GIS Data

- GIS data typically represents state at a specific moment in time: “historic”, “current”, or “future”.

Credit: iStockphoto/chris_lemmens
Real-time GIS Data

- Real-time GIS data is a continuous stream of events flowing from sensors where each event represents the latest state of the sensor.
  - Emergency Response
  - Utility Networks and Warehouses
  - Environmental

Challenge #1

Features
- Police Car
- Police Person
- Ambulance
- Network Sensor
- Warehouse Item
- Storm
- Wind
- Temperature
- Earthquake
- Wild Fire

Applications
Real-time Analytics

- Are my field personnel working within the designated project area?

Challenge #2

Continuous Analysis

Features

- Equipment
- Alert

Applications

Outside Boundary

Alert!

Incident: Outside project boundary
Time: 12:43 pm 4/17/13
Equipment: DT10 - 629
Operator: R. Smith
Real-time Notifications and Alerting

- Tell customer when their delivery truck is 15 minutes away.

Challenge #3
ArcGIS GeoEvent Processor for Server

Integrates and Exploits real-time 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
Working with real-time data
Receiving real-time data

- You can easily integrate real-time streaming data with ArcGIS by using an input connector.

You can add your own connectors.

### GeoEvent Processor

#### Inputs
- Receive RSS
- Receive text from a TCP Socket
- Receive text from a UDP Socket
- Receive Features on a REST endpoint
- Receive JSON on a REST endpoint
- Receive JSON on a Web Socket
- Receive JSON on external Web Socket
- Poll an ArcGIS Server for Features
- Poll an external website for JSON
- Watch a folder for new .csv files
- Watch a folder for new .json files

#### Outputs
- Receive Tweets
- Receive Instagram feed
- Receive Trimble
- Receive Sierra Wireless
- Receive NMEA
- Receive from RabbitMQ
- Receive from ActiveMQ
- Receive Air Traffic Control
- Receive Cursor on Target
- Receive VMF
- Receive VMF
- Receive Geomessages
- Receive Vessels

### GeoEvent Services

- GeoEvent Processor - An Introduction
- You can add your own connectors.
Demonstration
Social monitoring

<table>
<thead>
<tr>
<th>Name</th>
<th>Status</th>
<th>Count</th>
<th>Rate (over last 5 mins)</th>
<th>Max Rate</th>
<th>Time Since Last</th>
</tr>
</thead>
<tbody>
<tr>
<td>tweet-fs-out</td>
<td>STARTED</td>
<td>40</td>
<td>0.39 /sec</td>
<td>0.64 /sec</td>
<td>00:00:00</td>
</tr>
<tr>
<td>tcp-text-out</td>
<td>STARTED</td>
<td>6566</td>
<td>64.37 /sec</td>
<td>65.07 /sec</td>
<td>00:00:00</td>
</tr>
</tbody>
</table>
Sending real-time data

- You can easily send updates and results to those who need it where they need it using an output connector.

GeoEvent Processor

GeoEvent Services

Inputs

Outputs

You can add your own connectors.

Add a feature

Update a feature

Send an email

Send an instant message

Send a text message

Publish JSON to a Web Socket

Push JSON to an external Web Socket

Publish text on a TCP Socket

Publish text on a UDP Socket

Publish JSON to an external website

Publish on a REST endpoint

Write to .csv file

Write to .json file

Send a Tweet

Send to RabbitMQ

Send to ActiveMQ

Write to Hadoop

Write to MongoDB

Send to CESIUM
Sending real-time data to features
Using local feature services

GeoEvent Processor

GeoEvent Services

ArcGIS Server

Outputs

Inputs

feature layers

ArcGIS Online / Portal for ArcGIS

operation view

web map

Your Dashboards

Operations Dashboard for ArcGIS

Your Applications

JavaScript
Flex
Silverlight/WPF

iOS
Android
Windows Phone

.Net
Mac OS X
Java
Qt
Sending real-time data to features
Using remote feature services

GeoEvent Processor
GeoEvent Services
ArcGIS Server

ArcGIS Online / Portal for ArcGIS
Operations Dashboard for ArcGIS

Your Dashboards

Your Applications
JavaScript
Flex
Silverlight/WPF
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Android
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.Net
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Qt
Sending real-time data to features

