3D across the ArcGIS Platform

Chris Andrews | 3D Product Manager
The experience of GIS is changing

The GIS of the future is
- Mobile
- Immersive
- Visually compelling
- Real time/time aware
- Consumerized/User friendly
- Deep and Smart
- Scalable and Distributed

3D is the common visual and analytical experience for tomorrow’s GIS
Massive amounts of new data available

- Lidar from drones, trucks, backpacks, airplanes, and satellites
- High resolution, global-scale mesh created from aerial and satellite imagery
- Spherical and oblique imagery from consumer and industrial devices
- Underground information from millions of boreholes
- Large processing pipelines from Vexcel, Harris, and others
- Potential of IoT and indoor location
Core 3D Capability | Anywhere In Any Environment

- Use 2D and 3D GIS in a single GIS workflow
- Reuse dynamic services across clients
- Securely collect, manage, curate 3D data
- Conduct analysis across real-time and historical data
- Create tailored experiences for different types of users

Cross-platform  Open  Accessible

Server  Online Content and Services
Powerful 2D/3D desktop authoring and data management

- 3D streaming for global and local scenes
- Rich spatial analysis for advanced 3D workflows
- LiDAR classification, feature extraction and editing
- BIM (IFC) and KML (KMZ) interoperability support
- ArcGIS Pro SDK for Microsoft .NET to extend workflows

Advanced authoring tool for Urban Design

- Interactive design/modeling tools
- Procedural rule authoring
- Dynamic 3D streets and blocks
- Virtual reality with ArcGIS 360 VR

ArcGIS Extensions

- 3D Analyst
- Spatial Analyst
- Network Analyst
- Data Interoperability
ArcGIS Pro | 3D navigation

- Underground navigation
- 3D navigation control
- Dynamic view linking 2D-3D or 3D-3D
ArcGIS Pro | 3D editing

- Create new 3D objects
- Geometric shapes
- Snap to scene layers
- Apply procedural rules
- Use standard OBJ, DAE formats
ArcGIS Pro | 3D cartography

- Geometric Effects in 3D
- Advanced cartographic options
  - Military, Scientific
ArcGIS Pro | Storytelling with Animation

- Create rich animations with 3D content, overlays
- Use Range and Time
- Screen overlays
  - Placement
  - Text and imagery content
  - Timing
- Use geodesic paths
CityEngine 2017 | New capabilities

- Scenarios
- Local Edits
- Context Queries
- 3D Measure

CGA Enhancements for Zoning
<table>
<thead>
<tr>
<th>Apps</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>ArcGIS Earth</td>
<td>Easy-to-use 3D data exploration for Enterprise users</td>
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<tr>
<td>Drone2Map</td>
<td>Streamline the creation of professional imagery products from drones</td>
</tr>
<tr>
<td>Web Scene Viewer</td>
<td>View 3D maps in any standard web browser</td>
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<tr>
<td>Web AppBuilder</td>
<td>Build powerful 3D GIS apps without writing a single line of code</td>
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<tr>
<td>Story Maps</td>
<td>Combine 3D maps with narrative text, images, and multimedia content</td>
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ArcGIS Earth | 1st Year

- Earth launched in production Jan 2016
- Focus on innovation, agility and customer feedback
- Releasing quarterly
  - 4 releases since UC 2016
- Free for download
ArcGIS Earth | Consistent experience for desktop users

- Browse Online/Enterprise
- Authenticate with PKI, IWA
- Add local data
- Navigate
- Use KML
- Configure and personalize
Drone2Map | Create 2D and 3D products from drone imagery

- Orthomosaics
- Digital Surface Models
- Point Clouds and Meshes
- Smart Inspection
More Apps

Extending Industry Specific Workflows

Field
- Workforce
- Navigator
- Collector
- Survey123
- Drone2Map

Office
- ArcGIS Earth
- Explorer
- Maps for Office
- Insights
- Maps for Adobe Creative Cloud
- GeoPlanner
- Operations Dashboard
- Maps for SharePoint

Community
- Photo Survey
- Story Maps
- Open Data
- Quick Report
- Crowdsourcing

Applications:
- Collector
- Drone2Map
- Workforce
- Navigator
- Survey123
- Field Operations
- Maps for Office
- Insights
- Maps for Adobe Creative Cloud
- GeoPlanner
- Operations Dashboard
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Map-related applications:
- ArcGIS Earth
- Explorer
- Maps for Office
- Insights
- Maps for Adobe Creative Cloud
- GeoPlanner
- Operations Dashboard
- Maps for SharePoint
- Photo Survey
- Story Maps
- Open Data
- Quick Report
- Crowdsourcing
ArcGIS Online: Content and services for sharing ideas in 2D and 3D

