



Creating 3D Campuses

Craig McCabe

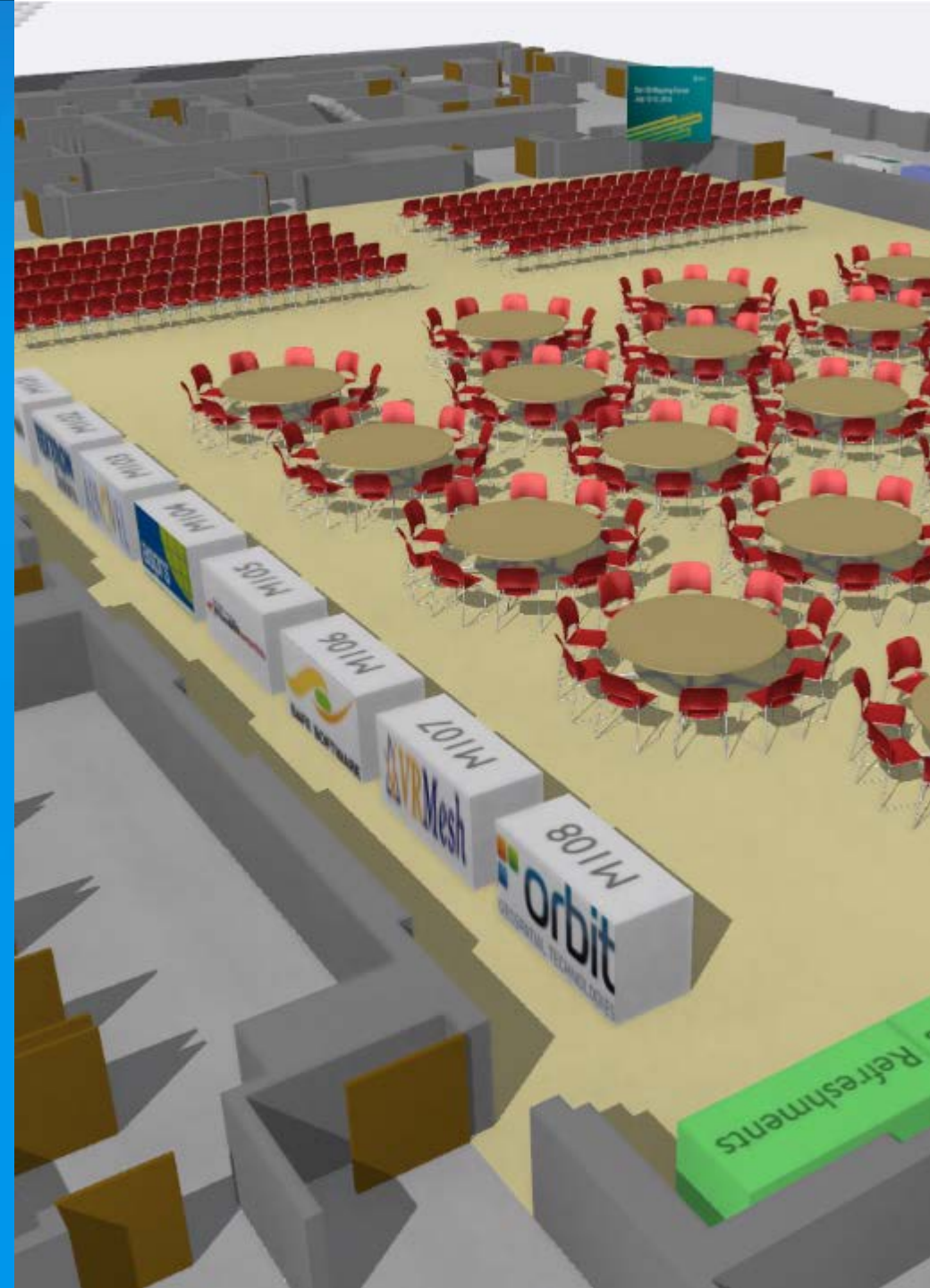
Jeff Archer

Agenda

- Value of a 3D campus
- Data Migration
- Making a good campus map
- Transportation networks
- Publishing
- Grand Finale



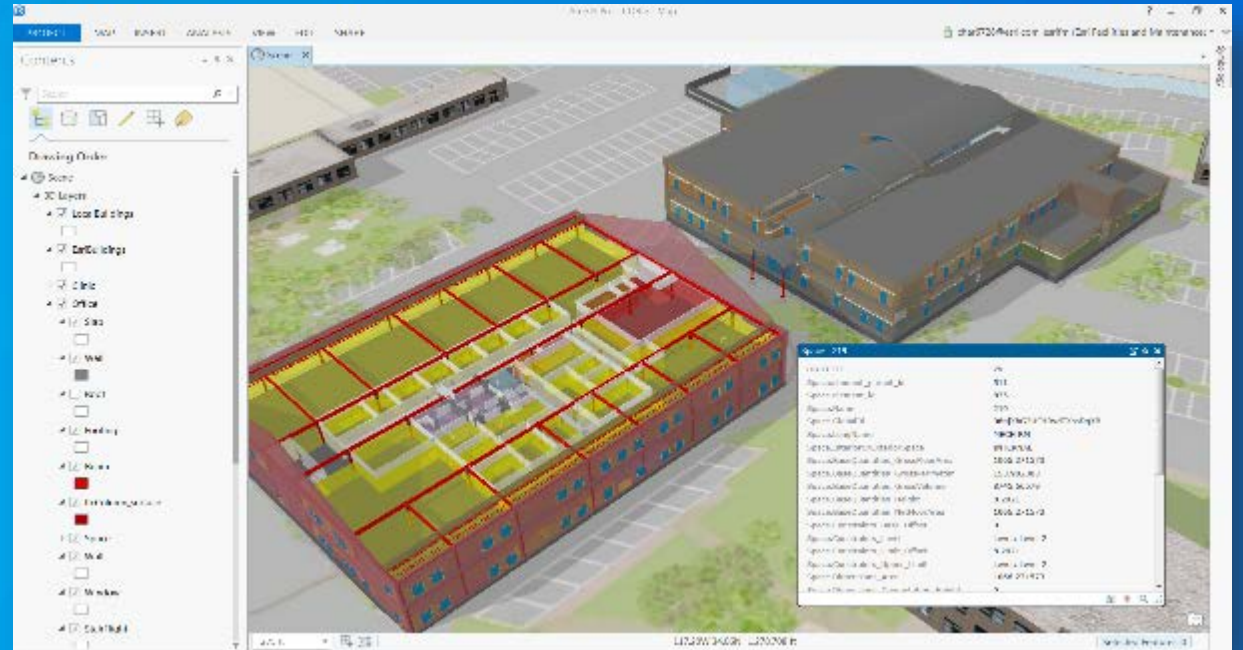
Value of a 3D Campus



Why a 3D Campus?

Common workflows

- Security and Safety
- Space Optimization
- Guest Routing and Directions
- Employee Routing and Directions
- Office Finder
- Sensor Networks



