ArcGIS GeoEvent Server: Real-Time GIS

Anthony Myers
Local Government Solutions Engineer

Kevin Armstrong
Public Safety Solutions Engineer
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Agenda

1. What is Real-Time GIS?
2. Working with Real-Time Data
3. Applying Real-Time Analytics
4. Integrating Real-Time Data in Web Apps
5. Wrap-up
ArcGIS Enterprise

**GeoEvent Server – Real-time and big-data capabilities**

- Ingest high velocity real-time data into ArcGIS
- Perform continuous analytics on events as they are received
- Store observations in a spatiotemporal big data store
- Run batch analytics on stored observations
- Visualize high velocity & volume data:
  - as an aggregation
  - as discrete features
- Notify those who need to know about patterns of interest

*GeoEvent Server is a “server role” extending the capabilities of your ArcGIS Enterprise …*
What is Real-Time GIS
GIS Data

What has happened, what is happening, what will happen

The ‘current’ snapshot is outdated almost as soon as it’s created …
Real-Time GIS Data

Continuous stream of events flowing from a data feed

Each event represents the latest state of the sensor…
Real-Time Analytics

What fishing vessels are inside designated ‘no fishing’ zones?

Continuous Analysis
- Inside Boundary

Features
- Vessel
- Alert

Applications

Continuous processing on event data as it is received …
Real-Time Notifications and Alerting

Tell a parent when their child leaves school property

Alerting stakeholders on discovered patterns of interest in real-time …
2 Working with Real-Time Data
Ingesting real-time data into ArcGIS

**Input connectors**

GeoEvent Extension

GeoEvent Services

**Inputs**

- 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

**Outputs**

- GeoEvent Services

**You can create your own connectors.**

**Out of the Box**

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**Esri Gallery**

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

**Partner Gallery**

- AWS IoT
- Amazon IoT
- Azure IoT
- CompassLDE
- Compass
- enviroCar
- exactEarth
- exactEarth AIS
- FAA (ASDI)
- GNIP
- GNIP
- Networkfleet
- OSIsoft
- OSIssoft
- Perfect Sense
- PerfectSense
- Sierra Wireless (RAP)
- Trimble (TAIP)
- Twitter
- Waze
- Valarm
- Waze
- Zonar
- Zonar
- Zonar
Storing real-time data in ArcGIS and alerting

**Output connectors**

You can create your own connectors.

### GeoEvent Extension

**Inputs**

- GeoEvent Services

**Outputs**

- GeoEvent Extension

### GeoEvent Services

- Inputs
  - 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
    - Add a Feature to a Spatiotemporal Big Data Store
    - Update a feature in a Spatiotemporal Big Data Store

- You can create your own connectors.

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GeoEvent Services

- A **GeoEvent Service** defines the flow of event records
  - The input(s) ingesting event data
  - The filtering and **processing** performed on each event record
  - The output(s) to which event records are sent
Working with Real-Time Data

Making features come alive

• Connect an output to your feature/stream service
• 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 features

Update features in real-time to produce a common operational display …
Making Features Come Alive
Tracking Live Traffic Incidents from Waze
Archiving Features
Tracking Live Traffic Incidents from Waze
Applying Real-Time Analytics
Filters

- A **Filter** eliminates GeoEvents based on an expression

Event records are allowed to pass when a filter’s expression evaluates **true** ...
Filtering
Using filters and filter expressions
Processors

- Use a Processor to calculate new values, enrich events, project geometry, ...

You can create your own processors.

Out of the Box
- Buffer Creator
- Convex Hull Creator
- Difference Creator
- Envelope Creator
- Field Calculator
- Field Enricher
- Field Mapper
- Field Reducer

GeoEvent Services
- Geotagger
- Incident Detector
- Intersector
- Projector
- Simplifier
- Symmetric Difference
- Track Gap Detector
- Union Creator

Esri Gallery
- Add XYZ
- Bearing
- Ellipse
- Event Volume Control
- Extent Enricher
- Field Grouper
- GeoNames Lookup
- Motion Calculator
- Range Fan
- Reverse Geocoder
- Service Area Creator
- Symbol Lookup
- Track Idle Detector
- Unit Converter
- Visibility
- Query Report

Processors generally alter event records they receive ...
Processing
Detecting Events of Interest
Spatial Operators

*Used by both filters and processors to determine spatial relationship*

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<th>outside</th>
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<tbody>
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<td>equals</td>
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<tr>
<td>overlaps</td>
<td>within</td>
</tr>
</tbody>
</table>

In GeoEvent Server, any geometry can serve as a geofence …
Spatial Operators - Example

*Incoming weather hazard intersects a geofence modeled as a point geometry*
Spatial Operators: Scope

- Intersects Any geofence

- Intersects All geofences
Spatial Operators - Example

Vehicles enter or leave assigned area
Spatial Aggregation – Hex Bin

Data is visualized in high volume
4 Integrating Real-Time Data in Web Apps
Visualization

choosing a service type: stream service, feature service, map service

- Stream layers in apps **subscribe** to stream services to immediately visualize observations
  - Does not require storage, low latency, no playback

- Map & Features layers in apps 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
Real-Time Data

Demonstration
5 Wrap-up
Summary

Real-Time GIS: GeoEvent Server

- ArcGIS Enterprise is a full-featured mapping and analytics platform
- GeoEvent Server brings real-time capabilities to the ArcGIS Enterprise
- Licensing roles allow ArcGIS Server, a component of the enterprise, to be licensed in different ways

  - GIS Server .../what-is-arcgis-gis-server-.htm
  - Image Server .../what-is-arcgis-image-server-.htm
  - GeoEvent Server .../what-is-arcgis-geoevent-server.htm
  - GeoAnalytics Server .../what-is-arcgis-geoanalytics-server-.htm
  - Business Analyst Server .../what-is-arcgis-business-analyst-server-.htm

GeoEvent Server is Real-Time GIS for your ArcGIS Enterprise
Summary

Real-Time GIS: GeoEvent Server

- GeoEvent Server:
  - Simplifies real-time data ingest with configurable out-of-the-box inbound connectors
  - Enables continuous analytics to be executed on event data as it arrives
  - Extends options for data storage with an enterprise spatiotemporal no-sql data store
  - Works with GeoAnalytics Server to make batch analytics on high volume data possible
  - Provides solutions for high volume data visualization with on-the-fly aggregation
  - Supports stakeholder notification of patterns of interest as they are discovered in real-time

*Know what is happening, as it happens, so you can make smart decisions faster …*
Summary

Real-Time GIS: GeoEvent Server

- Step-by-Step Tutorials, free to download
  - Introduction
  - Stream services
  - Spatiotemporal Big Data Store
  - Notifications

- Blogs and discussions on the forum
  - http://links.esri.com/geoevent-forum
Please take our Survey

Download the Esri Events App for iOS or Android
Questions / Feedback?

Please visit us at the booth

Anthony Myers
Local Government Solutions Engineer
awmyers@esri.com

Kevin Armstrong
Public Safety Solutions Engineer
karmstrong@esri.com