ESRI California | Hawaii | Nevada

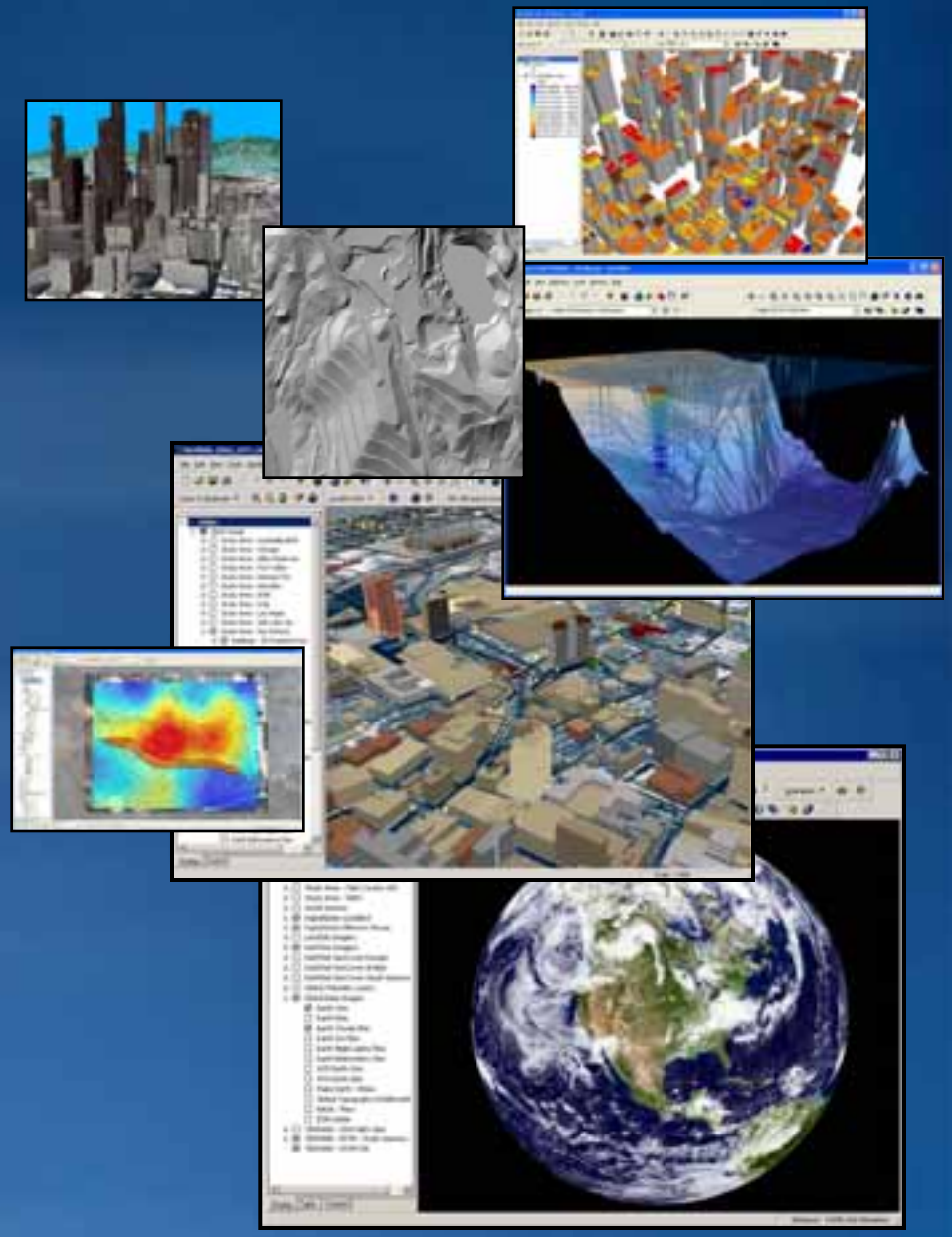
Regional User Group Conference

February 3–4, 2010 • ESRI • Redlands, CA

3D Visualization with ArcGIS

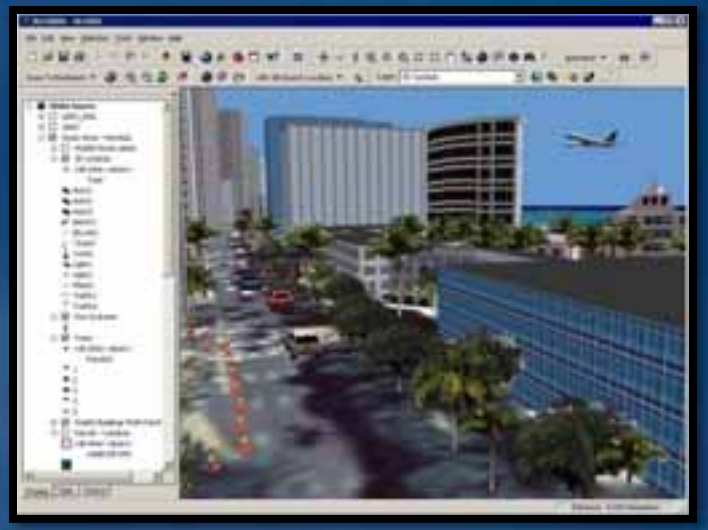
Agenda

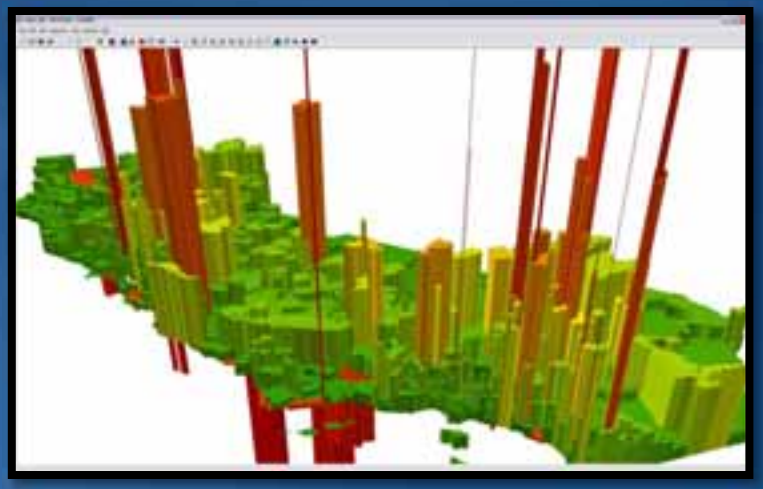
- Getting started with 3D GIS
- ArcGIS Desktop
  - Getting started with ArcGlobe
  - Creating visualization tips
  - Animations
- ArcGIS Explorer



