3D Visualization in ArcGIS Pro
Philip Mielke, Nathan Shephard, Stephen Heidelberg
3D Across ArcGIS

- GIS is 3D
- Web GIS services-based architecture
- New clients and experiences
- Workflow modernization
- GeoEnabled Systems
### ArcGIS Pro Enhancements to exploratory analysis and editing

<table>
<thead>
<tr>
<th>Exploratory analysis tools</th>
<th>3D editing / modeling</th>
<th>Realistic Visualizations</th>
<th>Animation for static and dynamic story telling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line of sight, viewshed, view dome, and slice by plane or volume capability can be applied to visible scene layers.</td>
<td>Directly edit OBJ, DAE, multipatch features (geodatabase) and scene layers with new precision editing tools. <strong>New:</strong> Explode, Merge and Slice Multipatch</td>
<td>Ambient Occlusion, Eye-dome lighting, Material support in Markers, Water fill symbol</td>
<td>Create rich animations with 3D content and screen overlays for text and imagery content that can be configured with timing settings.</td>
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<tr>
<td><strong>New:</strong> Cut-Fill Tool</td>
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*Learn more: [youtu.be/rQkK1P2tg](https://youtu.be/rQkK1P2tg)*

- **3D object scene layer symbology**
  - Smart mapping functionality to stylize 3D layers (similar to web scene viewer)

- **LAS Classification**
  - Classify building rooftops, ground and vegetation Lidar. New Profile viewing helps manually classify lidar.
Enabling customers and partners through Open Standards

Open Software, Standards and Data enable organizational resiliency

- Ensure access to data
- Guarantee interoperability
- Enable innovation
- Encourage usage and adoption

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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<tbody>
<tr>
<td>I3S</td>
<td>Scalable 3D scene content for visualization and distribution</td>
</tr>
<tr>
<td>LERC</td>
<td>Raster (imagery and elevation) compression technology for 2D and 2.5D</td>
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<tr>
<td>LEPCC</td>
<td>3D compression technology used for point clouds and other 3D rasterized data</td>
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<tr>
<td>GeoREST</td>
<td>Esri open REST APIs for access to any kind of GIS content and services</td>
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OGC Community Standard
ArcGIS Earth

Easy-to-use 3D data exploration for Enterprise users

Drone2Map

Streamline the creation of professional imagery products from drones

Web Scene Viewer

View 3D maps in any standard web browser

Web AppBuilder

Build powerful 3D GIS apps without writing a single line of code

App Templates

Compare scenes or include an inset web map with a scene

Story Maps

Combine 3D maps with narrative text, images, and multimedia content
### Scene Viewer

Enhancements to search, navigation, and rendering

<table>
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<tr>
<th>Animated Water Visualizations</th>
<th>Large Feature Datasets</th>
<th>Smart mapping line and polygon styles</th>
<th>Floor Picker in Building Explorer</th>
</tr>
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<tbody>
<tr>
<td>Water styles applied to polygon feature layers will add animated waves to your features representing the surface of oceans, lakes, rivers or pools.</td>
<td>Point, lines and polygon feature layers with thousands or even millions of feature layers can be added to a scene.</td>
<td>Lines and Polygons have new smart mapping styles to explore and visualize attribute data. Extrude buildings and make realistic utilities.</td>
<td>Isolate building levels to display spaces, structural assets and infrastructure.</td>
</tr>
</tbody>
</table>

**Search for features in web scenes**

Users can configure feature search in a scene and locate objects by attributed information.

**Underground Navigation**

Explore subsurface geology and infrastructure with underground navigation.


Try it out: [arcgis/yTSCe](http://arcgis/yTSCe)
ArcGIS Earth
Enhancements to analysis and mobile

**Browse 2D and 3D content from an Android device**
Users can connect to ArcGIS services or add local layer packages saved in local storage.

**Perform interactive 3D analysis and create simulations**
Run a quick visibility assessment with your fingertips for line of sight and viewshed or simulate along a route.

**Collect and share information in the field**
The tour feature was introduced to help users collect and share information with photos in album.

