GeoEvent Server
Introduction

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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
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
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*The ‘current’ snapshot is outdated almost as soon as it’s created …*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

Features
- Inside Boundary
- 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 …
GeoEvent Server – Real-time and big-data capabilities

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GeoEvent Server is a “server role” extending the capabilities of your ArcGIS Enterprise …
Working with Real-Time Data
Ingesting real-time data into ArcGIS

**Input connectors**

GeoEvent Extension

GeoEvent Services

Inputs

Outputs

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**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

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**Esri Gallery**

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

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**Partner Gallery**

- AWS IoT
- Amazon IoT
- Azure IoT
- CompassLDE
- CompassCam
- enviroCar
- exactEarth AIS
- FAA (ASDI)
- GNIP
- Networkfleet
- OSIsoft
- GNIP
- OSIssoft
- Valarm
- Waze
- Zonar
- Zonar
Storing real-time data in ArcGIS and alerting

**Output connectors**

GeoEvent Extension

GeoEvent Services

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

**Esri Gallery**

- AWS IoT
- Amazon IoT
- Azure IoT
- ActiveMQ
- ActiveMQ
- CoT
- Cursor-on-Target
- Hadoop
- Kafka
- MongoDB
- MQTT
- MQTT
- RabbitMQ
- Twitter

**Platform Services**

- ActiveMQ
- Amazon IoT
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- RabbitMQ
- Twitter
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 …
Tracking Live Traffic Incidents from Waze

Making Features Come Alive
Tracking Live Traffic Incidents from Waze
3 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, ...
Processing
Detecting Events of Interest
Spatial Operators

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

<table>
<thead>
<tr>
<th>inside</th>
<th>outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>enter</td>
<td>exit</td>
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<td>intersects</td>
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<td>crosses</td>
<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

• Geofencing scope: Any or All

• Don’t confuse “ANY” and “ALL” with the regular expression pattern used to select a set of geofences

GEOMETRY INTERSECTS ALL .*/.*

GEOMETRY DISJOINT ANY .*/.*
Spatial Operators: Scope

- Intersects Any geofence

- Intersects All geofences
Spatial Operators - Example

*Vehicles disjoint from an assigned area vs. vehicles disjoint from all areas*
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
Stream services
A GeoEvent Server capability

ArcGIS Enterprise
GeoEvent Server
spatiotemporal big data store
GeoAnalytics Server

live features
live & historic aggregates & features
stream service
map & feature service

Apps
Web
Device
Desktop
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-arcs-gis-server-.htm
- Image Server .../what-is-arcs-image-server-.htm
- **GeoEvent Server**  .../what-is-arcs-geoevent-server.htm
- GeoAnalytics Server  .../what-is-arcs-geoanalytics-server-.htm
- Business Analyst Server  .../what-is-arcs-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

- Video recordings of technical workshops
  - http://www.esri.com/videos
Real-Time & Big Data GIS

- GeoEvent Server: Internet of Things (IoT)  
  Tue, 1:00-2:00pm, Primrose B  
  Fri, 1:00-2:00pm, Primrose

- GeoEvent Server: Introduction  
  Tue, 5:30pm-6:30pm, Primrose B

- Visualizing Big Data with ArcGIS API for JavaScript & WebGL  
  Tue, 2:30-3:30pm, Primrose B

- GeoEvent Server: Creating Connectors using GeoEvent SDK  
  Wed, 2:30-3:30pm, Santa Rosa

- GeoEvent Server: Creating Processors using GeoEvent SDK  
  Wed, 4:00-5:00pm, Santa Rosa

- Real-Time & Big Data GIS at a Massive Scale  
  Wed, 4:00-5:00pm, Smoketree A-E

- Big Data & ArcGIS: Introduction to GeoAnalytics Server  
  Thu, 10:30-11:30am, Mojave Learning Center

- GeoEvent Server: Applying Real-Time Analytics  
  Thu, 10:30-11:30am, Primrose B

- GeoEvent Server: Best Practices  
  Thu, 2:15-3:15pm, Primrose C-D

- Developing Real-Time Web Apps with JavaScript  
  Thu, 3:00-3:30pm, Demo Theater 1, Oasis 1

- Big Data: Leveraging the Spatiotemporal Big Data Store  
  Thu, 4:00-5:00pm, Catalina/Madera

- Building Android Location Awareness with GeoEvent Server  
  Thu, 6:00-6:30pm, Mesquite C

- GeoEvent Server: Making 3D Scenes Come Alive  
  Fri, 8:30-9:30am, Primrose C-D
Please take our Survey

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Questions / Feedback?

Please take our IoT survey:
http://esriurl.com/IoTSurvey

To learn more:
http://links.esri.com/geoevent
http://links.esri.com/geoevent-forum

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