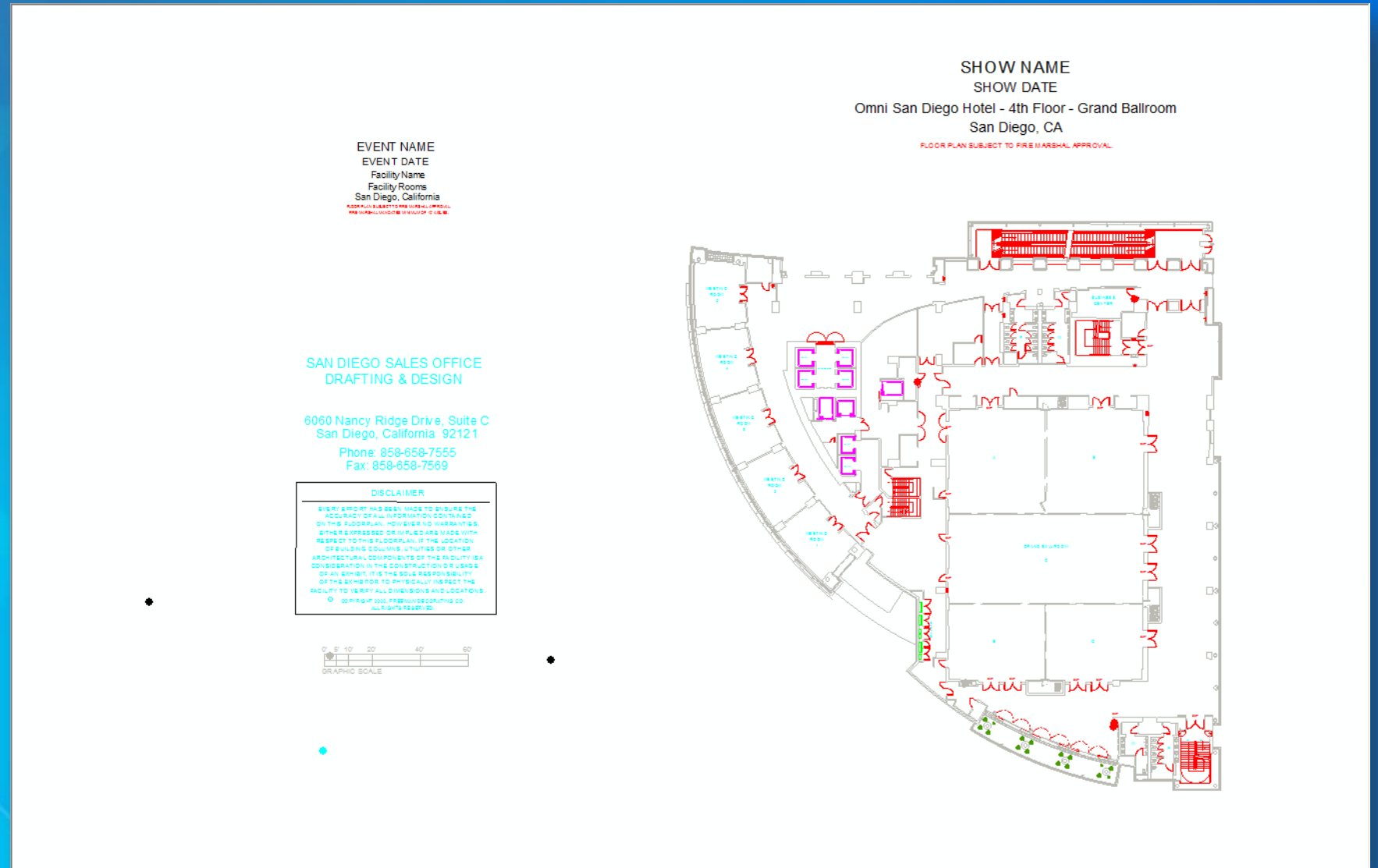
Data Migration



CAD → GIS

Omni 4th Floor

Import CAD



CAD → GIS → 3D Cities Information Model

Omni 4th Floor

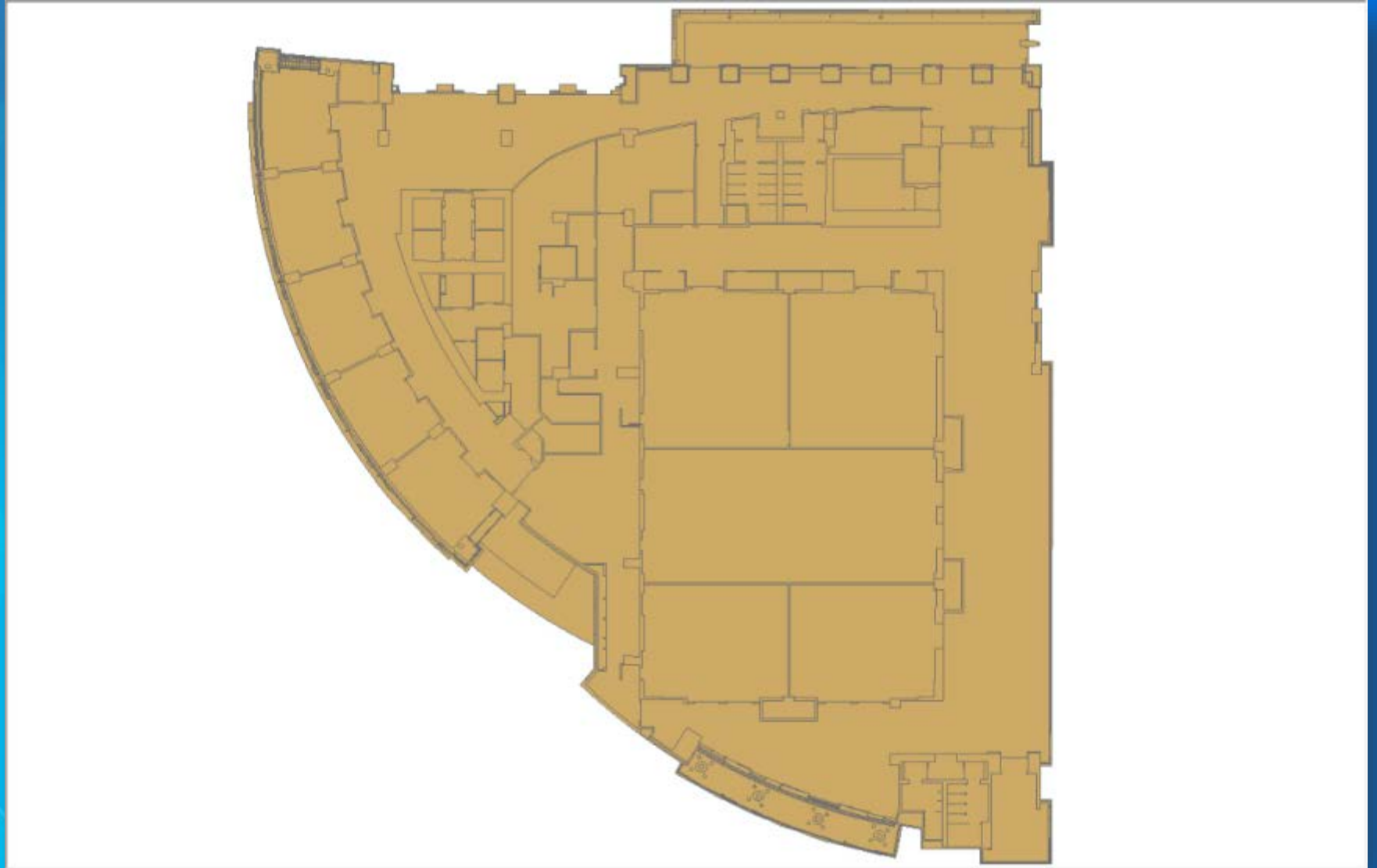
Import CAD
Georeference



CAD → GIS → 3D Cities Information Model

Omni 4th Floor

Import CAD
Georeference
Build Polygons

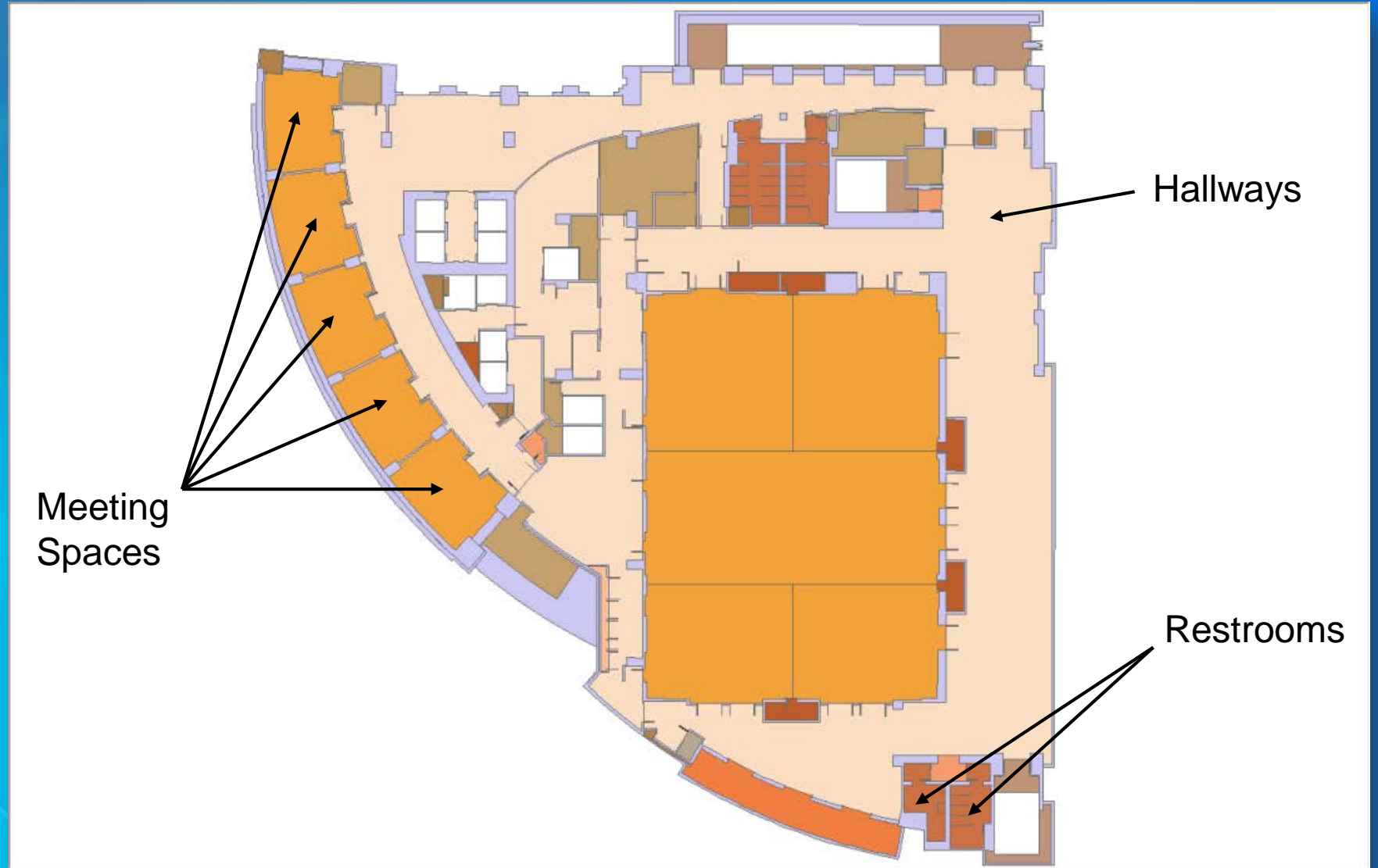


CAD → GIS → 3D Cities Information Model

