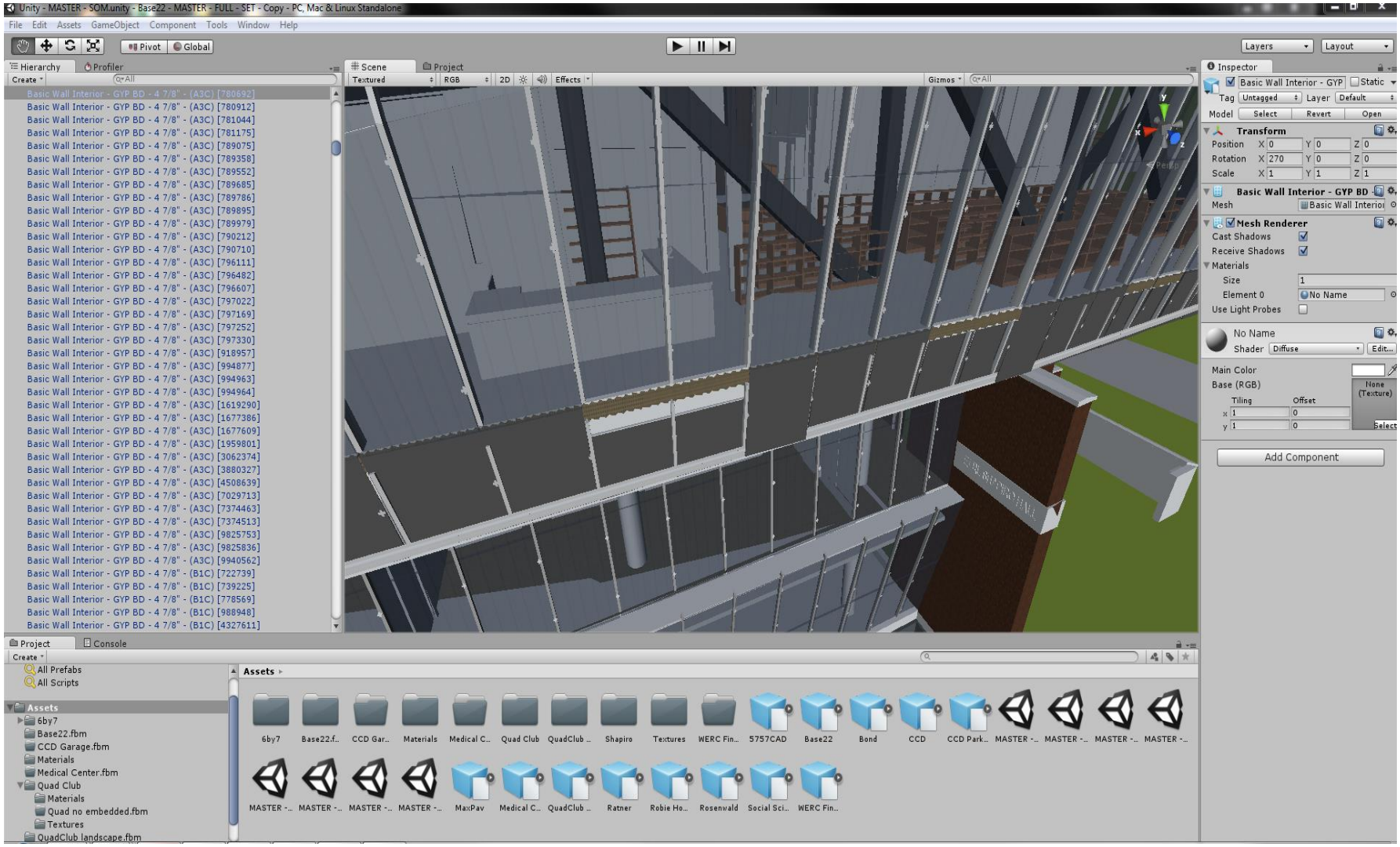

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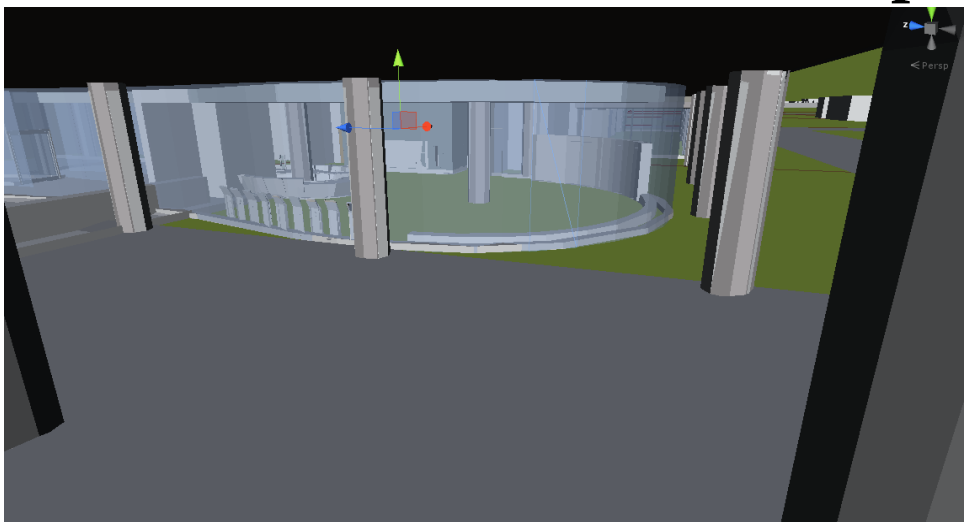
- **Virtual Campus Specifications:**
  - **Over 2 million objects**
  - **2,000 texture files: images and graphics**
  - **Total Model size: 2.5 GB**
  - **This is a small model – only 4 buildings are BIM models with interior spaces**



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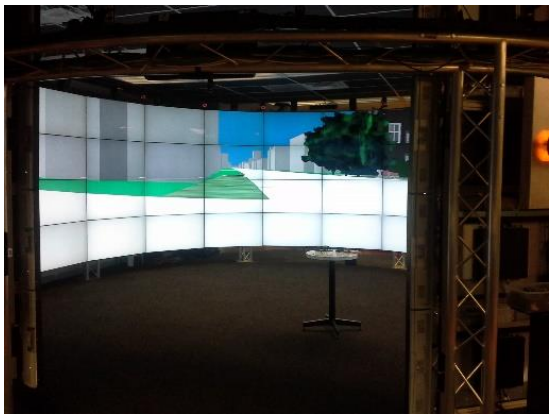