ArcGIS Enterprise: Scalable 2D/3D enterprise content distribution and geoprocessing

GeoEvent Server: Connect and manage real-time information (IoT)

Enterprise data and services:
- Web Scene
  - Vehicle for cross-platform 3D capability
- Collection of layers, environment settings, slides, animation
- Essential for 3D apps on any platform or experience
- Scene Layer
  - Scalable cache of graphics, styles, and attributes
  - 3D Objects, 3D Points, Integrated Meshes, Point clouds
More ways to use scenes

- Web AppBuilder
- Story Maps
- JS API Custom apps
3D in JavaScript | From API to configurable apps

- WebGL 3D experiences that run in a browser with no plug-in
- Customize, configure, or use out-of-the-box experiences
- Combine 2D and 3D content from your Organization with Living Atlas data
Standards
Enabling customers & partners through sharing and integration

Open Software, Standards and Data enable organizational resiliency
• Ensure access to data
• Guarantee interoperability
• Enable innovation
• Encourage usage and adoption

<table>
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<tr>
<th>I3S</th>
<th>Scalable 3D scene content for visualization and distribution</th>
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<tr>
<td>LERC</td>
<td>Raster (imagery and elevation) compression technology for 2D and 3D</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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Esri and 3rd Party Partner Content

ArcGIS Marketplace
3rd party geospatial apps and data from Esri’s global Partner Network

Living Atlas
3D and 2D content for use throughout mapping applications

Ready-to-Use Maps and Data
- Global Coverage
- Compiled from Best Available Sources
  - Basemaps
  - Imagery
  - Demographics
  - Landscape
- Tens of Thousands of Open Datasets
Developer Tools | Development and Scripting Tools For Extending/Customizing

ArcGIS Runtime SDKs | Developer tools for 2D and 3D native iOS, Android, Windows solutions
ArcGIS JavaScript API | Developer toolkit for building and extending 2D and 3D web apps

Reduce Development Costs
- 3D Everywhere
- Vector Tiles
- Smart Mapping
- Leverage User Roles
- Data Flows Between Apps

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

Python | REST
.C# | QML
Swift | Xamarin
objective-C | HTML5
Java | C++
C# | REST
.NET | QML
Swift | Xamarin
Objective-C | HTML5
Enterprise workflows

**Large Enterprises**
Exploring data securely on premises

Law enforcement, federal agencies & large companies need to explore information across large areas using 3D GIS behind a firewall

**Small Enterprises**
Sharing 3D using ArcGIS Online

City planners, urban designers, and small AEC firms want to create and share plans and status with constituents in 3D

**Hybrid scenario**
3D with large data packages in connected and disconnected workflows

Program management agencies, emergency managers, and utilities agencies need to use 3D within the organization for planning and to share with collaborators in the field to plan, respond and act
3D Virtual Construction

CAD, BIM, and GIS
75% of the Infrastructure That Will Exist in 2050 Doesn’t Exist Today

BY AURORA ALMENDRAL | OCTOBER 22, 2014
BIM is a process for increasing efficiency throughout the construction process.
BIM + GIS

Changing the way cities and utilities design, build, and manage resilient infrastructure
High-level GIS-BIM workflow

GIS
Plan, Manage & Operate
Owner/Operator

GIS data

BIM
Design, Build & Document
Designer

GIS data
BIM data
VR/AR/MR research

• Core capability vs. app vs. toolkit

• AR and VR as Esri Labs projects

• MR as research (Hololens)

• Challenge: Game engine-type performance (90 fps)
ArcGIS 360 VR

• VR experience
  - Simple creation of mobile VR demos for non-expert user experience
  - Quick immersion into design to experience impact of projects and proposals

• VR application for Samsung Galaxy
  - Adding Google Daydream (Cardboard experiences)
  - Additional support for viewing by a web app

• Currently an Esri Labs project
AuGeo

• AR experience
  - Easy-to-use iOS and Android app to demonstrate Augmented Reality
  - Display of point feature service information around the user’s location

• Currently an Esri Labs project

• Built with AppStudio for ArcGIS
  - Source code planned to be released at UC
Wrap up
3D in Esri today

- Create and manage 3D content
  - Point clouds, meshes, 3D objects, and 3D vector data
- Use Living Atlas elevation and imagery
- Host 3D content in ArcGIS Online or on premises
- Author 3D experiences across platforms
- Use open specifications (I3S) to distribute data
- Communicate with stakeholders through
  - Animation
  - Free web apps
  - Free desktop apps
- Build custom JavaScript and native apps
Future of 3D in ArcGIS

- BIM-GIS interoperability
- Visual effects
- Ease of use
- Interactive analytical tools
- 3D editing
- Mobile 3D
- Real-time and Big Data for immersive 3D
- Augmented Reality / Virtual Reality