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…

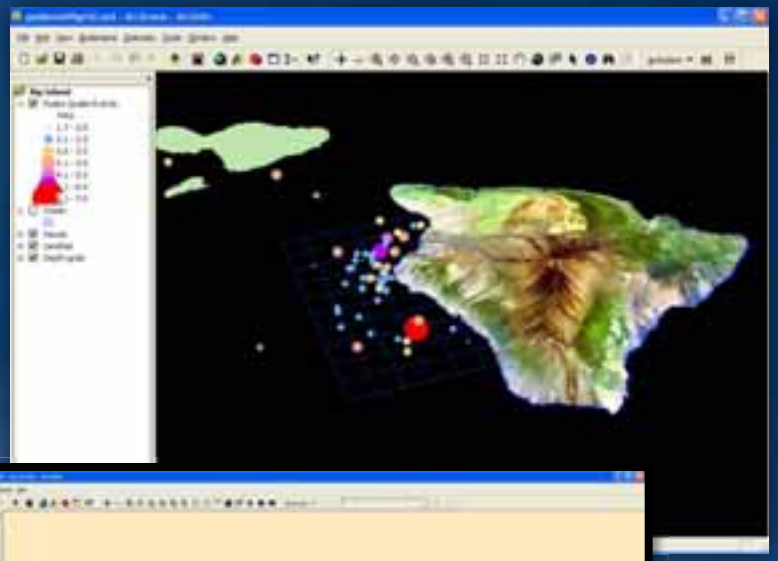


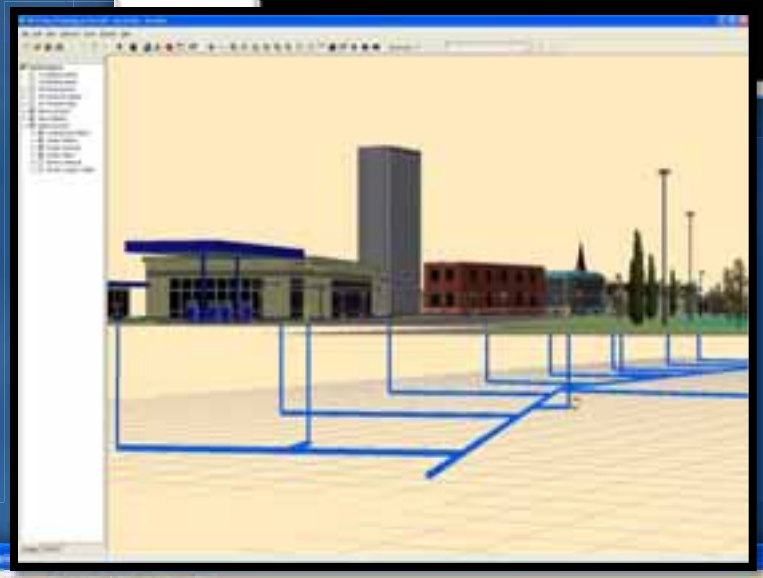


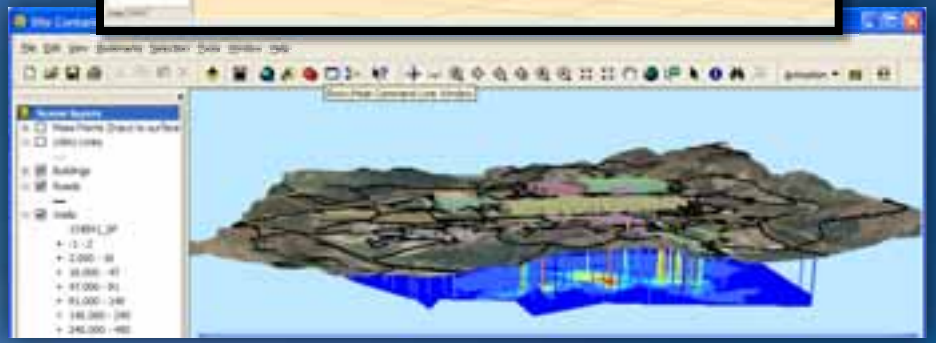
…Tool for solving many real-world problems

