ArcGIS GeoEvent Server:
Making 3D Scenes Come Alive with Real-Time Data

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Agenda

1. 3D for ArcGIS
2. Real-Time GIS
3. Static 3D Scene
4. Making 3D Scenes Come Alive
5. Real-Time 3D Visualization
6. Conclusions
1 3D for ArcGIS
• Combine 2D and 3D in the same web GIS architecture
• 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
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

Story Maps  
Combine 3D maps with narrative text, images, and multimedia content
Enterprise Hosted 3D In The Cloud and/or On-Premise

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

ArcGIS Online
- Content and services for sharing ideas in 2D and 3D

ArcGIS Server
- Scalable 2D/3D enterprise content distribution and geoprocessing

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

Languages and Technologies:
- Android
- Java
- C#
- Web
- .NET
- C++
- Swift
- Xamarin
- Objective-C
- HTML5
- REST
- JavaScript
- QML
- Python
- Qt
- Windows
- Apple
- Swift
- Apple
- Qt
- Xamarin
- Objective-C
- .NET
- QML
- Xamarin
- Objective-C
- .NET
Supported Real-Time Data

- StreamLayer (from GeoEvent Stream Service) – JavaScript API 4.x
- KML
- Feature Services from Spatiotemporal Big Data Store
  - Very fast writing rate on add, update, delete
  - Rapid retrieval of Features
2 Real-Time GIS
Real-Time GIS and The Internet of Things

Enable real-time spatial reasoning

- Spatial reasoning is needed amongst the Internet of Things
- Performing continuous analytics closer to the things can improve their ability to sense
- When meaningful patterns are found things can send updates to those who need it
Real-Time GIS
ArcGIS 10.5

- Can ingest higher velocity real-time data into ArcGIS.
- Observations CAN now be stored in a Big Data Store.
- Can visualize high velocity and volume data - as an AGGREGATION, - as discrete FEATURES, - live & HISTORICALLY.
- Visualization CAN scale.
3 Static 3D Scene
Creating Scene Services

1. Geodatabase
2. *.obj, CityGML
3. Other Formats
4. ArcGIS PRO
5. ArcGIS Online/Portal
6. 3rd Party Software
7. ArcGIS Server
8. ArcGIS Server
9. ArcGIS Server
10. ArcGIS Online/Portal
11. ArcGIS Server
Scene Service
Making 3D Scene Comes Alive
Stream services vs. traditional feature services

Two patterns, two important differences

- Feature services **persist** their data in a Geodatabase
- Stream services **broadcast** their data without first persisting the data
Support for stream services in the 10.3 and 10.3.1 product releases

What can I use to consume stream services?

- ArcGIS Online and Portal for ArcGIS Web Maps
- ArcGIS Online and Portal for ArcGIS web application templates
- Web applications built using Web AppBuilder
- Your own web apps that use the ArcGIS API for JavaScript
KML Service
How to enable KML service

- Not available out-of-box!
- Obtain the KML Connector for GeoEvent on GeoEvent Gallery (10.2.x)
  http://www.arcgis.com/home/item.html?id=8ddf65e2d9894d37ae19856671392c45
- Obtain source code from GitHub (updated to 10.4) and build it
  https://github.com/Esri/kml-for-geoevent
- Deploy the jar to GeoEvent\deploy folder
- Create Output
Demo Publishing
Real-Time Services
5 Real-Time 3D Visualization
3D Visualization Techniques
Keeping up the 3D display performance

- **3D scene contains continuous scale**
  - depending on the positions of viewer and target
- **Use high LOD 3D symbol to represent objects close to the viewer**
- **Use low LOD symbol for objects that are further away from the viewer**
  - Billboard 2D graphics
  - Simple geometric shape (e.g. spheres)
- **Remove objects that are too close or too far from the scene**
  - Use view volume culling
  - Use fog (particle system)
3D Visualization Techniques

Make it interesting

- **Animated symbol**
  - Contains animation sequence
  - 2D or 3D
  - GIF animation
  - Particle System

- **Multi-representation**
  - Adapting to object status or condition
  - Adapting to distance to the viewer - LODs
Demo Visualization Techniques
KML on ArcGIS Earth (1.2)
Demo 3D Seattle Buses
Demo 3D Flights
Demo Esri Real-Time 3D Apps
Demo 3D Vehicles
Demo 3D Windmills in motion
Conclusions
Conclusions

- Time enabled 3D applications for mobile and web can be developed using ArcGIS components
  - 3D Web Scene, ArcGIS Explorer, ArcGIS Earth
  - GeoEvent to handle real-time data
  - JavaScript API for ArcGIS version 4
- Visualization of large volume of data in 3D needs certain techniques for good performance
- JavaScript API version 4 allows external renderer using 3rd party libraries (e.g. Three.js)
Who do you want to be?
Real-Time & Big Data GIS

- GeoEvent Server: An Introduction
  - Tue, 10:15-11:30am, Room 10
  - Thu, 1:30-2:45pm, Hilton – Sapphire Ballroom I

- Real-Time & Big Data: Leveraging the Spatiotemporal Store
  - Tue, 10:15-11:30am, Room 15 A
  - Thu, 1:30-2:45pm, Room 15 A

- GeoEvent Server: Applying Real-Time Analytics
  - Tue, 1:30-2:45pm, Room 17 B
  - Thu, 3:15-4:30pm, Room 14 A

- Real-Time & Big Data GIS at a Massive Scale
  - Wed, 3:15-4:30pm, Room 3
  - Fri, 9:00-10:15am, Room 8

- GeoEvent Server: Leveraging Stream Services
  - Wed, 3:15-4:30pm, Room 14 B

- GeoEvent Server: Best Practices
  - Thu, 10:15-11:30am, Room 9

- GeoEvent Server: Internet of Things (IoT)
  - Thu, 10:15-11:30am, Room 14 B

- GeoEvent Server: Making 3D Scenes Come Alive
  - Wed, 1:30-2:15pm, Demo Theater 05 - Real-Time

- GeoAnalytics Server: An Introduction
  - Wed, 10:15-11:30am, Room 4
  - Thu, 10:15-11:30am, Hilton – Sapphire Ballroom E
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