Omni 4th Floor

Import CAD
Georeference
Build Polygons
Attribute Spaces

- BuildingHasShell
- BuildingHasShellPart
- BuildingHasSpace
- BuildingInteriorSpace**
- BuildingInteriorStructure
- BuildingShell
- BuildingShellPart
- CityFabricRelation

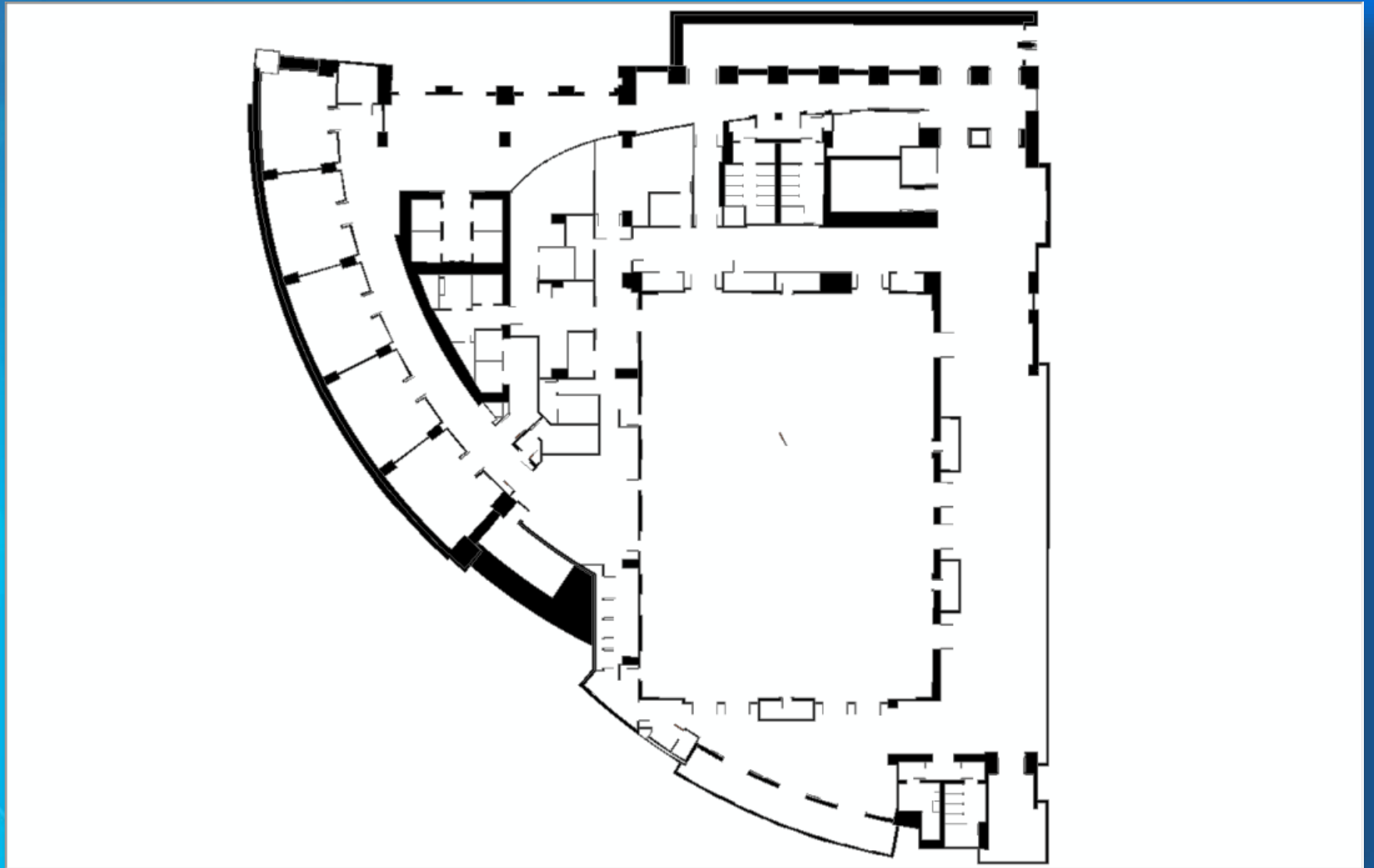


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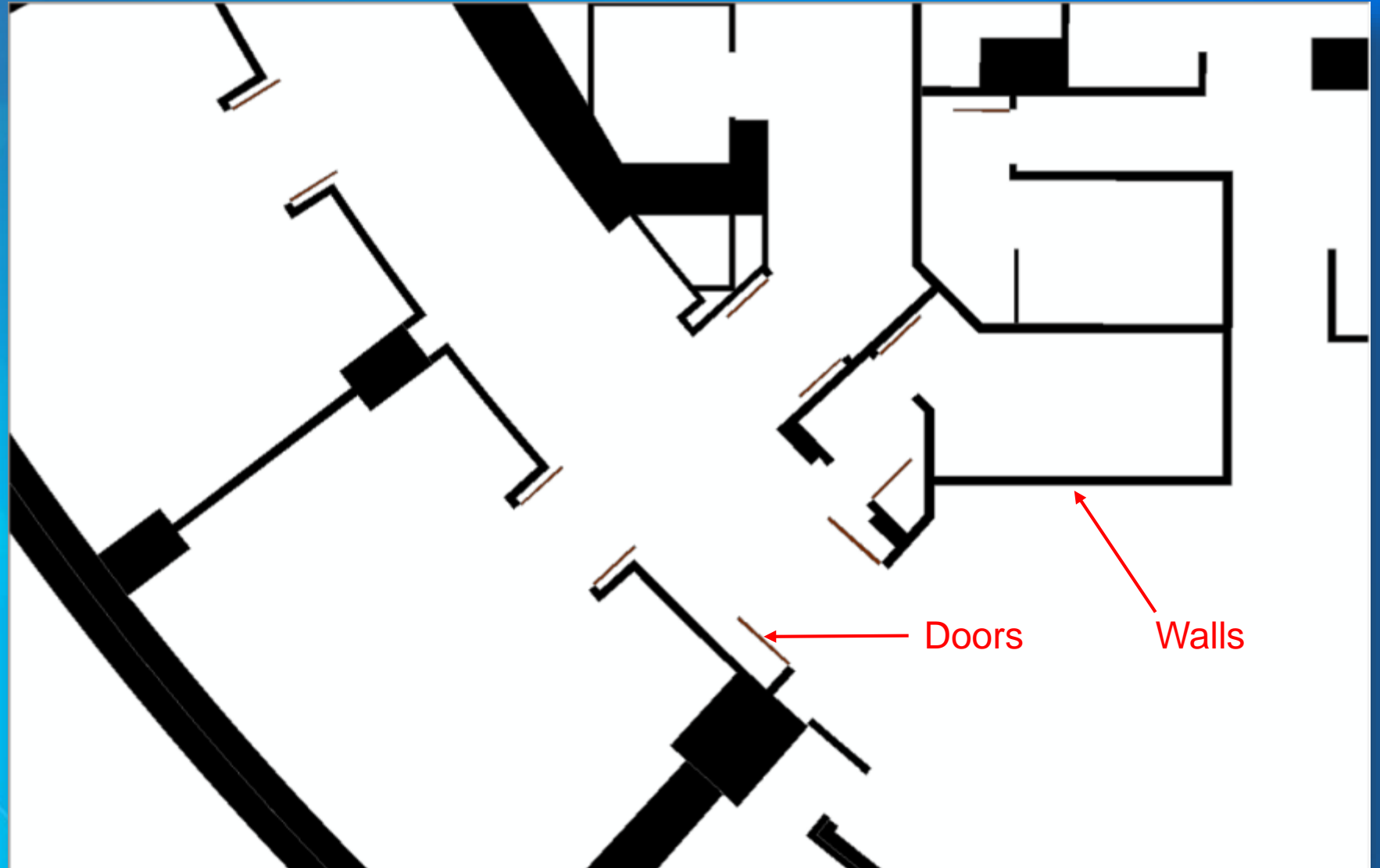