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





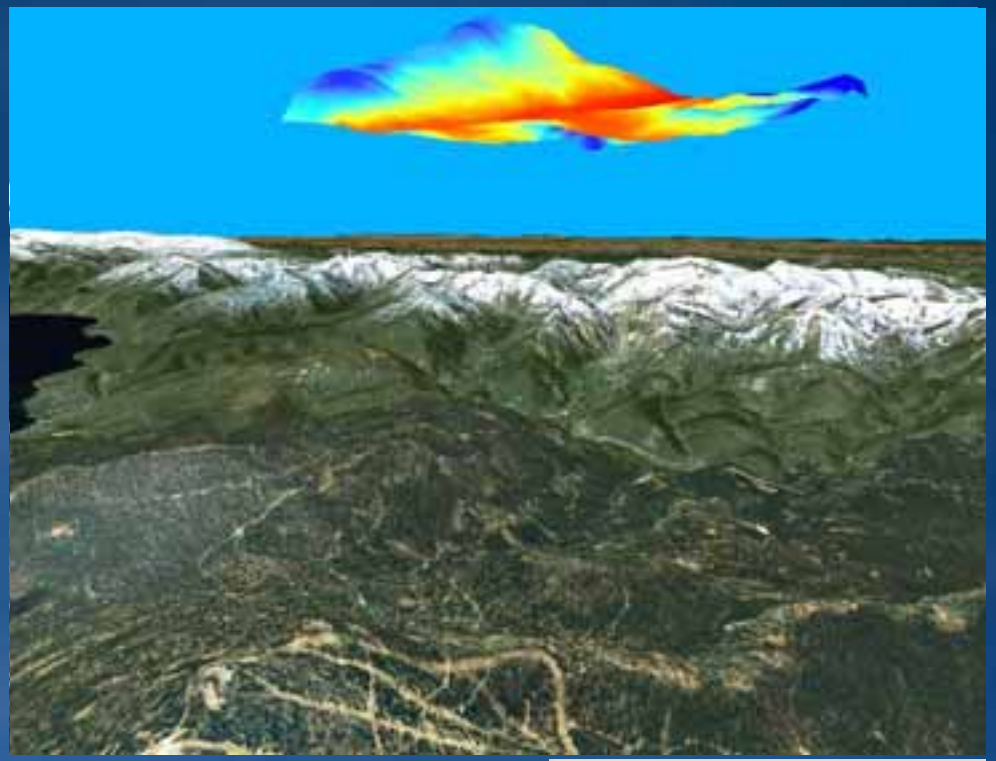


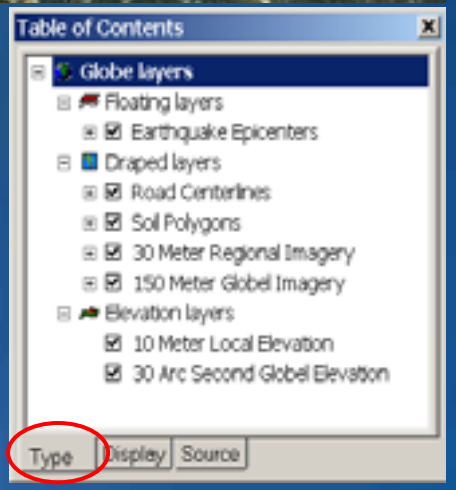
ArcGlobe

- 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

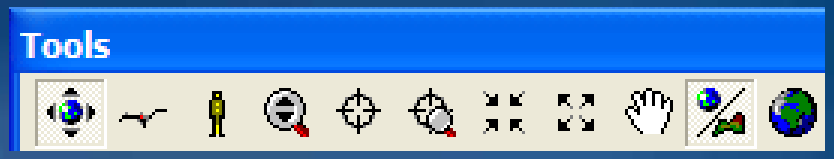


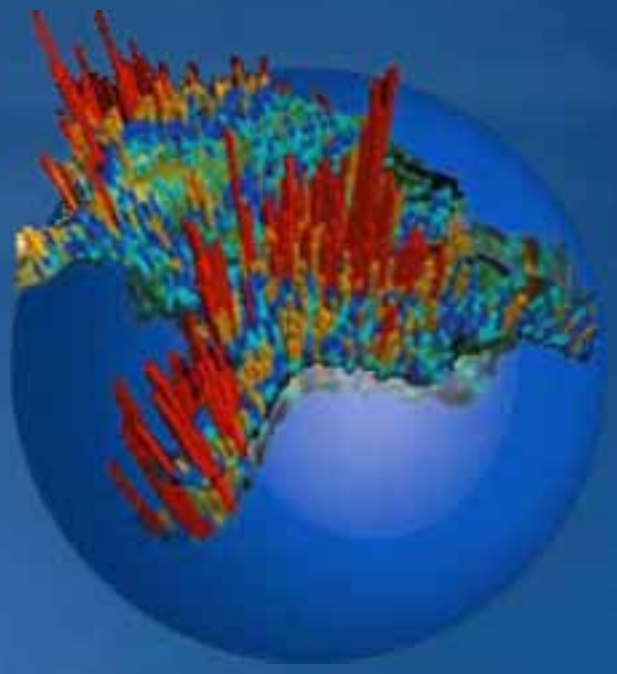


Note - Drawing order of overlapping draped and elevation layers is set via 'Type' tab on TOC and not on 'Display' tab.