Learn more: [bit.ly/ArcGISEarth18](https://bit.ly/ArcGISEarth18)
Download directly from Google Play Store
Developer Tools
Development and Scripting Tools For Extending/Customizing

ArcGIS Runtime SDKs
Developer tools for 2D and 3D native iOS, Android, Windows solutions

ArcGIS API for JavaScript
Developer toolkit for building and extending 2D and 3D web apps

Android Java C#
Web HTML5 REST JavaScript
.NET QML Python
Swift Qt Windows
Xamarin Apple
Objective-C

Reduce Development Costs
• 3D Everywhere
• Leverage User Roles
• ArcGIS layers
• Data Flows Between Apps
3D Visualization in ArcGIS Pro

Introduction of key concepts
Scenes are 3D maps

Global Scene (sphere)

Local Scene (planar)

Map (2D)

Data from Open Street Map and National Data Buoy Center
Navigating in a scene

- Pan, Zoom, and **Orbit**
  - (Orbit = “Rotate and Tilt the map”)

**Tips:**
- Use bookmarks
- Enable underground navigation
- Use Previous/Next extent
- Learn keyboard shortcuts
- Use the On-screen Navigator control

2D – cannot tilt
3D - tilted
Scenes have elevation surface/s

- Surfaces act as a **height source** / canvas
- A Pro scene always has a **Ground** surface
  - Can act as a boundary for above-ground navigation
- **More surfaces** can be added
  - Non-ground surfaces – geological strata, …
  - Thematic surfaces – temperature, crime, …
  - Before/After surfaces – design, disasters, …
- A surface can have **multiple data sources**
  - Local data – rasters, TINs
  - Services – elevation image services
- You can exaggerate, shade, and color surfaces
Scenes support many types of data

- **Vector layers**
  - Feature classes: Point, line, polygon, multipatch, annotation, …
  - Scene layers: 3D Point, 3D Object, Integrated Mesh, Point Cloud, …
  - Services: Feature services, Map services, Scene services, …
  - Third party layers: KML, BIM (Revit), CAD, CSV, …

- **Raster layers**
  - On disk: Image files, Mosaic datasets, NetCDF, …
  - Services: Image services, KML Network Links, WMS, …

- **Elevation layers**
  - Single-band rasters, TINs, Elevation image services
Scenes have extra symbology options

- **Use 3D models** for realism and recognizable objects
  - Models may have material properties (eg: shiny)
- **Extrude** polygons to make 3D blocks
- Simple **attribute-driven** shapes (aka “Preset layers”)
- Set vertical positions **realistically** or **thematically**

- Plus advanced symbols only available in 3D
  - Procedural rule packages (from CityEngine)
  - 3D-aware geometric effects
  - Animated water fill
Scenes have lighting, shadows, and environmental effects

- Atmospheric effects
  - Sunset, sunrise, atmospheric halo
- Sun, moon, and star positioning
- Enable ambient occlusion lighting
- Cast shadows
- Animate lighting through time
Scenes can be published and re-used (as web scenes)

- Web AppBuilder
- Story Maps
- JS API Custom apps
Overview of working with 3D in ArcGIS Pro

Nathan Shephard
Summary: 3D Concepts for ArcGIS Pro

- 3D Viewing modes: **Global** or **Local**
- Symbol size: **Screen-space** or **Real-world**
- Styling: **Realistic** or **Thematic**
- Use attributes to drive symbology
  - Especially geometric properties like size / rotation / offset
- Define the lighting and shadows for the scene
- More advanced options are available, such as:
  - Geometric Effects
  - Procedural Symbology
  - Animated Water Fill (not shown… yet)
Using Sliders with 3D
Exploring data through time and numeric ranges
Explore content using sliders

• Visual filtering of content using interactive on-screen controls
  - “A map/scene can have a temporal extent”
  - “A map/scene can have a range extent”

• Sliders can drive many layers in the scene

• Properties are kept when publishing
  - But… web maps only have a time slider (OOB)
  - And… web scenes have neither (so far)

• TIP: Can be used in Animations!
Time-aware layers

• Temporal information stored as an attribute
  - Single field for the event moment
  - Two fields for the start-end of an event
• Set the time zone (as needed)
• Content will filter **based on the map’s time**
  - Feature data (by database row)
  - Mosaic datasets (by image row)
  - NetCDF (by virtual row)
• Play through time
• Store time-aware bookmarks
Range awareness

- Numeric range values, stores as an attributes
  - Can be any numeric field for tabular data
  - EG: temperature, price, days-since-serviced, …
- Can have multiple ranges in one layer
  - Set the alias name
  - Define the same logical range on other layers
- Only one range can be active at a time
  - That is, only one range attached to the slider
- Play through a range
- Store range-aware bookmarks
Using the Time and Range Sliders
Nathan Shephard
Introduction to Animation
Author and share geographic stories from Pro as videos
Animation for static and dynamic story telling
TIP: How to find the Animation ribbon

- Go to the View Ribbon
- Click on Add on the Animation Tab
- *Don’t click Remove unless you want to delete your current animation keyframes*
Animation in ArcGIS Pro
Steve Heidelberg
Please Share Your Feedback in the App

Download the Esri Events app and find your event

Select the session you attended

Scroll down to “Survey”

Log in to access the survey

Complete the survey and select “Submit”
Questions?