ArcGIS GeoEvent Server: An Introduction

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Agenda:

1. Key Product Capabilities
2. Working with Real-Time Data
3. Demo: Field Location and Monitoring
4. Wrap-up
Key Product Capabilities
Real-Time GIS

Types of Observations and Data

Stationary sensors...
- water gauges
- weather stations
- air quality sensors
- device temperature

Things that move...
- airplanes
- vehicles
- animals
- storms

Things that “just happen”...
- ships
- satellites
- trains
- people
- crimes
- lightning
- accidents
- tweets
ArcGIS Enterprise
*With Real-Time Capabilities*

- Apps
- Desktop
- APIs
- Analytics
- Storage
- Visualization
- Ingestion
- Actuation
- ArcGIS GeoEvent Server Role
- Spatiotemporal Big Data Store

ArcGIS Enterprise with real-time capabilities integrates ingestion, actuation, analytics, and storage components to provide live and historic data services.
GeoEvent Server – Key Capability #1

❖ Ingest Data: **Configurable inputs for any type of data**

Bringing real-time and big data capabilities to your ArcGIS Enterprise
GeoEvent Server – Key Capability #2

- Apply real-time analytics: **Filtering**
  - Identify event records with specified attribute values

Bringing real-time and big data capabilities to your ArcGIS Enterprise
GeoEvent Server – Key Capability #2

- Apply real-time analytics: Filtering
  - Identify event records with specified attribute values
  - Determine spatial relationships with established geofences

Bringing real-time and big data capabilities to your ArcGIS Enterprise
**GeoEvent Server** – Key Capability #2

- Apply real-time analytics: Processing
  - Configure and use over two dozen types of processors
    - Field Calculator
    - Field Mapper
    - Buffer Creator
    - GeoTagger
    - Incident Detector
    - Track Gap Detector
    ...

Bringing real-time and big data capabilities to your ArcGIS Enterprise
**GeoEvent Server – Key Capability #2**