Key ArcGlobe distinctions (compared to ArcMap)

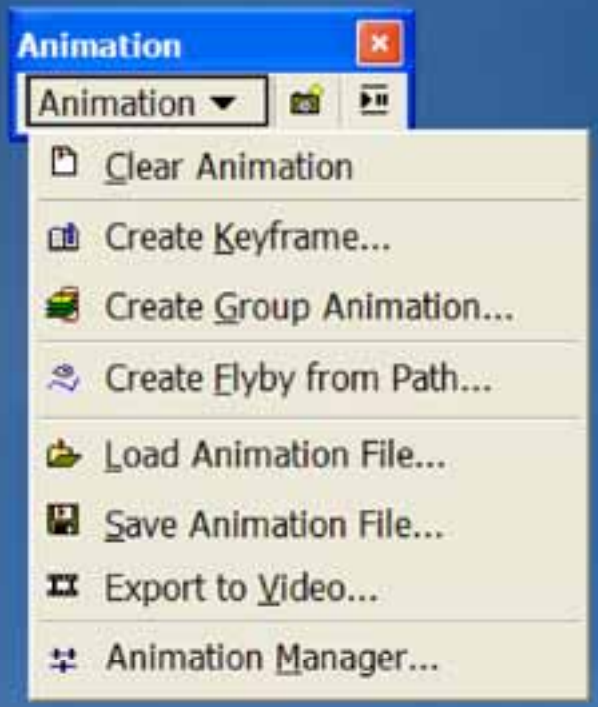
- Single globe data view
  - i.e. No layout mode
  - TOC behaves differently
- Navigation tools
  - e.g. Fly, Walk, Tilt, …etc.
- Scale is referenced differently
  - i.e. Distance *above* surface
- Additional layer properties
  - But many similarities (e.g. Join, Definition queries, …etc.)
- Supports 3D objects
  - For vector layers or graphics

