3D MAPPING FORUM

Time Enabled 3D Applications for the Web and Mobile Platforms with the GeoEvent Extension for ArcGIS Server

Morakot Pilouk, Ph.D.
Senior Software Developer/Consultant

Moxie Zhang
Director of R&D Center Beijing, China
Outline

- Web 3D for ArcGIS
- ArcGIS Real-Time
- Authoring (Static) 3D Scenes
- Making 3D Scenes Come Alive
- Sample application
- Conclusions
Web 3D for ArcGIS
3D Across the Platform

Desktop

Web Scene

Web

Mobile

3D Runtime

Server

Hosted Services

ArcGIS Pro

CityEngine
Web 3D Development Architecture

Data Processing:
- ArcGIS Professional
- ArcGIS Online/Portal Client

Services:
- ArcGIS Server
- ArcGIS Online/Portal Service
- 3D Scene Service
- Web Scene

SDKs:
- ArcGIS API for JavaScript
- ArcGIS Runtime SDKs

Apps:
- Web App Builder
- Widgets
Web Scene

- New in ArcGIS Online and Portal
- Mash-up of 3D / 2D layers
- Consumed by all clients
Web Scene – designed for 3D

- 3D Layers
- 3D Symbology
- 3D Labels
- Table of Contents
- 3D Popups
- Tours
- ...

General 3D Web Application Architecture
App Development in 3D

3D Runtime SDK
- Full 3D Runtime functions
- High performance
- Large data set
- Machine Native code
- Mobile and desktop

JavaScript (WebGL Render)
- Pure browser app without plugin
- WebGL is maturing
- Under heavy development
- Performance and large data set support are improving
- Cross browser support

Application Development
(1) Full app on API
(2) Widget/Theme for Web AppBuilder for ArcGIS
Web 3D Client Architecture

- ArcGIS API for JavaScript with 3D capabilities
  - New internal architecture but same* public JS API classes

  * 99% backwards compatible code + new classes for 3D
Web 3D Client Architecture

- ArcGIS API for JavaScript with 3D capabilities
  - New internal architecture but same* public JS API classes

* 99% backwards compatible code + new classes for 3D
Web 3D Client Architecture

- ArcGIS API for JavaScript with 3D capabilities
  - New internal architecture but same* public JS API classes

* 99% backwards compatible code + new classes for 3D
Web 3D Client Architecture

- ArcGIS API for JavaScript with 3D capabilities
  - New internal architecture but same* public JS API classes

* 99% backwards compatible code + new classes for 3D
Supported Layer Types

- ArcGISTiledMapServiceLayer
- ArcGISDynamicMapServiceLayer
- GraphicsLayer
- FeatureLayer
- ArcGISElevationLayer
- SceneLayer
- StreamLayer → **Real-time!**
ArcGIS Real-Time
Real-Time GIS
Integration and exploitation of streaming data

- Integrates real-time streaming data into ArcGIS
- Performs continuous processing and real-time analytics
- Sends updates and alerts to those who need it where they need it

ArcGIS Server
GeoEvent Extension
Desktop Web Device
Receiving Real-Time Data
Easily integrate real-time streaming data into ArcGIS using an Input Connector

You can create your own connectors.

GeoEvent Extension
GeoEvent Services

Out of the Box

- Poll an ArcGIS Server for Features
- Poll an external website for GeoJSON, JSON, or XML
- Receive Features, GeoJSON, JSON, or XML on a REST endpoint
- Receive GeoJSON or JSON on a WebSocket
- Receive RSS
- Receive Text from a TCP or UDP Socket
- Subscribe to an external WebSocket for GeoJSON or JSON
- Watch a Folder for new CSV, GeoJSON, or JSON Files

Esri Gallery

- ActiveMQ
- CAP
- CoT
- Cursor-on-Target
- esd
- Exploitation Support Data
- Instagram
- KML
- Kafka
- MQTT
- NMEA 0183
- RabbitMQ
- Sierra Wireless (RAP)
- Trimble (TAIP)
- Twitter

Partner Gallery

- CompassCom
- CompassLDE
- CompassLDE
- exactEarth
- FAA (ASDI)
- GNIP
- GNIP
- Networkfleet
- OSIsoft
- OSIsoft
- Valarm
- Zonar
- Zonar

* Indicates supported protocols.
Applying real-time analytics

Perform real-time analytics by defining a GeoEvent Service

- A **GeoEvent Service** configures the flow of GeoEvents,
  - The Filtering and GeoEvent Processing steps to perform,
  - what input(s) to apply them to,
  - and what output(s) to send the results to.
Applying real-time analytics

**GeoEvent Processing**

- You can perform continuous analytics on GeoEvents as they are received using a **processor**.