- Apply real-time analytics: Processing
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```
TRACK_ID = driver_id + '-' + vehicle_id
```
GeoEvent Server – Key Capability #2

- Apply real-time analytics: Processing
  - Configure and use over two dozen types of processors
    - Field Calculator
    - **Field Mapper**
    - Buffer Creator
    - GeoTagger
    - Incident Detector
    - Track Gap Detector

<table>
<thead>
<tr>
<th>TrackID (int)</th>
<th>7890</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>DurationMin</td>
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<tr>
<td>SpeedMPH</td>
<td>43.2</td>
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<tr>
<td>CourseDeg</td>
<td>250.0</td>
</tr>
<tr>
<td>Geometry</td>
<td>-117.123..., 36.064...</td>
</tr>
<tr>
<td>Category</td>
<td>Field Crew</td>
</tr>
</tbody>
</table>

TrackID (string) | 7890 |
Date             | 1405176845553 |
Velocity         | 43 |
Heading          | 250 |
Geometry         | -117.123..., 36.064... |
GeoEvent Server – Key Capability #2

- Apply real-time analytics: Processing
  - Configure and use over two dozen types of processors
    - Field Calculator
    - Field Mapper
    - **Buffer Creator**
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    ...

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ArcGIS Enterprise

GeoEvent Server

Spatiotemporal

Big Data Store

Desktop

APIs

Apps
GeoEvent Server – Key Capability #3

- Store data as feature records in a geodatabase
  - Configurable outputs enable processed events to be stored in a traditional relational geodatabase
  - When data is received at a high volume, high velocity, or is accumulated over time, a spatiotemporal big data store is an available noSQL option for enterprise storage
GeoEvent Server – Key Capability #4

- Visualize feature records
  - Relational geodatabase feature services support traditional RESTful web applications and APIs
  - Big data map and feature services support on-the-fly feature aggregation

Bringing real-time and big data capabilities to your ArcGIS Enterprise
GeoEvent Server – Key Capability #4

- Visualize feature records
  - Relational geodatabase feature services support traditional RESTful web applications and APIs
  - Big data map and feature services support on-the-fly feature aggregation
  - Stream Services for visualization only

Bringing real-time and big data capabilities to your ArcGIS Enterprise
GeoEvent Server – Key Capability #5

- Notify stakeholders about detected patterns of interest
  - Configurable outputs provide the capability to format an e-mail or SMS text message
  - How you choose to disseminate processed event records is entirely up to you

Bringing real-time and big data capabilities to your ArcGIS Enterprise
GeoEvent Server – Key Capability #5

❖ Adjust the behavior of things in our environment through actuation

Bringing real-time and big data capabilities to your ArcGIS Enterprise
GeoEvent Server – Managing Real-Time Capabilities

### GeoEvent Server Interface

- **Services**: Monitor, Inputs, GeoEvent Services, Outputs

#### Asset Status Tracking

Tracks the current status of assets with respect to hazard zones

<table>
<thead>
<tr>
<th>Status</th>
<th>In/Out</th>
<th>Count</th>
<th>Rate (over last 3 mins)</th>
<th>Edit Rate</th>
<th>Max Rate</th>
<th>Time Since Last</th>
<th>View Graph</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>STARTED</td>
<td>In</td>
<td>631,569</td>
<td>2 /sec</td>
<td>2 /sec</td>
<td>0 /sec</td>
<td>00:00:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Out</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>3 Days, 01:19:42</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Processor Properties

- **fs-poll-in**
  - **Name**: Update Task Group Location with Current Zone
  - **Processor**: GeoTagger
  - **Geofence(s)**: Search Zone
  - **Spatial Operator**: Inside Any
  - **Geometry Field**: GEOMETRY
  - **Target Field**: Existing Field

- **fs-poll-in-assets**
  - **Include Geofence Category in GeoTag?**: Yes

- **tcp-text-in-lightning**
  - **tcp-text-in-vehicle**

- **Outputs**
Working with Real-Time Data
Out of the Box Input Connectors
- Poll an ArcGIS map or feature service
- Poll an external web server or service
- Receive data records via HTTP/POST
- Subscribe to an external web socket
- Watch a system folder for changes to a file

Subscribe to a Kafka Topic (new 10.7.1)

Improved Documentation (new 10.7.1)

You can create your own custom inputs through the GeoEvent Manager or SDK (Java)

Partner Gallery Connectors
- exactEarth
- Valarm
- CompassLDE
- enviroCar
- ...

GeoEvent Gallery Samples
- FlightAware
- Verizon Connect/Telogis
- Waze
- Apache Kafka
- GeoTab Fleet Management
Out of the Box Output Connectors

- Add or Update a feature
- Add or Update a spatiotemporal big data store
- Send Features to a Stream Service
- Push data records to an external website
- Push data records to an external WebSocket
- Send a text, email, or instant message
- Write a local file (CSV, JSON, GeoJSON)

Write to a Kafka Topic *(new 10.7.1)*

Improved Documentation *(new 10.7.1)*

You can create your own custom outputs through the GeoEvent Manager or SDK (Java)

Gallery Components

- Amazon & Azure IoT
- Hadoop
- Kafka
- MQTT
- ActiveMQ
- RabbitMQ
- MongoDB
- Twitter
- …
Working with Real-Time Data
Configurable Processors

Out of the Box Processors
- Buffer Creator
- Convex Hull Creator
- Difference Creator
- Envelope Creator
- Field Calculator
- Field Enricher
- Field Mapper
- Field Reducer
- Geotagger
- Incident Detector
- Intersector
- Projector
- Simplifier
- Symmetric Difference
- Track Gap Detector
- Union Creator

Sample Add-on Processors
- Motion Calculator
- Reverse Geocoder
- Service Area Creator
- Track Idle Detector
- …

New at 10.7
- Add XYZ Values
- Event Volume Controller
- Range Fan Calculator
- Bearing Calculator
- Feature to Point
- Event Joiner

You can create your own custom processors using the SDK (Java)
You can configure filters using **tags** and **regular expressions**

**Out of the Box Attribute Filters**
- Equal
- Not Equal
- Greater Than
- Greater or Equal
- Less Than
- Less or Equal
- In
- Matches
- Exists
- Is Null

**Out of the Box Spatial Filters**
- Inside
- Outside
- Contains
- Crosses
- Disjoint
- Equals
- Intersects
- Overlaps
- Touches
- Within
- Enter
- Exit
Working with Real-Time Data

GeoFences

GeoFence Geometry
- Point
- Line
- Polygon

Static GeoFences
- Source
  - Map Service
  - Feature Service
- Lifecycle
  - Poll Once

Dynamic GeoFences
- Source
  - Map Service
  - Feature Service
  - Stream Service
- Lifecycle
  - Active & Inactive
  - Start & End Dates

You can configure and distinguish GeoFences using Unique Names and Categories

You can configure dynamic GeoFences using synchronization rules
Demo: Field Location and Monitoring
Situational Awareness
Field Location and Monitoring
Situational Awareness

Tracking Ground Crew Status
Situational Awareness

Updating Search Zones

- Poll Search Zones
- Zone Contains Any Task Group Member
- Update Zone Status to Cleared (Field Calculator)
- Stream: Search Grid Updated

Processor Properties

Name*: Update Zone Status to Cleared
Processor: Field Calculator
Expression*: 'Cleared'
Target Field*: Existing Field

Definition

Existing Field Name*: Search_Grid
Status
4

Summary & Resources
Resources

Self-Paced Training and Resources

- ArcGIS GeoEvent Server resources
    - Updated Documentation
    - Installation Guides
    - System Requirements
    - Tutorials

- Blogs and discussions on the forum
  - http://links.esri.com/geoevent-forum

- Video recordings of technical workshops
  - http://www.esri.com/videos
Real-Time and Big Data Technical Workshops

• Tuesday
  – 8:30 - 9:30  ArcGIS GeoEvent Server: An Introduction
  – 10:00 - 11:00  ArcGIS GeoEvent Server: Applying Real-Time Analytics
  – 2:30 - 3:30  ArcGIS and the Internet of Things (IoT)

• 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
  – 4:00 - 5:00  ArcGIS and the Internet of Things (IoT) 2nd offering
  – 2nd offering

• 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
  – Only Offering
  – 2nd offering
  – 2nd offering
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Feedback

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