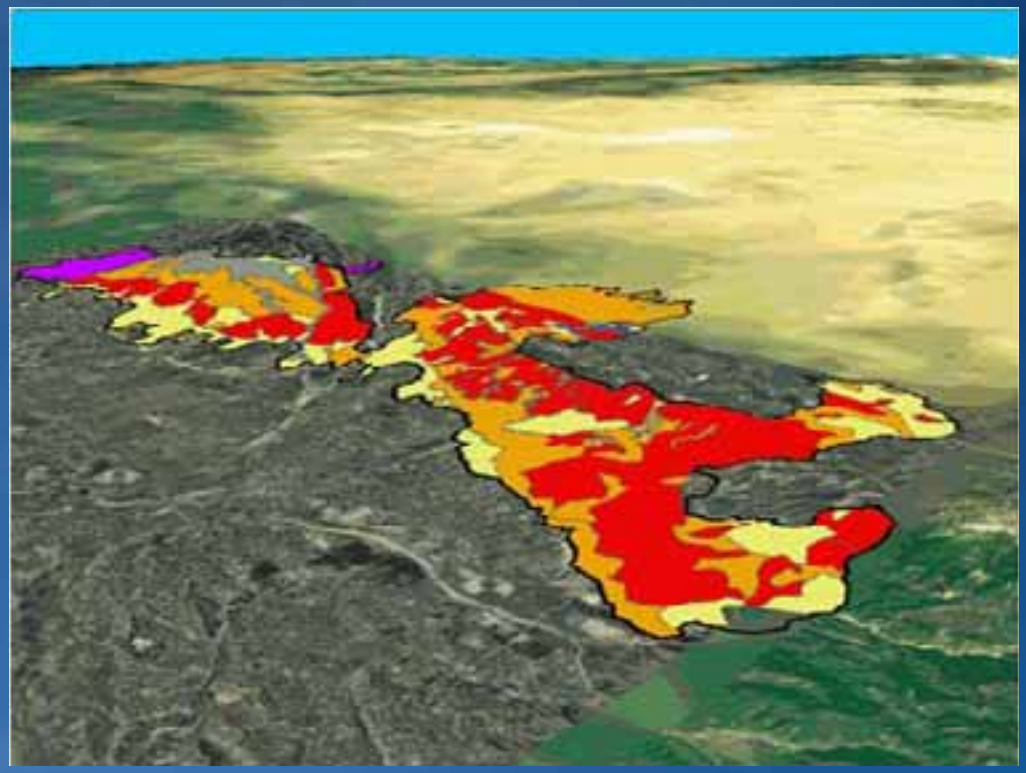




Animations

- 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

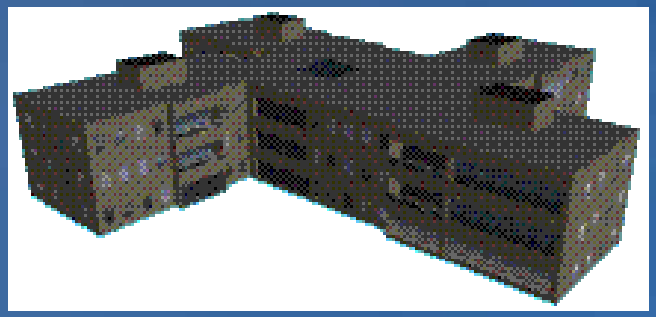
3D (textured) Objects can be added to ArcGlobe by:

