ArcGIS GeoEvent Server: Visualizing Real-Time Data

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ArcGIS Enterprise
With Real-Time Capabilities

- Ingestion
- Actuation
- Visualization
- Analytics
- Storage

ArcGIS GeoEvent Server Role
Spatiotemporal Big Data Store

Live Features Stream Services
Live & Historic Aggregates & Features
Agenda:

1. Visualization Overview
2. Visualizing Stream Layers
3. Visualizing Features
4. Resources & Wrap-Up
Visualization Overview
Stream Layers vs. Feature Layers
Visualization

- **Stream layers subscribe** to stream services to immediately visualize observations
  - does not require storage, low latency, no playback
- **Map & Features layers periodically poll** to visualize most current observations
  - backed by an enterprise geodatabase (EGDB) or a spatiotemporal big data store (BDS)
  - history can be retrieved & queried for playback
Stream Layers

advantages when working with real-time data

- More **responsive** and more **efficient** than feature layers.
- Stream Layers display **immediately** and refresh **automatically**.
- Data is only sent to the client **once**.
Visualization of real-time data
adding a stream service as a layer in a web map

- Navigate to ‘My Content’ and select the layer item
- Note that stream layers have a different icon than feature layers
Visualization of real-time data
adding a stream service as a layer in a web map
Visualization of real-time data adding a stream service as a layer in a web map

Another way you can add a stream layer to a web map:

• Open the ArcGIS REST Services Directory
• Navigate to the stream service’s web page
• Copy the stream service’s URL
Visualization of real-time data
adding a stream service as a layer in a web map

- Paste the URL into the text field as illustrated here:

https://caramon.esri.com/server/rest/services/AVL-Broadcast/StreamServer
Stream Layers in Webmaps
Visualization of real-time data
adding a stream service to ArcGIS Pro 2.2+

- Add a Portal or ArcGIS Online item
- From a server connection
- Add Data From Path
Visualization of real-time data symbolizing a stream service in ArcGIS Pro 2.2+

- Set Renderer
  - Single Symbol
  - Unique Values
  - Graduated Symbols
  - Graduated Colors
- Current / Previous Observations
- Feature Labeling
- Vary by attribute
  - Transparency
  - Rotation
  - Size
  - Color
Stream Layers in ArcGIS Pro
Visualizing Features

that use data in the spatiotemporal big data store
Visualization of observation data

- Map & Feature services that use data in the spatiotemporal big data store enable you to:
  - Visualize raw feature view and inspect feature-level attributes
Visualization of observation data

- Map & Feature services that use data in the spatiotemporal big data store enable you to:
  - Visualize on-the-fly aggregation of data and inspect feature-level attributes
  - Set feature threshold to switch between raw feature view and aggregation view
Visualization of observation data

- Map & Feature services that use data in the spatiotemporal big data store enable you to:
  - Visualize aggregation of data and attribute statistics
Visualization of observation data

- Map & Feature services that use data in the spatiotemporal big data store enable you to:
  - Display data using content-dependent as well as scale-dependent rendering
Visualization of observation data

- Map & Feature services that use data in the spatiotemporal big data store enable you to:
  - Replay (via time slider) historic observations in aggregation or raw feature view
Visualization of observation data

- Map & Feature services that use data in the spatiotemporal big data store enable you to:
  - Perform exploratory queries over any combination of
    - Attributes
    - Space
    - Time
Visualizing observation data

Map & feature services using data from a spatiotemporal big data store
Spatiotemporal big data store

Aggregation styles to support on-the-fly aggregation

• Aggregation styles supported:
  – Geohash, square, pointy and flat hexagon / triangle
Geohash

- Geohash is a way of encoding lat/lon points as strings
- Geohash divides the world into a grid of 32 cells, with 4 rows and 8 columns, each represented by a letter or number
- Each cell can be further divided into another 32 cells, total 12 levels of details (LOD)
Spatiotemporal big data store
geohash spatial indexing to support on-the-fly aggregation

- As data is written to a dataset in the spatiotemporal big data store,
  a spatial index for a geohash aggregation is continuously updated.

