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
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

- Meeting Spaces
- Hallways
- Restrooms
CAD ➔ GIS ➔ 3D Cities Information Model

Omni 4th Floor

Import CAD
Georeference
Build Polygons
Attribute Spaces
Attribute Structure
CAD → GIS → 3D Cities Information Model

Omni 4th Floor

Import CAD
Georeference
Build Polygons
Attribute Spaces
Attribute Structure

Creating Interior 3D Web Scenes and 3D Base Layers

Doors
Walls
Creating Interior 3D Web Scenes and 3D Base Layers
CAD ➔ GIS ➔ 3D Cities Information Model

Omni 4th Floor

Import CAD
Georeference
Build Polygons
Attribute Spaces
Attribute Structure
Stairs

Creating Interior 3D Web Scenes and 3D Base Layers
CAD → GIS → 3D Cities Information Model

Common Issues

- CAD Topology
  - Line Gap
- Door Closure

Curves
BIM → GIS
Feature Extraction from LiDAR
Trees and Buildings
Feature Height Extraction from LiDAR

Demo – Craig McCabe
Procedural 3D Buildings
In CityEngine

- Building footprint
- Rule Package
- Textured 3D façade

Key attributes:
- Height
- Base elevation
- Number of floors
- Land use
Procedural 3D Trees
In ArcGIS Pro

Tree Points
Pre-Set Pro Layer
3D Trees

Key attributes
Making a Good Campus Map

Jeff Archer
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 in a university or business campus, a hospital, government complex, or a military base.

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.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
</table>
| Experience  | Editing workflows in ArcGIS for Desktop
|             | Installing add-ons and configuring tools in ArcGIS for Desktop |
Campus Map
Examples
Demo - Jeff Archer
Transportation Networks

Jeff Archer
2015: In-building Route Creation – single floor
# Supported Route Restriction -- Considerations

<table>
<thead>
<tr>
<th>Route Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary/secondary/tertiary paths (avoid cutting through rooms)</td>
</tr>
<tr>
<td>Indoor/outdoor/covered paths</td>
</tr>
<tr>
<td>Wall distance (for readability)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelchair accessible</td>
</tr>
<tr>
<td>ADA compliant</td>
</tr>
<tr>
<td>Slope</td>
</tr>
<tr>
<td>Curbs or ramps</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Safety &amp; Security</th>
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</thead>
<tbody>
<tr>
<td>Emergency exit routing</td>
</tr>
<tr>
<td>Prefer well-lit paths</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Path width/height</td>
</tr>
<tr>
<td>Path direction (1-way or 2-way)</td>
</tr>
<tr>
<td>Door key access (directional)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Route Summary (solver optimizes distance &amp; walk time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total walking time</td>
</tr>
<tr>
<td>Total distance (feet or meters)</td>
</tr>
<tr>
<td>Directions</td>
</tr>
</tbody>
</table>
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?