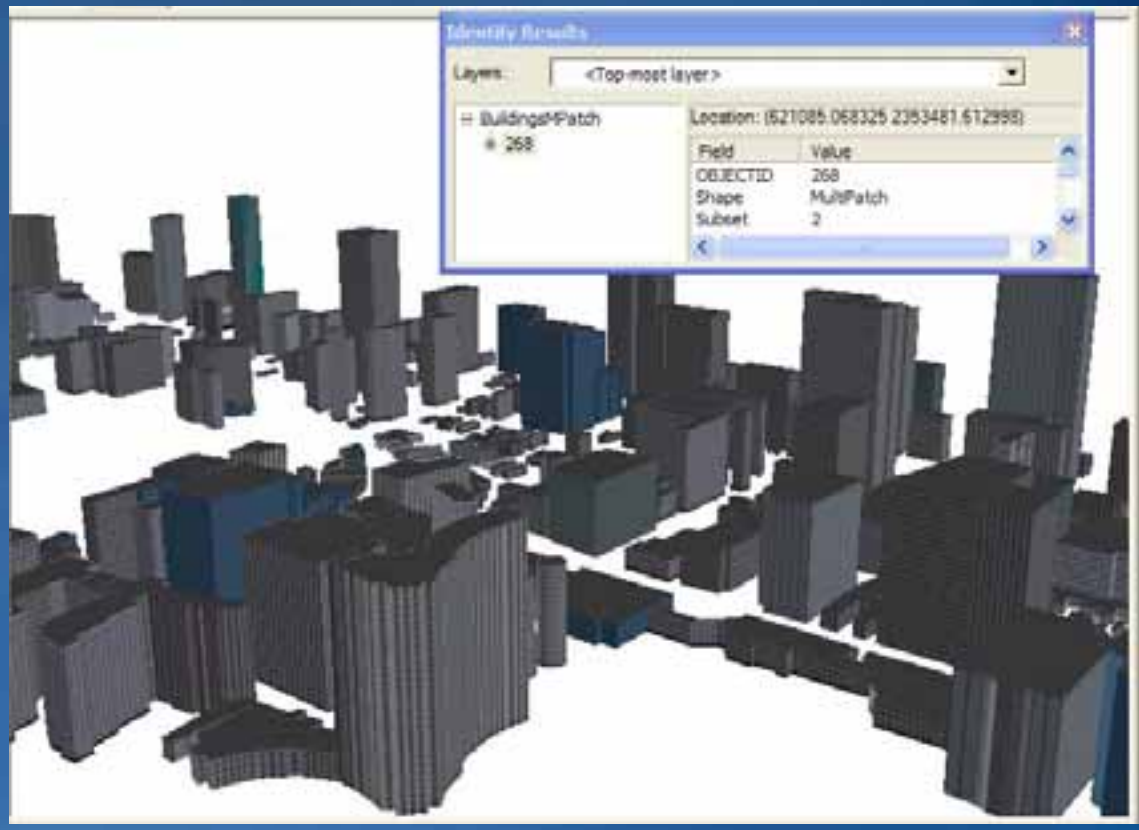
- Symbolizing points with 3D markers
  - ESRI-provided styles
  - Supported 3D file formats
- Multipatch features
  - Result of GP tasks
  - Imported 3D files
  - Generated using ArcObjects
- Extruding features
  - For example, building footprints
  - Supported 3D file formats: .3ds, .flt, .skp, .dae, .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

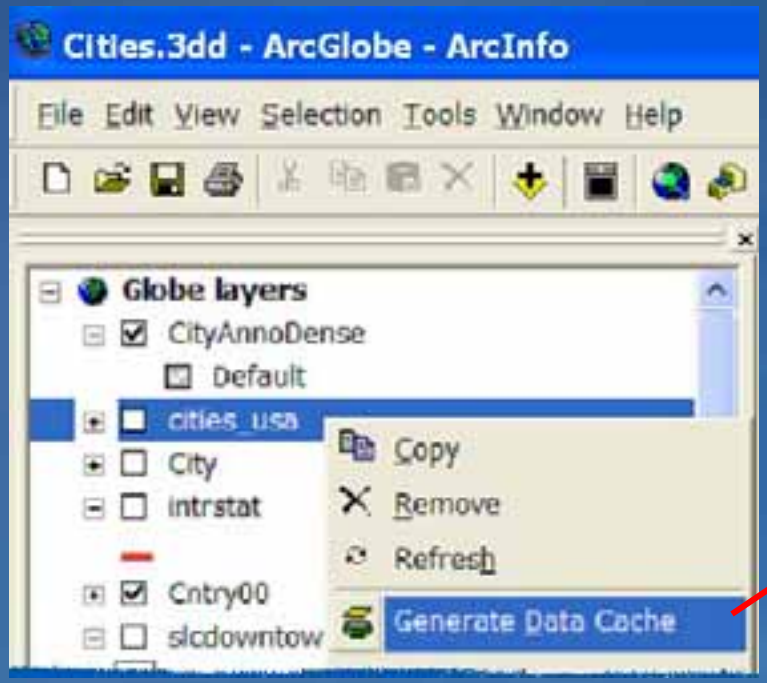
- 3D Graphics Toolbar
  - Digitize point, line, polygons and text graphics
  - Apply 3D Symbology to the graphic elements
- Keyhole MarkUp Language (KML)
  - XML-based language for defining the display of 3D spatial data in Google Earth
  - Add KML data using the KML toolbar in ArcGlobe
  - Strong support for KML 2.2