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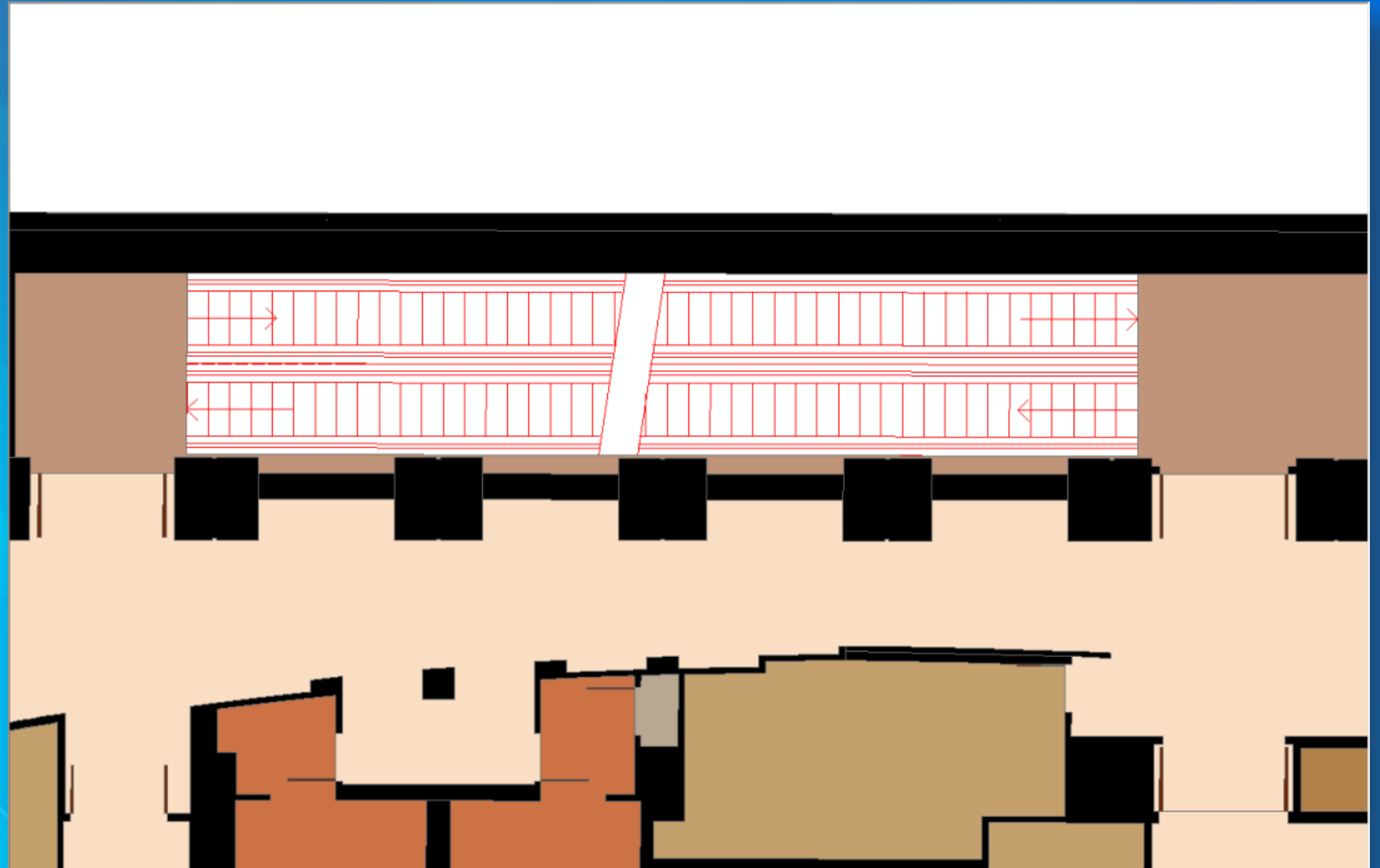


CAD → GIS → 3D Cities Information Model

Omni 4th Floor

Import CAD
Georeference
Build Polygons
Attribute Spaces
Attribute Structure
Stairs

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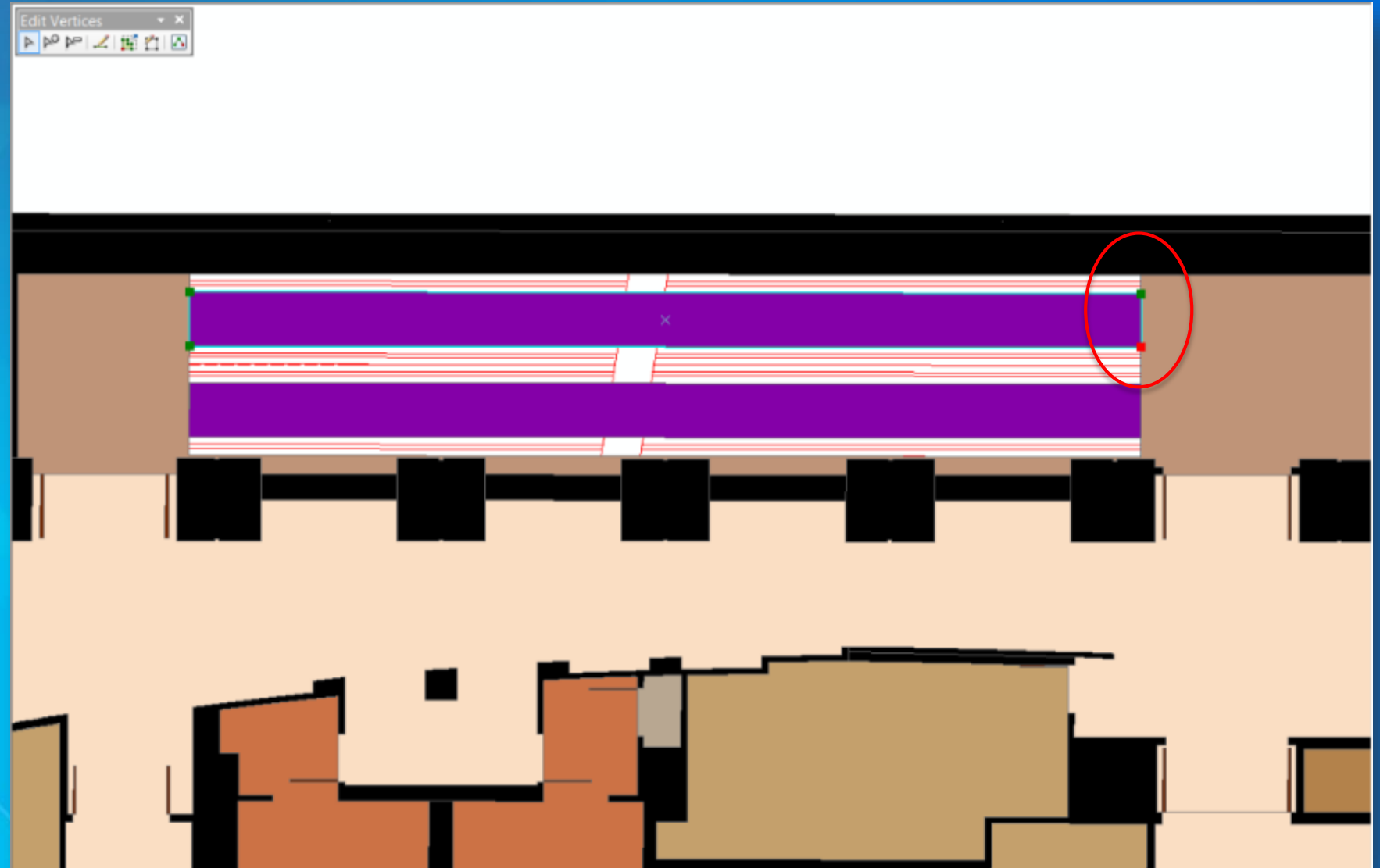