![GeoEvent Extension diagram](image)

You can create your own processors.

### GeoEvent Extension Inputs
- Buffer Creator
- Convex Hull Creator
- Difference Creator
- Envelope Creator
- Field Calculator
- Field Enricher
- Field Mapper
- Field Reducer

### GeoEvent Extension Outputs
- Geotagger
- Incident Detector
- Intersector
- Projector
- Simplifier
- Symmetric Difference
- Track Gap Detector
- Union Creator

### Out of the Box
- Add XYZ
- Bearing
- Ellipse
- Event Volume Control
- Extent Enricher
- Field Grouper
- GeoNames Lookup
- Motion Calculator
- Query Report

### Esri Gallery
- Range Fan
- Reverse Geocoder
- Service Area Creator
- Symbol Lookup
- Track Idle Detector
- Unit Converter
- Visibility

---

**GeoEvent Services**
- GeoEvent Services
  - GeoEvent Services
  - GeoEvent Services
Sending Real-Time Data

Easily disseminate notifications, alerts, and updates using an Output Connector

GeoEvent Extension

GeoEvent Services

Inputs

Outputs

You can create your own connectors.

Out of the Box

- Add or Update a feature
- Publish Text to a UDP Socket
- Push GeoJSON or JSON to an external Website
- Push GeoJSON or JSON to an external WebSocket
- Push Text to an external TCP Socket
- Send a Text Message
- Send an Email
- Send an Instant Message
- Send Features to a Stream Service
- Write to a CSV, GeoJSON, or JSON File

Esri Gallery

- ActiveMQ
- Cursor-on-Target
- Hadoop
- Kafka
- MongoDB
- MQTT
- RabbitMQ
- Twitter

Partner

- CESIUM
Authoring (Static) 3D Scenes
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
Publishing a Scene Service
Making 3D Scene Come Alive
Working with Real-Time Data

*Making features come alive*

- Connect an **output** to your feature
- Import the schema of your feature as a **GeoEvent Definition**
- Configure an **input** to receive real-time data
- Author and publish a **GeoEvent Service**
- Visualize your real-time feature
Real-Time GIS
Integration and exploitation of streaming data

• Integrates real-time streaming data into ArcGIS
• Performs continuous processing and real-time analytics
• Sends updates and alerts to those who need it where they need it
Stream services vs. traditional feature services

Two patterns of Real-time GIS

- Feature layers **pull** from feature services
  - Web apps poll to get periodic updates
- Stream layers **subscribe** to stream services
  - Web apps subscribe to immediately receive data
  - Low latency and high throughput
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
Stream services are published using the GeoEvent Manager
Publish your stream service as part of configuring your GeoEvent output
Stream services are discoverable in the ArcGIS REST Services Directory

Logging is as an administrator will expose additional capabilities such as publishing content to the stream

- Click the service to open its REST specification page...
Stream Layer

What is it?

- A layer in the Javascript API
  - Available since version 3.6
- Draws data on map using client-side graphics
Stream layer
The lifecycle of a stream layer

FeatureCollection:
{ layerDefinition:
  { geometryType: esriGeometryPoint,
    timeInfo: { 
      startTimeField: "StartTime",
      trackIdField: "Name" },
    fields: [ ... ] },
  featureSet: null }

Options
• webSocketUrl:
  ws://gep:6180/urlpath
• purgeOptions:
  { displayCount: 500 }
Advantages to using stream layers
Stream layers are more responsive and more efficient than feature layers

- Stream layers display immediately and refresh automatically
- Data is only sent to the client once
- Messages are sent without extra headers
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
3D Scene with Real-Time Data
Demo 3D Flights
Conclusions
Conclusions

- Time enabled 3D applications for mobile and web can be developed using ArcGIS components
  - 3D Web Scene
  - GeoEvent to handle real-time data
  - JavaScript API for ArcGIS version 4
- JavaScript API version 4 is in beta
  - More functionality are being added
Understanding our world.