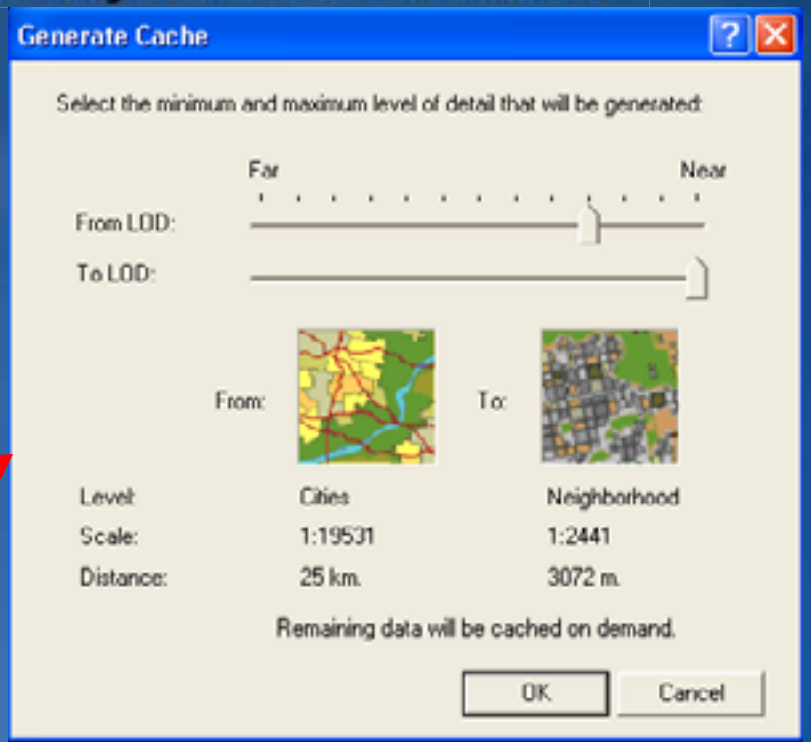
Best practices for ArcGlobe performance

- 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:
  - http://support.esri.com/index.cfm?fa=knowledgebase.documentation.viewDoc&PID=54&MetaID=1298
  - ArcGIS Desktop system requirements: http://wikis.esri.com/wiki/display/ag93bsr/ArcGIS+Desktop