CAD → GIS → 3D Cities Information Model

Omni 4th Floor

Import CAD
Georeference
Build Polygons
Attribute Spaces
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Stairs

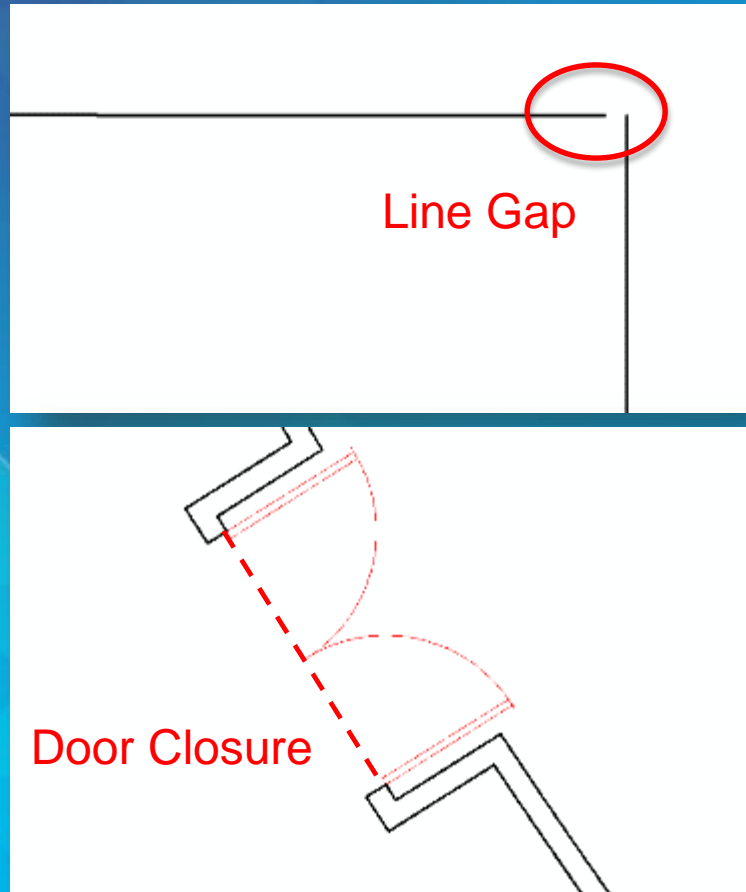
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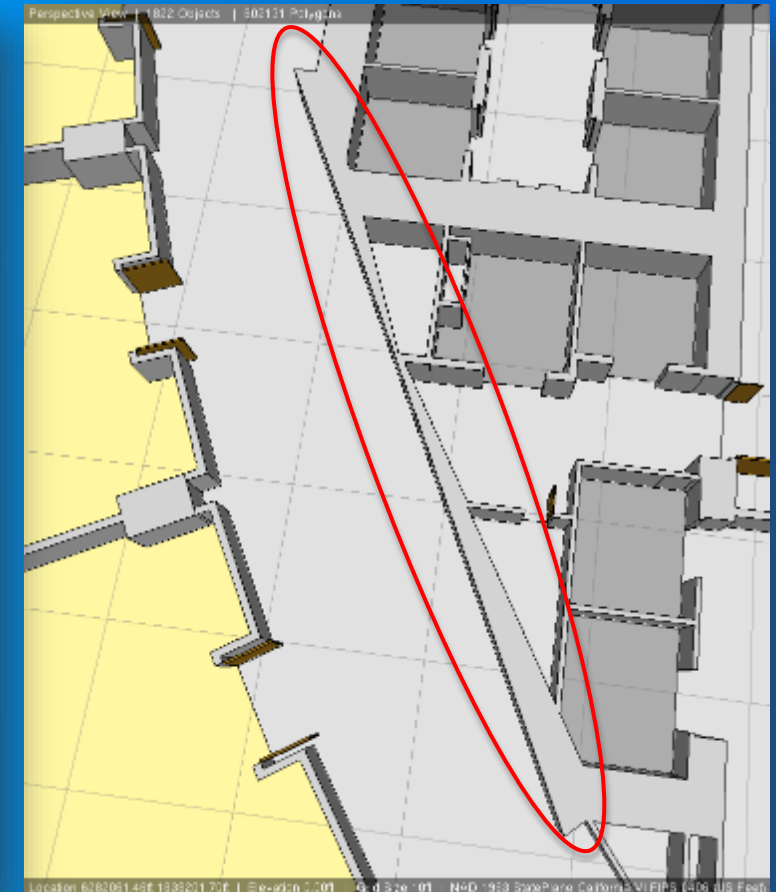
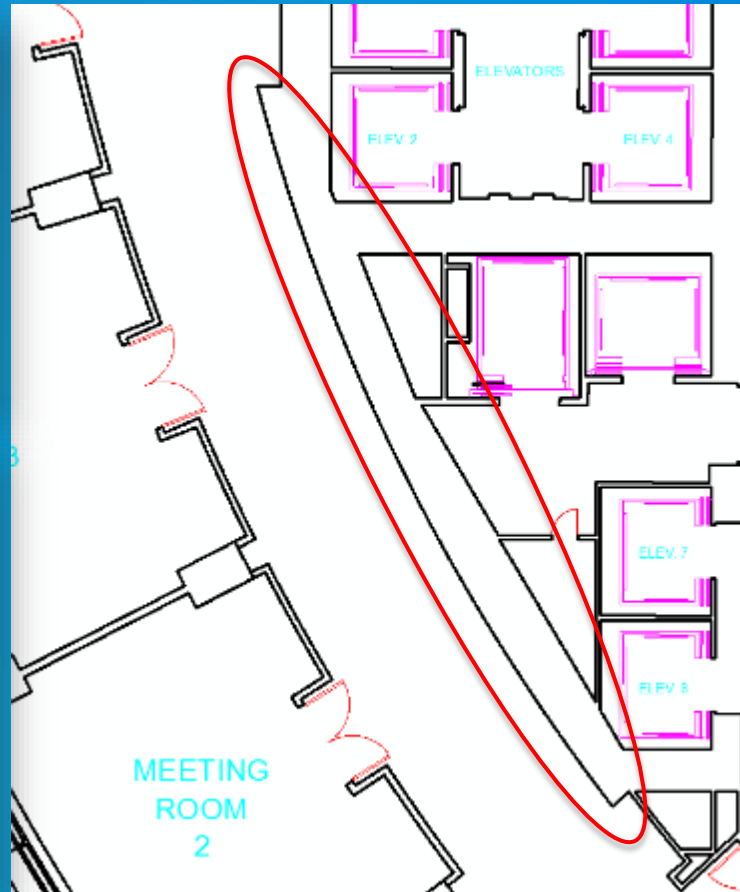
CAD → GIS → 3D Cities Information Model

Common Issues

CAD Topology



Curves



BIM → GIS

The image displays a dual-window interface. The top window is Autodesk Revit, showing a project named 'MTB_MEC_HVC7'. The bottom window is Esri ArcGIS Pro, displaying a 3D model of the same building. The Revit window includes a 'Project' tab and a 'Contents' panel with a 'Drawing Order' list. The ArcGIS Pro window shows a 3D view of the building with a 'Space - 219' data table overlaid.