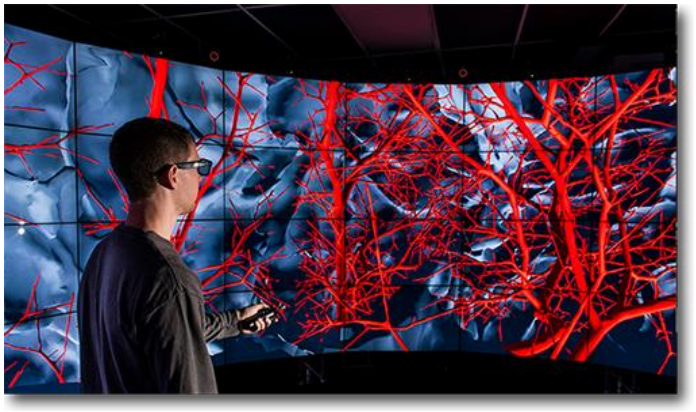
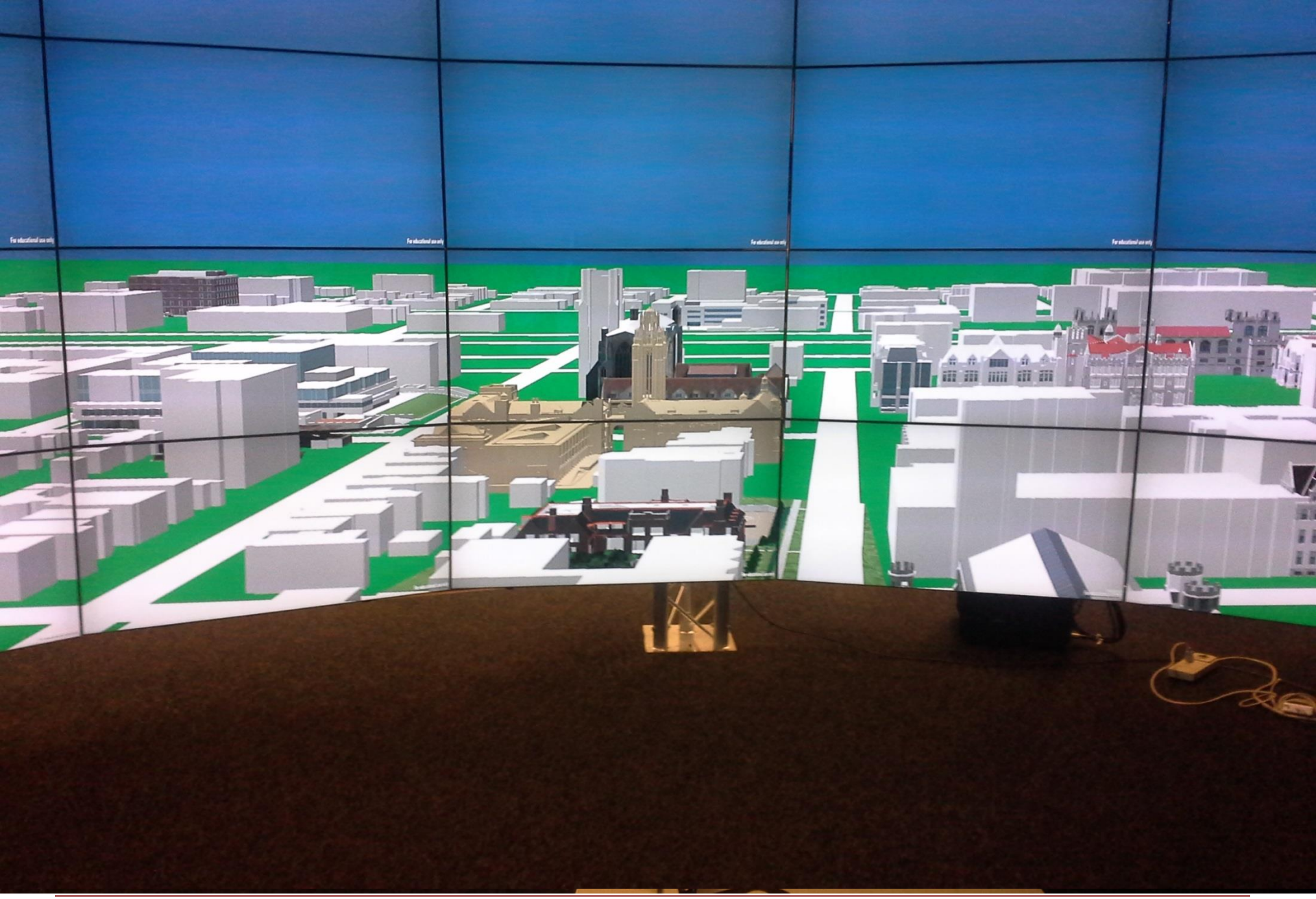
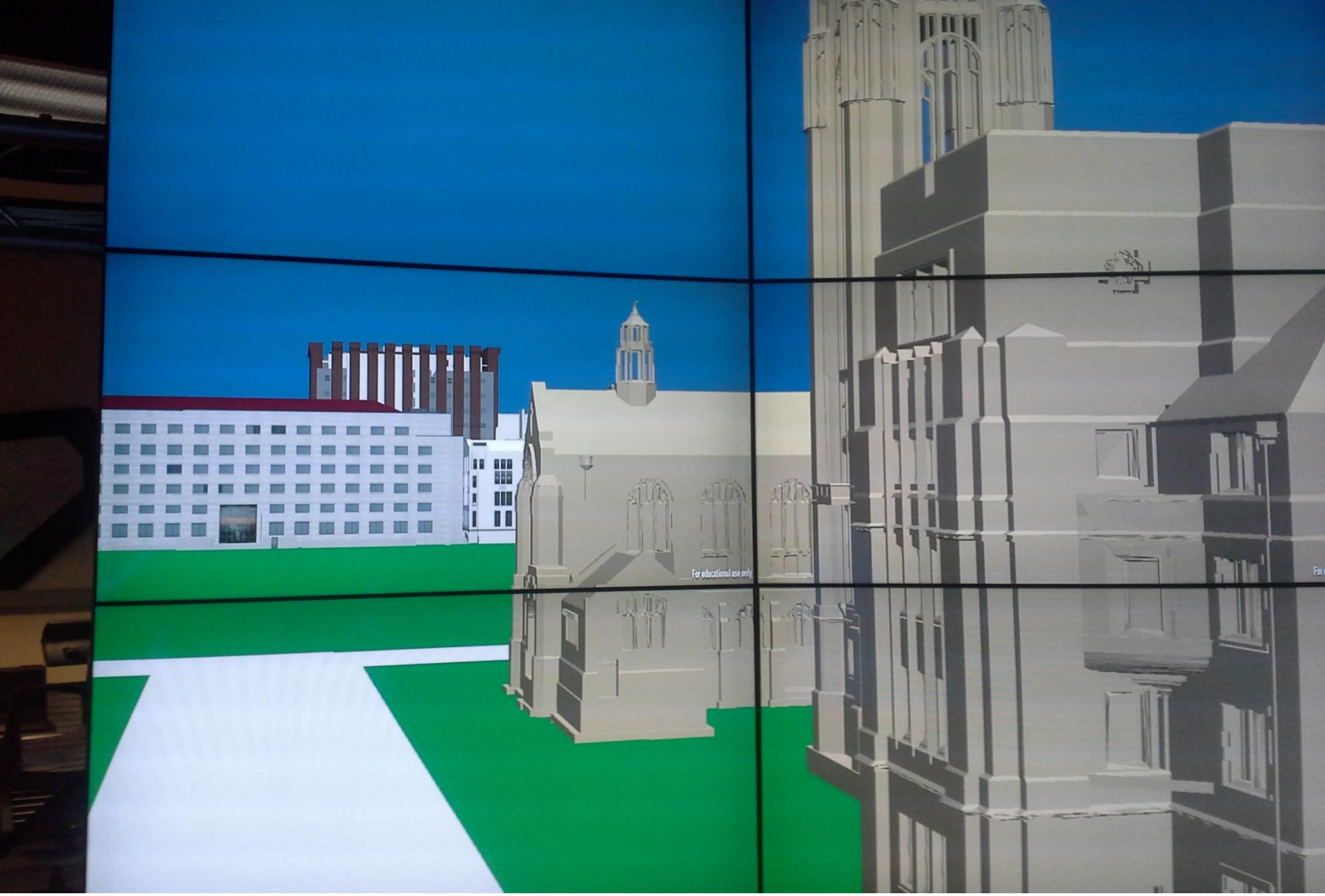
- **CAVE2 – Virtual Reality System: UIC EVL**
  - **320 degree panoramic 3D that matches human visual acuity**
  - **480 SqFt of viewing surface**
  - **.029 inch per pixel resolution – 100 million pixels**
  - **10 camera optical tracking system – uses glasses or 'drive stick' for navigation**





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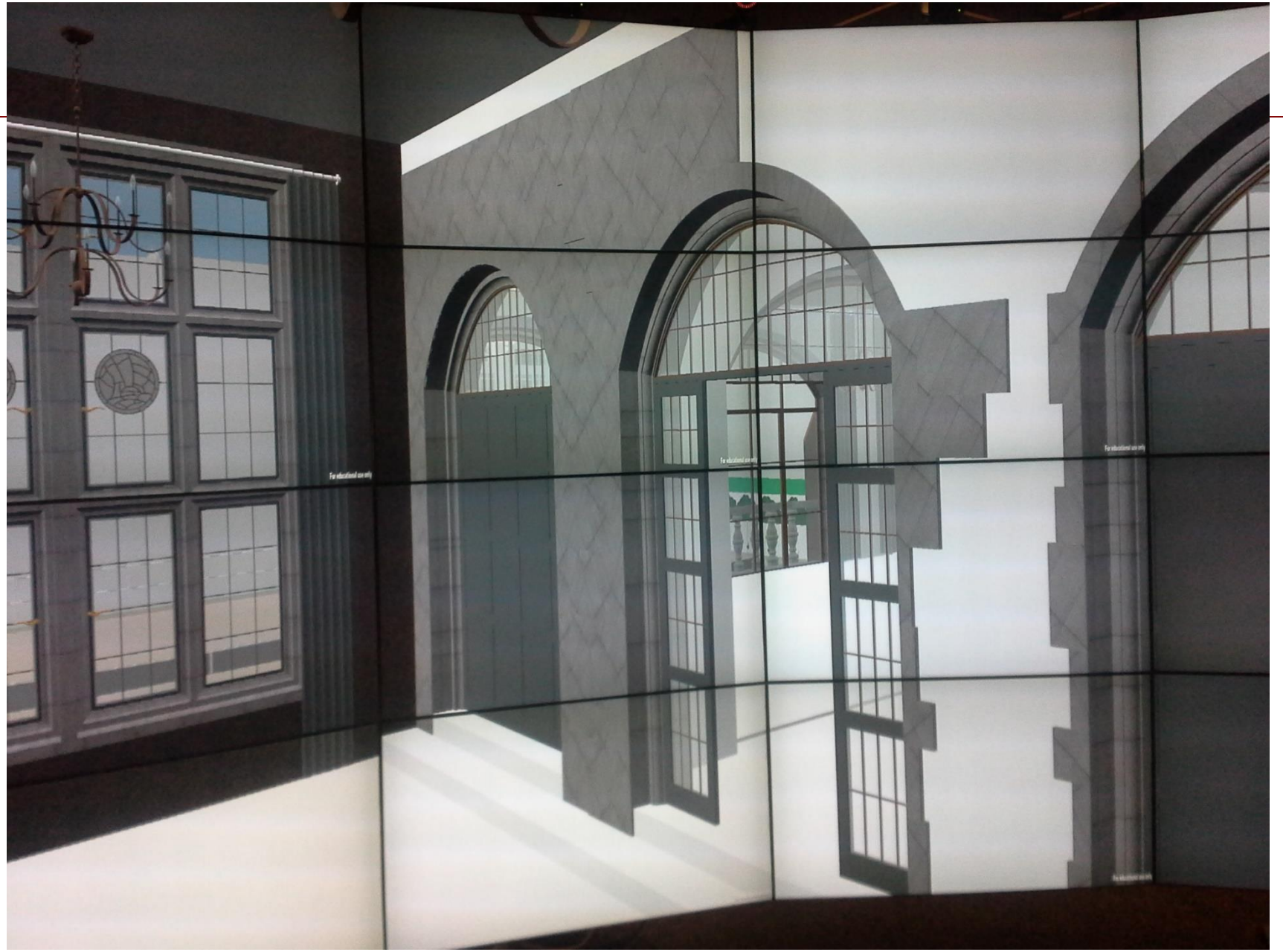

