3D Visualization with ArcGIS
Agenda

- **Getting started with 3D GIS**
- **ArcGIS Desktop**
  - Getting started with ArcGlobe
  - Creating visualization tips
  - Animations
- **ArcGIS Explorer**
What is the 3D Analyst Extension?

- Extension to ArcGIS platform
  - ArcGIS Desktop
  - ArcGIS Engine
  - ArcGIS Server

- Sophisticated surface modeling and GIS analysis tools

- Visualize GIS features beyond “2D”
  - Realistic landscapes and urban environments, and...

...Tool for solving many real-world problems
ArcScene

- **3D visualization application**
  - .SXD documents
- **Fundamentals:**
  - Provides perspective viewing
  - Planar display & projections
  - Geoprocessing (ArcToolbox)
  - Animations and videos
  - Great for sub-surface display
- **Memory based application**
  - Best for smaller study areas
ArcGlobe

• Desktop Authoring tool
  – .3DD document files (globe documents)
  – Globe display (spherical)
  – CUBE projection

• Fundamentals:
  – Unique navigation tools
  – Geoprocessing (ArcToolbox)
  – Animations and videos
  – Publish Globe views as web service

• Supports sophisticated memory management
  – Ideal for Global datasets
  – Ideal for large datasets
Layer Types in ArcGlobe

- **Elevation**
  - Defining globe surface

- **Draped**
  - On the globe surface

- **Floating**
  - Above or below globe surface

**Note** - Drawing order of overlapping draped and elevation layers is set via ‘Type’ tab on TOC and not on ‘Display’ tab.
Key ArcGlobe distinctions (compared to ArcMap)

• Single globe data view
  – i.e. No layout mode
  – TOC behaves differently

• Navigation tools
  – e.g. Fly, Walk, Tilt, …etc.

• Scale is referenced differently
  – i.e. Distance above surface

• Additional layer properties
  – But many similarities
    (e.g. Join, Definition queries, …etc.)

• Supports 3D objects
  – For vector layers or graphics
Animations

• Quickly specify a series of 3D viewpoints to fly between
• Create flybys from a path feature
• Animate groups of layers
• Export videos for sharing
What do I need to run ArcGlobe?

• **Software:**
  - ArcGIS 3D Analyst Extension with ArcView, ArcEditor or ArcInfo
  - ArcGIS 9.0 or higher (latest Service Packs recommended)

• **Hardware:**
  - CPU at least 1.5 GHz
  - Additional disk space for data cache, depending on need
  - OpenGL 1.2 compatible video card with minimum 64 MB of memory

• **Data:**
  - Most ArcGIS-supported datasets
  - ArcGIS Online (Default content)
  - ArcGIS Data and Maps DVD
Layer Authoring - 3D Objects

3D (textured) Objects can be added to ArcGlobe by:

• Symbolizing points with 3D markers
  – ESRI-provided styles
  – Supported 3D file formats

• Multipatch features
  – Result of GP tasks
  – Imported 3D files
  – Generated using ArcObjects

• Extruding features
  – For example, building footprints
  – Supported 3D file formats: .3ds, .flt, .skp, .dae, .wrl
What is multipatch?

A 3D geometry used to represent the outer surface, or shell, of features that occupy a discrete area or volume in three-dimensional space.

- **Unique polygon**
  - Geodatabase
  - Shapefile
  - With or w/o textures
3D Graphics and KML support

• **3D Graphics Toolbar**
  – Digitize point, line, polygons and text graphics
  – Apply 3D Symbology to the graphic elements

• **Keyhole MarkUp Language (KML)**
  – XML-based language for defining the display of 3D spatial data in Google Earth
  – Add KML data using the KML toolbar in ArcGlobe
  – Strong support for KML 2.2
Best practices for ArcGlobe performance

- Keep note of recommended system requirements
- Use scale dependency
- Manage the use of textures and 3D symbology
  - Layer property settings
- Practice good cache and memory management
- White paper:
Caching and Optimization

- ArcGlobe uses caching to optimize display performance
- Cache tiles are kept for each layer: in-memory for immediate use and on disk for later
  - Group layer caching
- Caches are preserved when saving a layer file or document
Caching Tips

- Save a document or layer file to preserve the cache
- Verify the size of the memory cache in the Options dialog
- From time to time, clean the cache location
- To optimize interaction, generate the caches in advance

- For more read technical papers on http://support.esri.com :
  - Tips for Designing Interactive ArcGlobe Documents
  - Techniques for Consuming 3D Textured Objects in ArcGlobe and ArcScene
Publishing 3D content to the web

• Publish 3D GIS data to the Web
  – Globe Services provide globe visualization, animation and ability to perform spatial queries on 3D data
  – Globe Services provide a means for generating, managing and serving optimized globe data (e.g. 3D properties)

• Supported ArcGIS clients
  – ArcGlobe
  – ArcGIS Engine Applications using GlobeControl
  – ArcGIS Explorer and ArcReader
ArcGIS Explorer is GIS for Everyone

• Free, lightweight geobrowser

• Enables you to deliver GIS to a broad audience

• Makes it easy to integrate information geographically
  - Many content formats supported
  - Notes, videos, URLs, Rich media content, etc
Integrated 2D/3D Display

Complete control over your visualization experience

- Toggle modes on-the-fly
- Maps can be saved in either mode
- Projections (2D mode)
ArcGIS Explorer
*Works with ArcGIS Desktop and ArcGIS Server*

- Layer packages
- Other data

Author using ArcGIS Desktop
- Maps, globes
- Geoprocessing

Serve with ArcGIS Server

Use in ArcGIS Explorer

- ArcGIS Online Sharing
How do you get ArcGIS Explorer?

- Download from ESRI
  
  http://www.esri.com

- Download from ESRI Resource Center
  
  http://resources.esri.com/arcgisexplorer
ArcGIS Explorer Resources

- **Resource Center**
  - [http://resources.esri.com/arcgisexplorer](http://resources.esri.com/arcgisexplorer)
- **ArcGIS Explorer Blog**
- **ArcGIS Online**
  - [http://www.arcgisonline.com/home](http://www.arcgisonline.com/home)
3D Analyst – The Road Ahead

ArcGIS 10

- 3D display improvements
  - Faster rendering in 3D / improved display quality

- 3D data management
  - Edit GIS features directly in 3D
  - Expansion of Terrain and TIN capabilities

- 3D analysis functionality
  - 3D vector analysis

- Usability improvements
  - animation, styles, navigation, documentation
• Online training
  – Web course: Learning ArcGIS 3D
  – Web course: Managing Lidar Data in ArcGIS