Revit Contents - Drawing Order

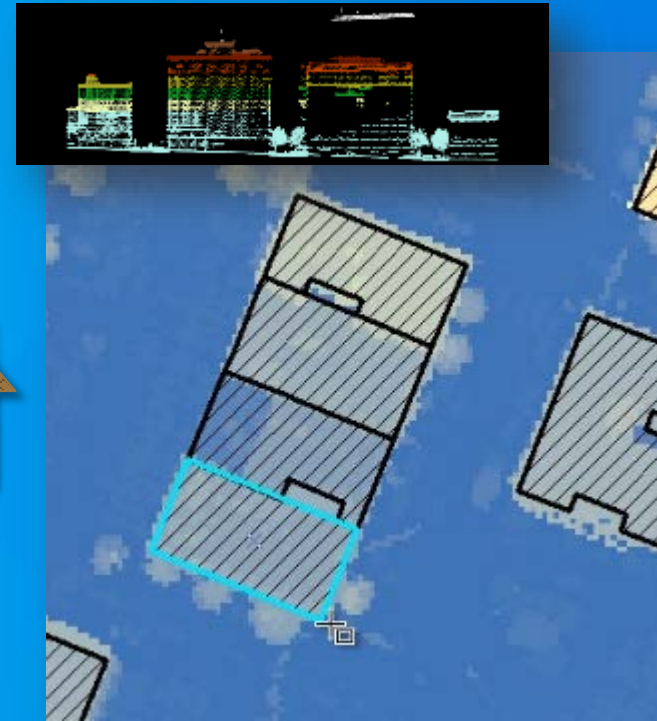
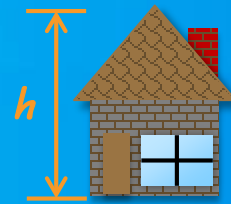
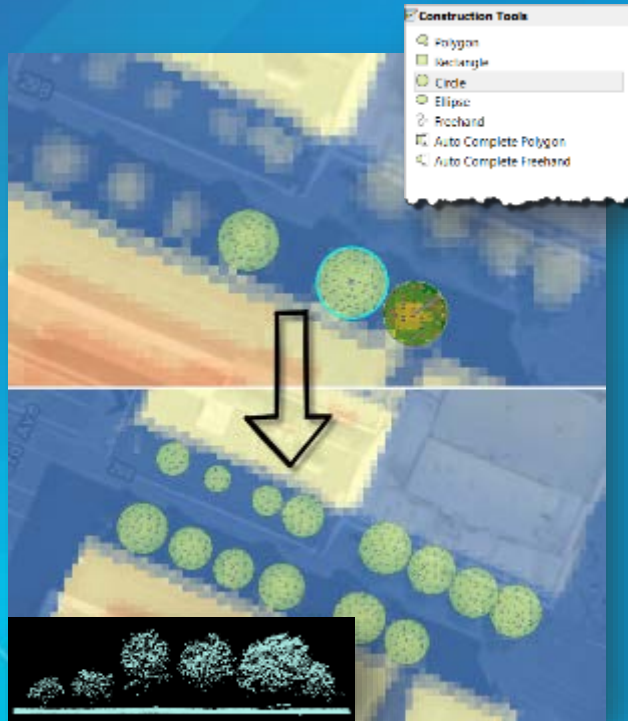
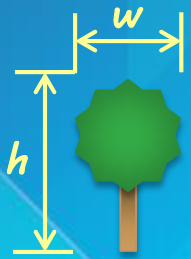
- Scene
- 3D Layers
 - LocalBuildings
 - EsriBuildings
 - Clinic
 - Office
 - Slab
 - Wall
 - Roof
 - Footing
 - Beam
 - IC:Column_surface
 - Space
 - Wall
 - Window
 - StairFlight

ArcGIS Pro - Space - 219

OBJECTID	79
Space.element_parent_id	511
Space.element_id	875
Space.Name	219
Space.GlobalId	069102G3HC4RyDTXsdDqxB
Space.profileName	MECH4 RM
Space.InteriorOrExteriorSpace	INTERNAL
Space.BaseQuantities_GrossFloorArea	1066.271573
Space.BaseQuantities_GrossPerimeter	151.907363
Space.BaseQuantities_GrossVolume	8745.66579
Space.BaseQuantities_Height	8.2021
Space.BaseQuantities_NetFloorArea	1066.271573
Space.Constraints_Base_Offset	0
Space.Constraints_Level	Level: Level 2
Space.Constraints_Limit_Offset	8.2021
Space.Constraints_Upper_Limit	Level: Level 2
Space.Dimensions_Area	1066.271573
Space.Dimensions_Combination_Related	0

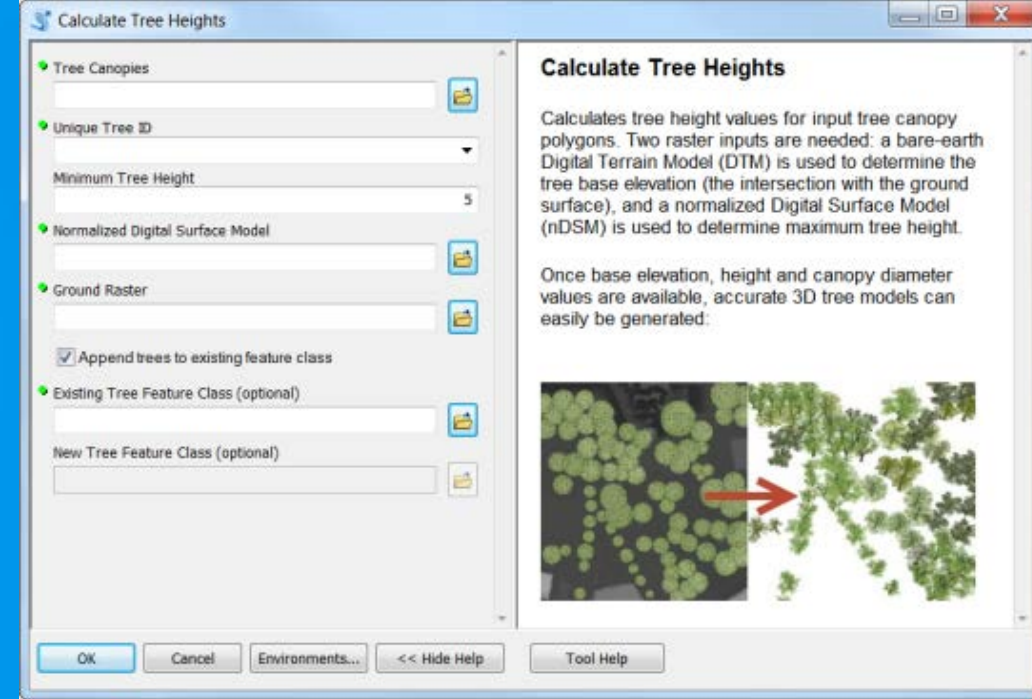
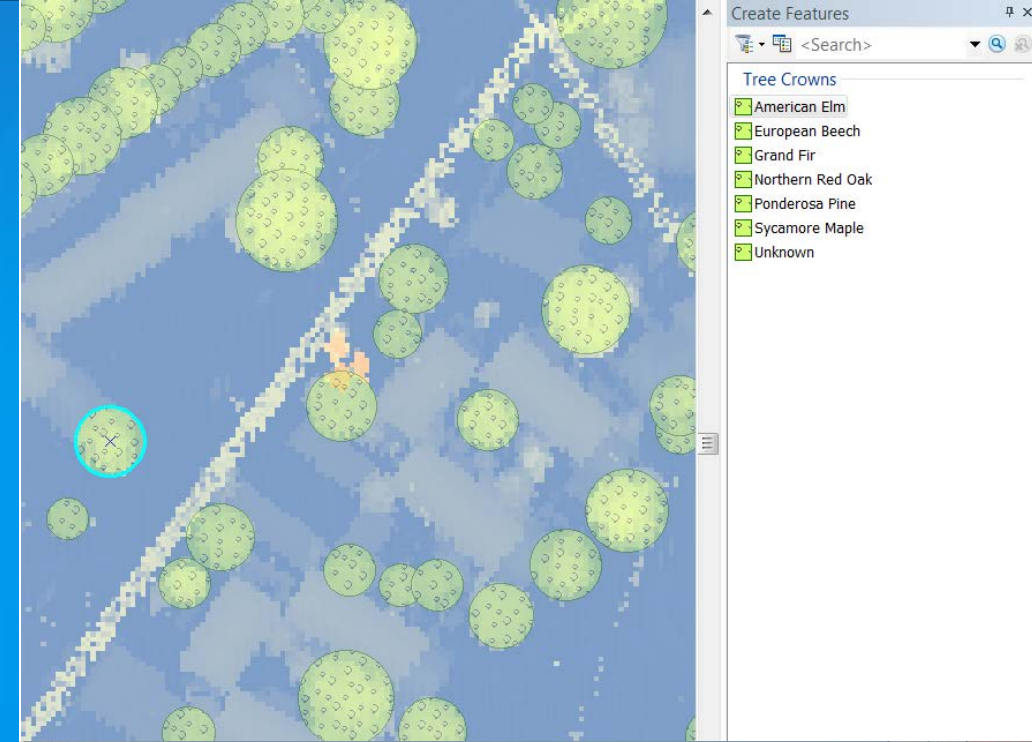
Feature Extraction from LiDAR

Trees and Buildings



Feature Height Extraction from LiDAR

Demo – Craig McCabe



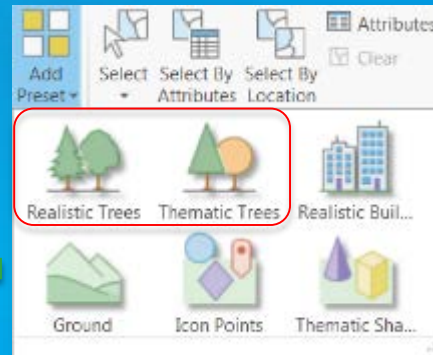
Procedural 3D Trees

In ArcGIS Pro

Tree Points



Pre-Set Pro Layer



3D Trees



Realistic Trees : Tree

Type	Tree Genus
Height	Crown height
Crown Width	Crown diameter
Unit	Feet

Key attributes

Making a Good Campus Map

Jeff Archer



Campus Editing

[Home](#)[Get Started](#)[Workflows](#)[Tools](#)

Overview

The Campus Editing map is used by mapping technicians to collect and manage building, interior space, and related exterior campus data.