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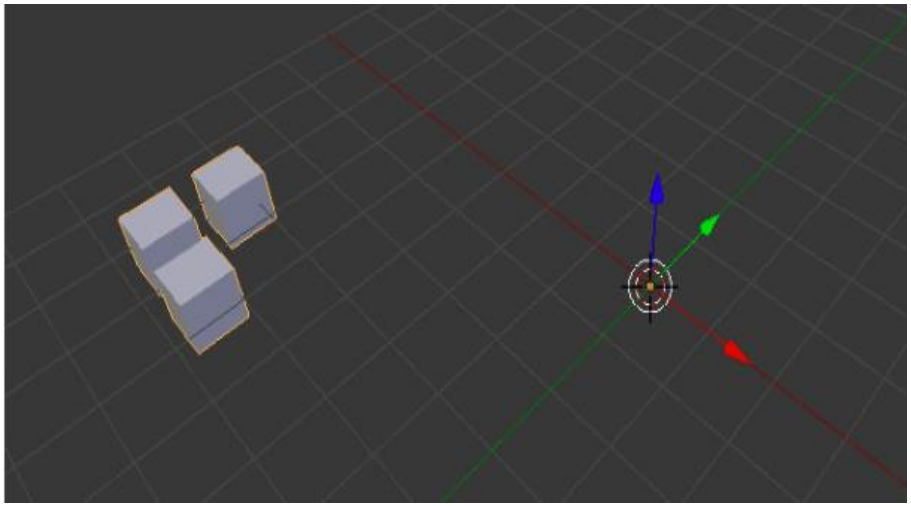
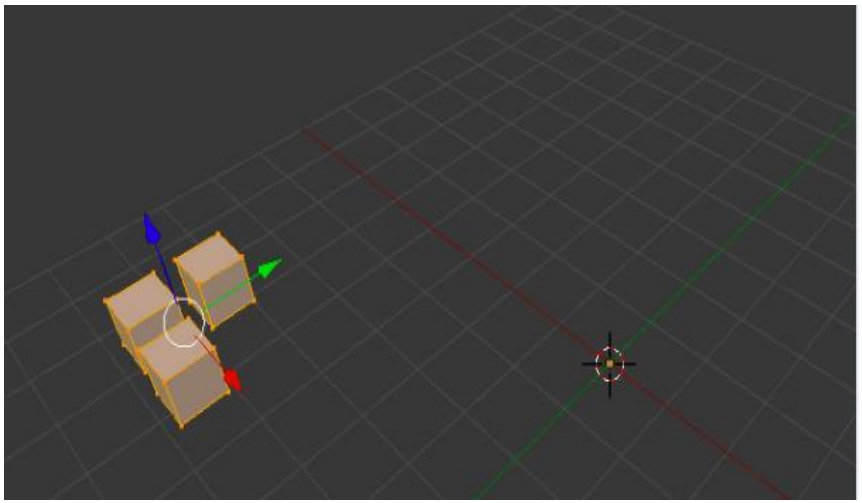
- **Tricks:**
  - **LOD for textures – turn off at large scales**
  - **Interior polygons/textures loaded at run time as we approach the building.**
  - **Center of the model (Origin) very important – must complete resolution of model as you migrate**





- **Lessons Learned**
  - **Data Models:**
    - ✓ **LOD & Map Scale**