Using ArcGIS Online / Portal for ArcGIS feature services

Your Dashboards

Operations Dashboard for ArcGIS

ArcGIS Online / Portal for ArcGIS

- operation view
- web map

feature layers

GeoEvent Processor

GeoEvent Services

Inputs

Outputs

ArcGIS Server

Your Applications

- JavaScript
- Flex
- Silverlight/WPF
- iOS
- Android
- Windows Phone

- .Net
- Mac OS X
- Java
- Qt

Esri
EMEAUC13  ArcGIS GeoEvent Processor - An Introduction
Performing continuous processing and real-time analytics
Continuous processing and analytics

GeoEvent Services

- 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 outputs(s) to send the results to.
Continuous processing and analytics

Processors

• Modify a geoevent: Field Enricher, Field Reducer
• Calculate new fields on a geoevent: Field Calculator, GeoTagger
• Derive geoevent: Field Mapper, Track Gap Detector, Incident Detector
Continuous processing and analytics

Processors – modify a geoevent

- A **Field Enricher** processor
  - enriches the **geoevent** with new fields derived from a data source: feature service or file.

- A **Field Reducer** processor
  - removes fields from a **geoevent**.
Continuous processing and analytics

Processors – calculate new fields on a geoevent

• A **Field Calculator** processor uses an expression to
  - calculate a new field or update an existing field.
  - Expressions can be mathematical expressions or regular expressions.

[Diagram showing GeoEvent, Expression, Enriched GeoEvent]

• A **GeoTagger** processor
  - uses a spatial condition to tag the event with related geometries.

[Diagram showing GeoEvent, Spatial Condition, Enriched GeoEvent]
Continuous processing and analytics
Processors – derive a new geoevent

- A **Field Mapper** processor
  - translates from one geoevent format to another.

- A **Track Gap Detector** processor
  - Detects the absence of events and alerts about the situation.
Continuous processing and analytics
Processors – derive a new geoevent

• **An Incident Detector** processor
  - creates an incident upon an opening condition being met,
  - maintains state for the duration of the incident,
  - closes the incident based on a closing condition or expiration.
Demonstration

Noise violation alerting

external network (amazon ec2)

GeoEvent Processor

GeoEvent Service

ws://

ws://

ArcGIS Server

JSON

Noise App

internal network (my laptop)

GeoEvent Processor

GeoEvent Service

ws://

feature

incident detector

feature

ArcGIS Server

Excessive Noise at at iPhone, Ongoing for last 2 seconds.
Solutions and sample applications
Applying real-time GIS

- A number of **sample applications** and **solutions** leverage GeoEvent Processor to enable real-time GIS capabilities within them including:
    - ArcGIS for the Military
    - ArcGIS for the National Guard
    - ArcGIS for Intelligence
  - Asset Monitor
  - Route Monitor
Demonstration
Ambulance monitoring

Alerts

- AMB-15 is approaching Hospital, Started at Sun Mar 24 02:19:00 PDT 2013

- AMB-15 is inside a Dangerous area, Ended at Sun Mar 24 01:56:00 PDT 2013 and lasted for 13 minutes.

- AMB-15 is speeding, Ended at Sun Mar 24 01:25:00 PDT 2013 and lasted for 8 minutes.
Asset Monitor

Features

Asset Monitor

Vehicle Monitoring
Excessive Speed Monitoring
Dangerous Area Monitoring
Proximity Monitoring
Territory Monitoring

ArcGIS for Server

GeoEvent Processor

Assets

Operation View

Alerts
ArcGIS for the National Guard
ArcGIS GeoEvent Processor – An Intro

Summary

• ArcGIS is a dynamic platform that enables real-time visualization and continuous analytics to better understanding of our world.

• GeoEvent Processor allows you to:
  - be alerted when interesting events occur
  - react and make smarter decisions faster
  - to know what is happening, as it happens

• To learn more, visit the tutorials in the Gallery:
  - http://pro.arcgis.com/share/geoevent-processor
Sending real-time data to big data stores

Write to a Hadoop Distributed File System (HDFS)
Write to a MongoDB Document Store

- GIS Tools for Hadoop
  - http://github.com/Esri/gis-tools-for-hadoop

Real-time data
ArcGIS for the Military

Maritime Operations
ArcGIS for the Military

Land Operations

Local Tactical Group 1

Local Tactical Group 2

Operations Server

ArcGIS

GeoEvent Services

Sensor Observations
Track Reports
Spot Reports
Digital Chemlights

Commanders

Analysts

Supporting HQs
ArcGIS for Intelligence
Template