**lodType**=geohash&**lod**=9

```json
{
  "features": [  
    {  
      "attributes": {  
        "objectId": 1,
        "geohash": "eGpFlurgw",
        "lodEncoding": "eGpFlurgw",
        "count": 12
      },
      "geometry": {  
        "rings": [
          
        ]
      }
    }
  ]
}
```

**geohash aggregation** (based on a geohash index)
Spatiotemporal big data store
geohash & square spatial indexing to support on-the-fly aggregation

- As data is written to a dataset in the spatiotemporal big data store
  - a spatial index for square aggregation is also continuously updated

**geohash aggregation** (based on a geohash index)

**square aggregation** (based on a square index)
Spatiotemporal big data store
triangle spatial indexing to support on-the-fly aggregation

• As data is written to a dataset in the spatiotemporal big data store
  – spatial indices for ‘pointy’ and ‘flat’ triangles aggregations are continuously updated
Spatiotemporal big data store

hexagon (same as triangle) spatial indexing to support on-the-fly aggregation

- As data is written to a dataset in the spatiotemporal big data store
  - spatial indices for ‘pointy’ and ‘flat’ hexagon aggregations are continuously updated
Spatiotemporal big data store

spatial indexing to support on-the-fly aggregation

- As data is written to a dataset in the spatiotemporal big data store
  - up to four types of spatial indices are supported (geohash, square, pointy and flat hexagon/triangle)
  - an inverted index on each attribute field is created
  - a temporal index on the time field is created
Spatiotemporal big data store map services: on-the-fly aggregation of polyline and polygon features

aggregation using centroid of polyline & polygon features
Spatiotemporal big data store

visualizing features

• Customize rendering settings
  – create map service
  – update map service
Spatiotemporal big data store

**visualizing features**

- aggregation-viewer-server-map-service

https://github.com/esri/aggregation-viewer-server-map-service
Map and feature services backed by the spatiotemporal big data store

Visualization and replay
Map and feature services backed by the spatiotemporal big data store
Sample Applications & Tutorials

helpful links

- **StreamLayer API help:**
  - 3.x: [https://developers.arcgis.com/javascript/3/jsapi/streamlayer-amd.html](https://developers.arcgis.com/javascript/3/jsapi/streamlayer-amd.html)

- **Sample stream services with simulated data:**
  - [https://geoeventsample1.esri.com:6443/arcgis/rest/services](https://geoeventsample1.esri.com:6443/arcgis/rest/services)

- **Sample applications on GitHub:**
  - [https://github.com/Esri/aggregation-viewer-server-map-service](https://github.com/Esri/aggregation-viewer-server-map-service)

- **Tutorials:**
  - [http://links.esri.com/geoevent-tutorials](http://links.esri.com/geoevent-tutorials)

- **Discussions & Blogs (on GeoNet):**
  - [https://geonet.esri.com/community/gis/enterprise-gis/geoevent/content](https://geonet.esri.com/community/gis/enterprise-gis/geoevent/content)
# Real-time and Big Data Technical Workshops

**Wednesday**
- 8:30 - 9:30  ArcGIS GeoEvent Server: Visualizing Real-Time Data
- 10:00 - 11:00  Real-Time & Big Data GIS: Best Practices
- 1:00 - 2:00  ArcGIS GeoEvent Server: An Introduction
- 4:00 - 5:00  ArcGIS GeoEvent Server: Applying Real-Time Analytics

**Thursday**
- 10:00 - 11:00  Real-Time & Big Data GIS: Best Practices
- 2:30 - 3:30  Real-Time & Big Data GIS: Road Ahead
- 4:00 - 5:00  ArcGIS GeoEvent Server: Visualizing Real-Time Data
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