It can be used by facilities management and public works organizations to capture interior and exterior assets on a university or business campus, a downtown, a government complex, or a military base.

[REQUIREMENTS](#)[WHAT YOU GET](#)[WHAT'S NEW](#)[DOWNLOAD](#)

You may be interested in

ArcGIS for Local Government includes several related maps and apps that also can be configured in your organization:

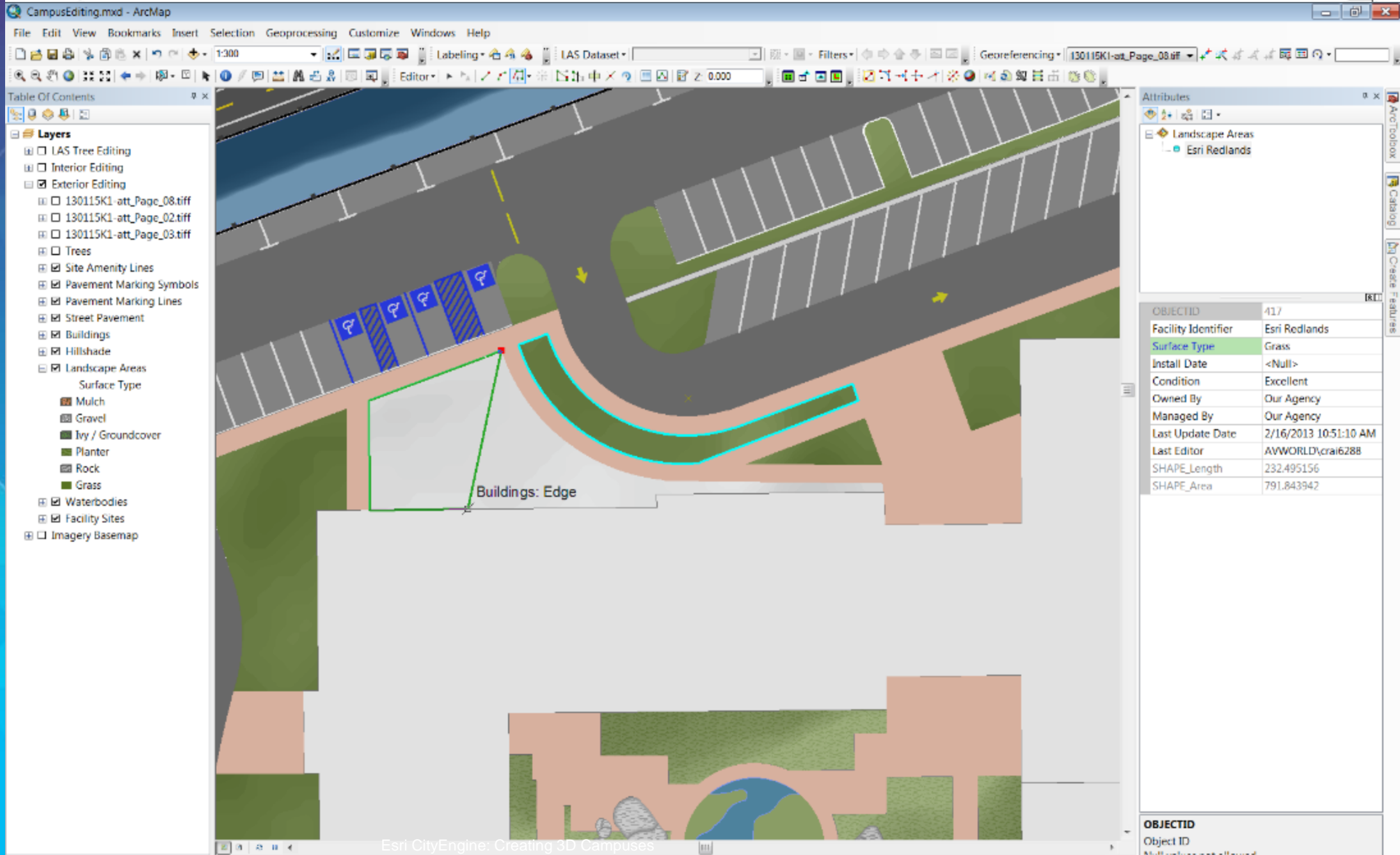
- [Campus Place Finder](#)

Requirements

Campus Editing requires specific technical experience and software. Minimum system requirements for the ArcGIS Platform can be found on the Support website.

Campus Editing is supported on ArcGIS 10.1, 10.2 and 10.3.

Requirement	Description
Experience	<ul style="list-style-type: none">Editing workflows in ArcGIS for DesktopInstalling add-ins and configuring toolbars in ArcGIS for Desktop