    - ✓ **Textures do not map constantly from BIM or SketchUp.**
    - ✓ **Geometric Conversions are tough – FBX most common supported format**
    - ✓ **How much Attribution do we carry forward – semantics will be huge**
    - ✓ **We want the Visualization Environment to work for Catalog and Smart Cities/OWS down the road.**

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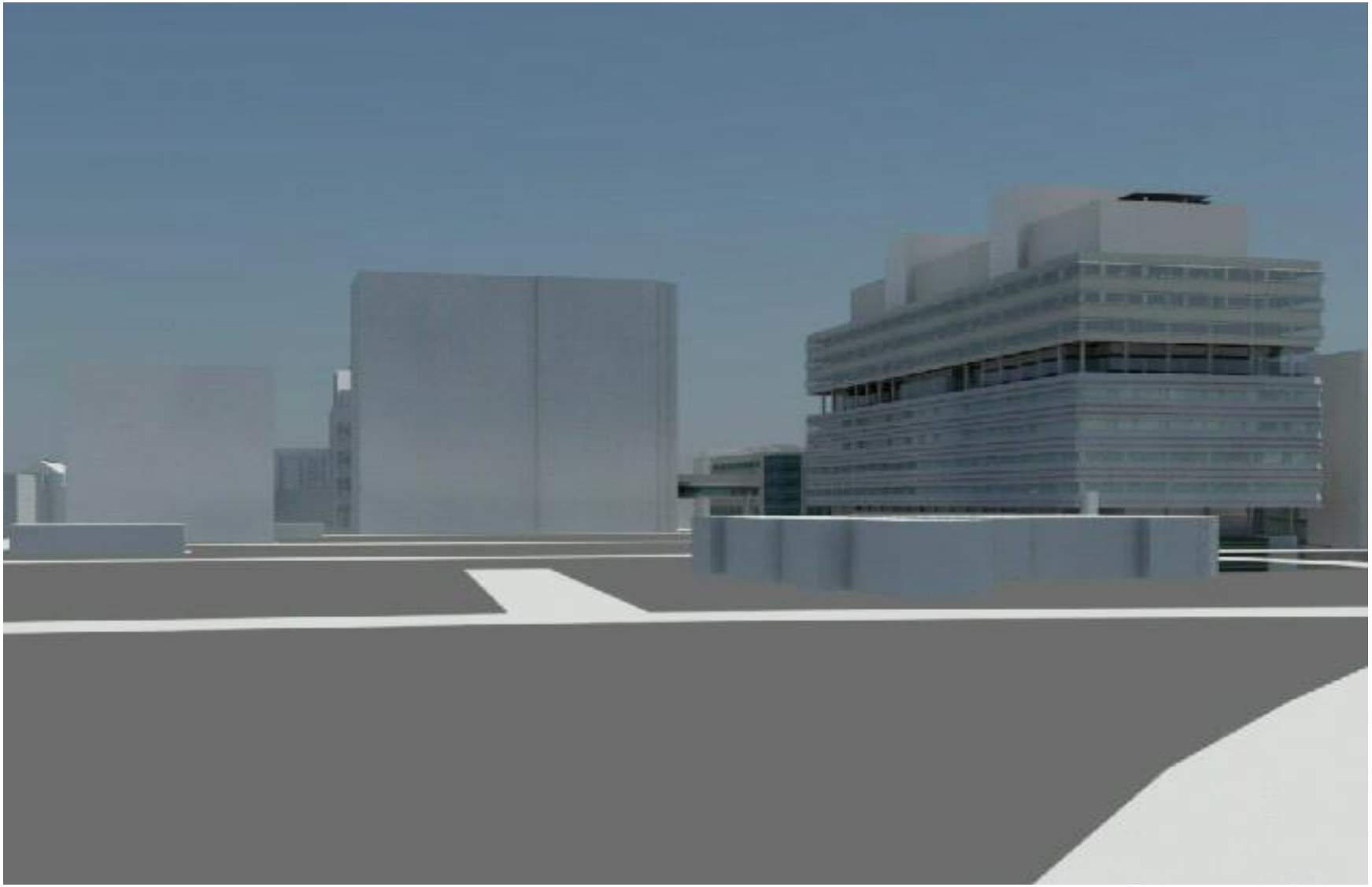

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- **Lessons Learned**