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

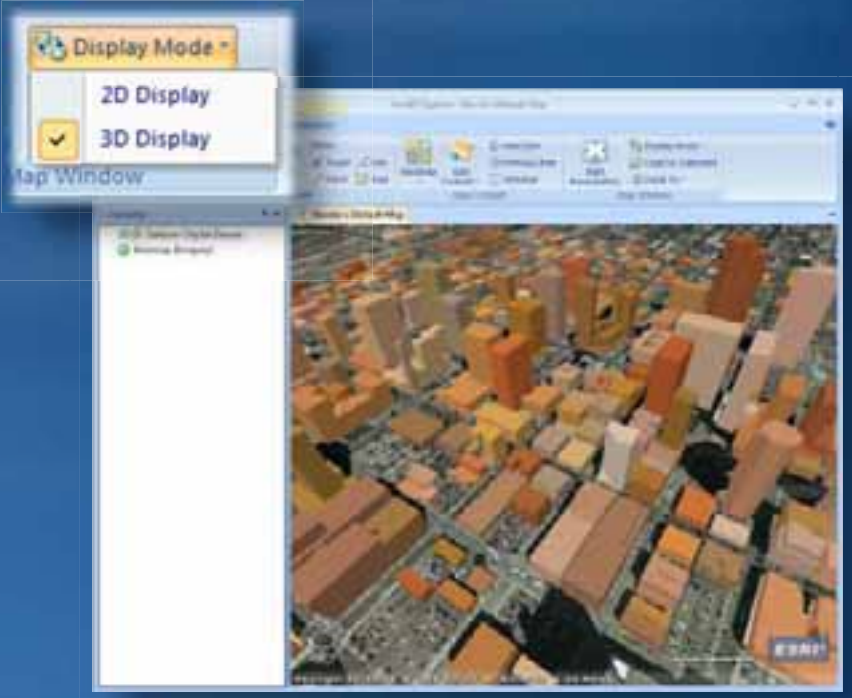
ArcGIS Explorer is GIS for Everyone

- 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

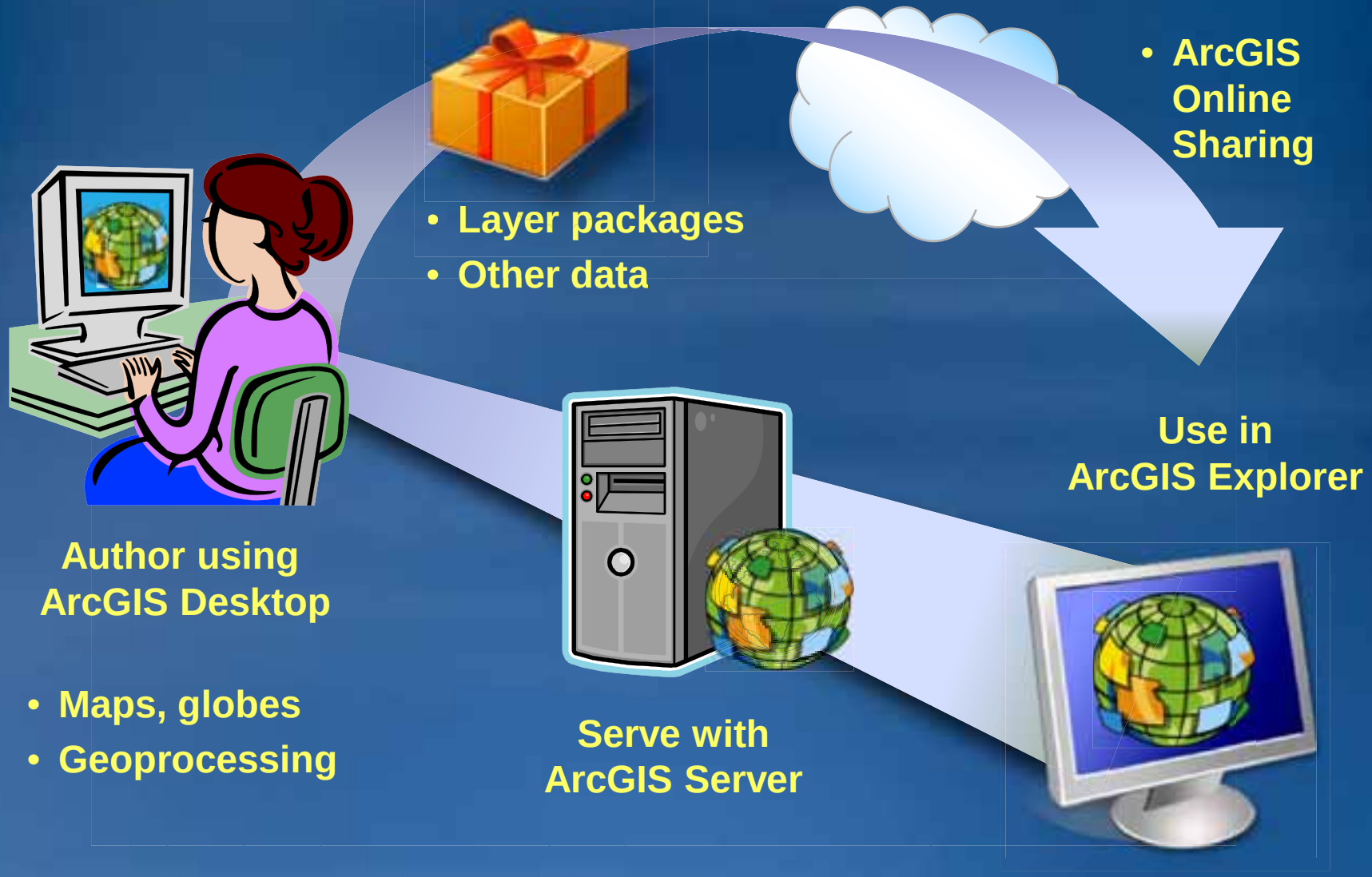
Complete control over your visualization experience

- Toggle modes on-the-fly
- Maps can be saved in either mode
- Projections (2D mode)



ArcGIS Explorer

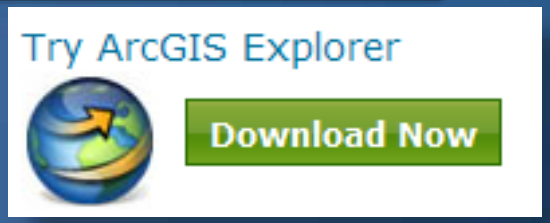
Works with ArcGIS Desktop and ArcGIS Server



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
- ArcGIS Explorer Blog
  - http://blogs.esri.com/Info/blogs/arcgisexplorerblog/
- ArcGIS Online
  - 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

Learning more…

- Online training
  - Web course: Learning ArcGIS 3D
  - Web course: Managing Lidar Data in ArcGIS