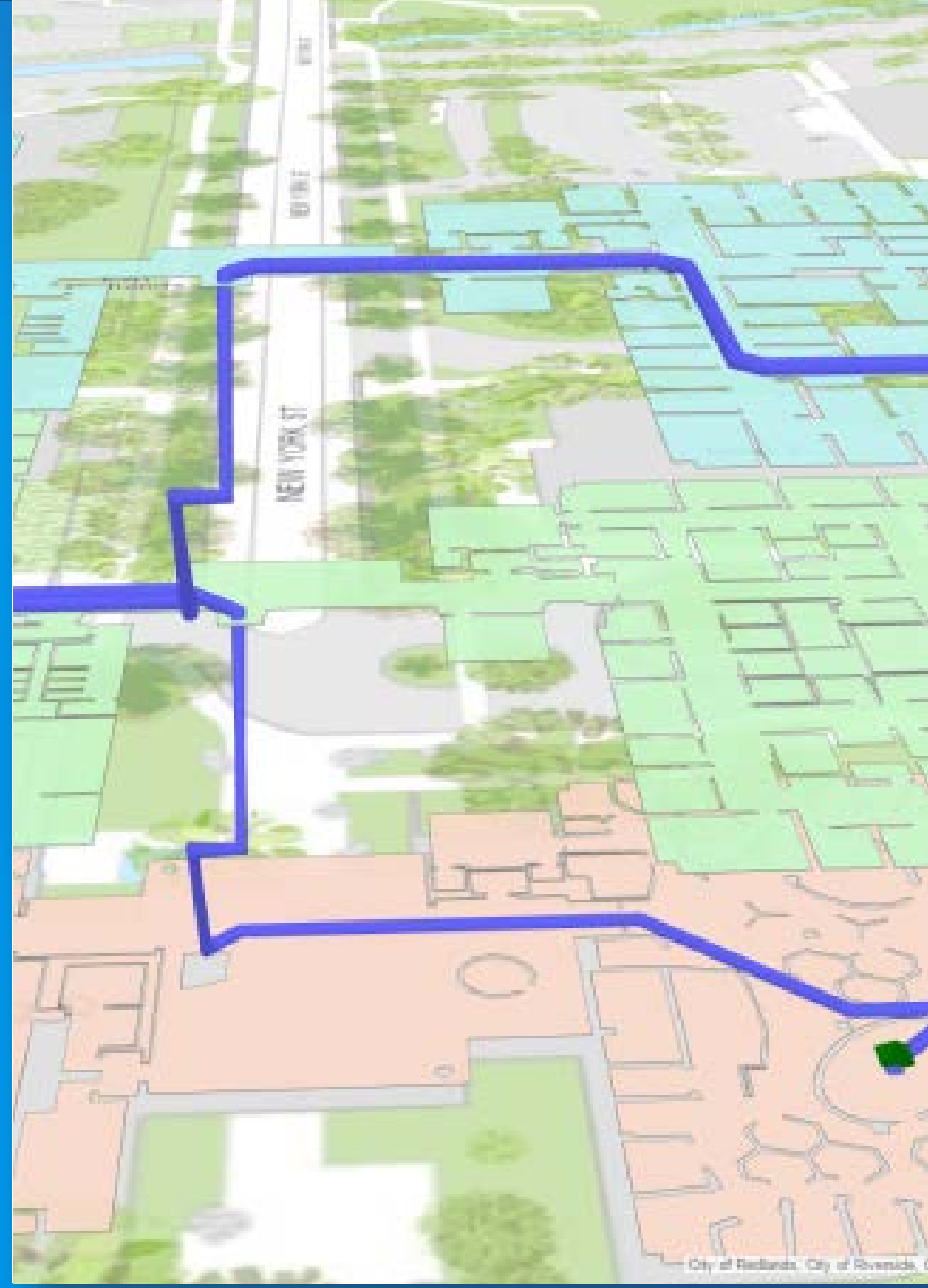
Campus Map Examples

Demo - Jeff Archer



Transportation Networks

Jeff Archer



2015: In-building Route Creation – single floor

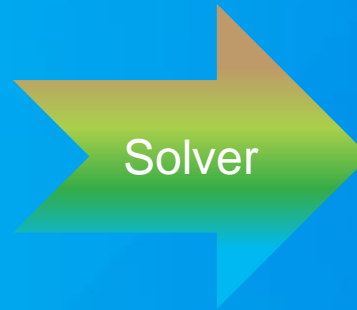
Inputs

- Space Polys
- Floor Lines
- Doors
- Space Points
- Points



Supported Route Restriction -- Considerations

Route Preference
Primary/secondary/tertiary paths (avoid cutting through rooms)
Indoor/outdoor/covered paths
Wall distance (for readability)
Accessibility
Wheelchair accessible
ADA compliant
Slope
Curbs or ramps
Safety & Security
Emergency exit routing
Prefer well-lit paths
Physical Limits
Path width/height
Path direction (1-way or 2-way)
Door key access (directional)



Route Summary (solver optimizes distance & walk time)
Total walking time
Total distance (feet or meters)
Directions

In-building routing network generation – whole building

1. Create fishnet
2. Clip to floor
3. Add wall lines
4. Erase walls & calculate wall distance
5. Add spaces
6. Tag primary paths & add space centroids
7. Calculate floor paths
8. Calculate all paths
9. Deploy network



3D Routing Resources & Examples

- Campus Transportation Schema (beta)
 - bit.ly/esri3dnetwork
- 3D Routing Development Demo:
 - <http://nadev.arcgis.com/arcgis/samples/4.0/3d-basic3d.html>



Network Analysis – Beyond Routing

Vehicle Routing Problem



Location-Allocation



Service Area Points



Service Area Lines

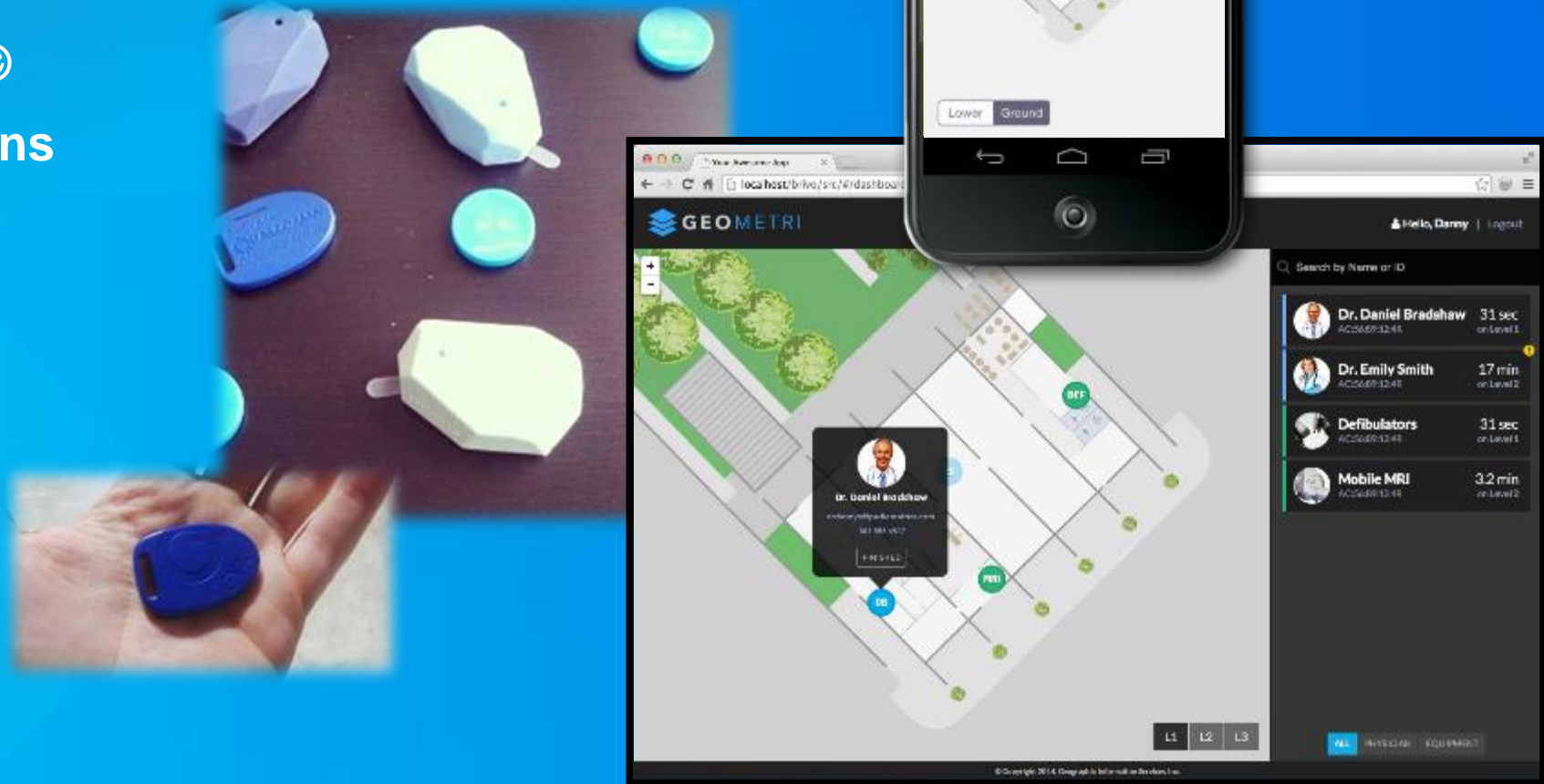


Service Area Polygons



What About Real-Time Navigation?

- The “blue dot” experience
- Predominantly a hardware solution
 - Radio triangulation
 - Beacons
- You still need the map 😊
- Several 3rd party solutions
 - GIsi Indoors/GeoMetri
 - Pen Bay
 - RF Spot
 - Newaer



Publishing

Jeff Archer



Publishing

- **2D is pretty easy**
 - **Networks**
 - **Floor spaces**
- **3D is not so much**
 - **Story is fluid and changing**
 - **True for all 3D data, not just campus/indoor**
 - **Shoot for Pro and publish to AGOL or Portal**
 - **Web Scene functionality will continue to grow**
 - **City Engine is an option for those who are savvy**
 - **Scene services can be an option**
 - **New at 10.3**

3D Campus Demos

Craig McCabe



Grand Finale

Why build a 3D Campus?

- **CityEngine Web Scene**
- **Coffee Station Inspection / ArcScene**
 - Campus Data
 - Transportation Network
 - VRP Solver
 - Publish to web
 - Full on ArcGIS Stack solution



Upcoming Workshops

Routing in Buildings with 3D Networks in ArcGIS Pro (Demo Theatre)

Wednesday 9:30am SDCC Hall B

3D – The Next Generation of Emergency Response (Demo Theatre)

Wednesday 9:30am Security Showcase – SDCC Hall B

5 Tips to Make Your 3D Life Easier (Demo Theater)

Wednesday 10:00am Tech Theater 15, SDCC Hall A

Spatially-Enabled Asset and Facility Management from IBM

Wednesday 12:00pm Room 24B

Using ArcGIS to Manage Military Bases and Facilities (Demo Theatre)

Thursday 9:30am Security Showcase – SDCC Hall D

Special Interest Group Meetings

Facilities and Indoor Mapping SIG

Wednesday 5:30pm SDCC Room 28A – Plaza Terrace Upper Level

Moderated Paper Sessions

3D Campus and Facility Modeling

Thursday 8:30am SDCC Room 27B

Please fill out the session survey:

Offering ID: 1630

Online – www.esri.com/ucsessionsurveys

Paper – pick up and put in drop box



Thank you!

Questions?



Understanding our world.