  - **Hardware:**
    - ✓ **It's good and getting better all the time**
    - ✓ **Standard 64bit environments might not cut it for very large models (Campus or Citywide)**
    - ✓ **CAVE2 technology can handle the throughput on the images – no flicker to resolution issues**

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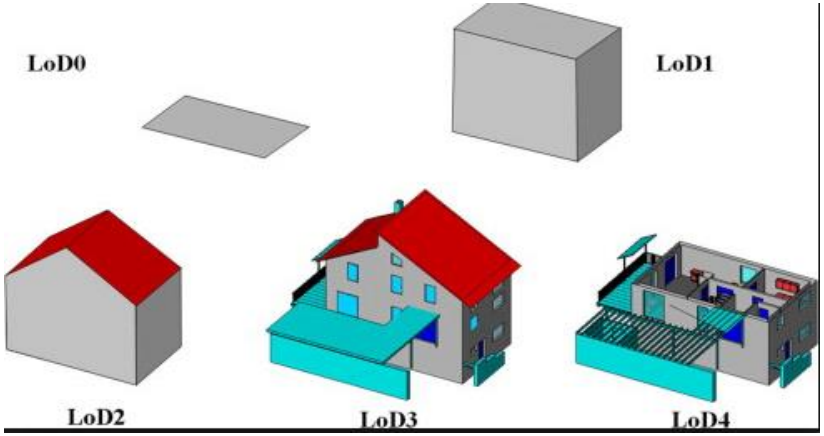
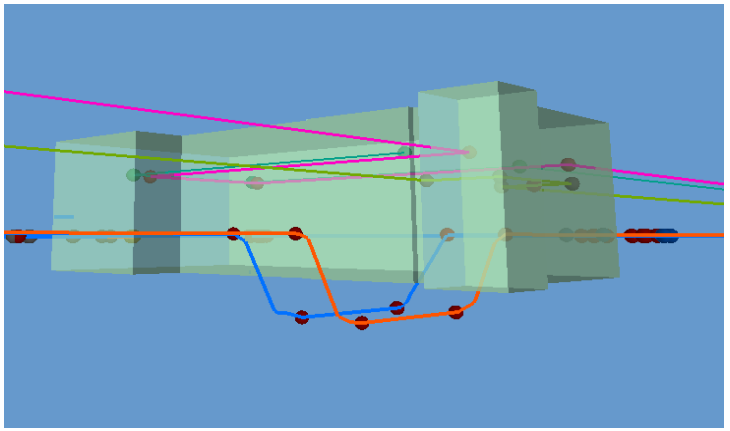
- **Next Steps:**
  - **Determine the Visualization Software**
  - **Build the Virtual Campus in CityGML**
  - **Include other Campus Assets to the Model: Utilities**
  - **Establish best practices in Texture Management**
  - **‘Plug and play’ Model components for buildings & utilities – State Plane, Data Formats etc….**





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- **Next Steps – 2nd Generation Model**
  - **Prototype 1: Detailed BIM/Virtual Campus:**
    - ✓ **Very Detailed Design Model Export**
    - ✓ **Determine the level of Texture Mapping supported**
    - ✓ **Placement within the VC for Design Evaluation**

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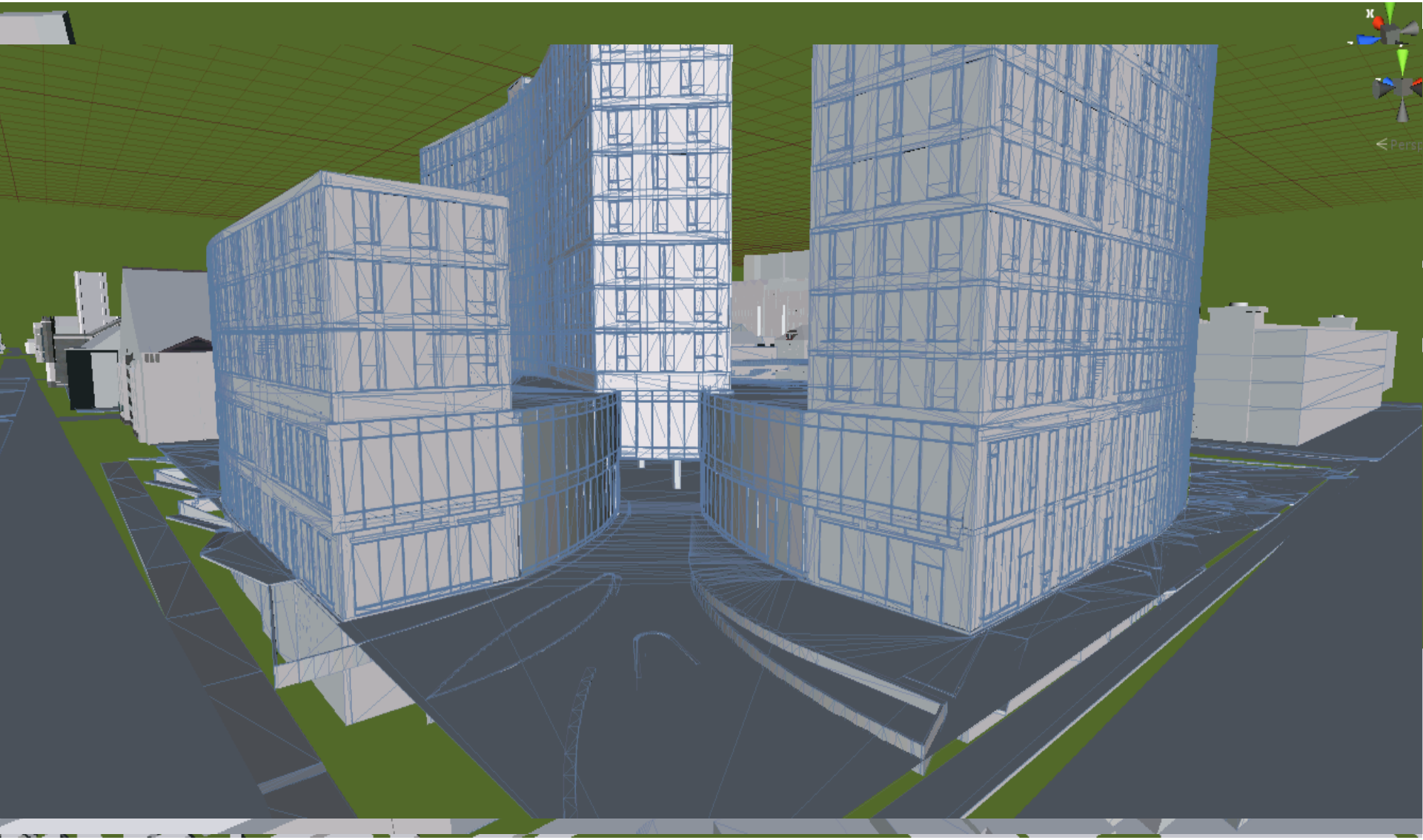

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- **Next Steps – 2nd Generation Model**
  - **Prototype 2: Euclideon Technology Evaluation:**
    - ✓ **Convert Point Clouds into Unlimited Detail format**
    - ✓ **Test Resolution/Visualization quality**
    - ✓ **Hardware/Software Requirements**
    - ✓ **Include in existing Virtual Campus model**

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- **Next Steps**
  - **Evaluation of the Prototypes:**
    - ✓ **Visualization/Geometric Modeling – CAVE2**
    - ✓ **Mixture of Technology/Modeling formats**
    - ✓ **Determine Management Requirements**
    - ✓ **Adjust the SDI Program Plan**

Target – end of 2015 to complete the process???

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