The Road Ahead for Tracking

Adam Mollenkopf, amollenkopf@esri.com
Motivations for the road ahead
Adam Mollenkopf
Road Ahead

Motivations

- Make it simple for ArcGIS Users to configure and use Streaming Data.
  - receive Streams
  - perform Continuous Analysis (Stream Processing)
  - produce new Streams
Road Ahead

Motivations

- Provide a Highly Configurable product that has a Catalog of Resources that can be easily applied including:
  - Support a wide variety of Stream Formats
  - Support common types of Stream Processing
  - Applications and Templates for Targeted Uses
Road Ahead

Motivations

• Tradecraft Sharing
  - Allow users to share Continuous Analysis results and the Analysis artifacts with their communities of interest.

• Provide a Flexible Product Architecture that is
  - Tightly aligned with ArcGIS
  - Multi-Platform: Windows, Linux, Cloud
  - Highly Available: supports local and remote redundancy
  - Scales-Up: take advantage of 64-bit Architecture & multiple cores
  - Scales-Out: allows clustering of multiple machines/instances
the road ahead is …
ArcGIS GeoEvent Server

availability:  Q1 2013

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ArcGIS GeoEvent Server
Enabling ArcGIS with GeoEvent Stream Processing

• GeoEvent Stream Processing:
  - A GeoEvent contains information about things that happen and where they happened.
  - A GeoEvent Stream is a sequence of GeoEvents ordered by time.
  - GeoEvent Stream Processing is the act of continuously analyzing GeoEvent Streams and creating resulting output from them.
  - A GeoEvent Service configures GeoEvent Stream Processing steps, what Input GeoEvent Stream(s) the processing should be applied to, and where the resulting output should be sent.
ArcGIS GeoEvent Server
Tightly aligned with the ArcGIS platform

Integration with ArcGIS Server:
- GeoEvent Stream Processing can output results directly to Feature Services hosted on ArcGIS Server(s).
  - Can update Features on a Feature Service or append new Features.
- GeoEvent Server can use Features from ArcGIS Server(s).
  - e.g. Polygons of a Feature Service on ArcGIS Server can be used as the basis for Spatial Filtering or GeoFence detection.
ArcGIS GeoEvent Server

Application Templates

• The best way to understand what ArcGIS GeoEvent Server can do is to see how it can be applied.

• A Catalog of Resources allow customers to find and configure what they need for their implementation including:
  - **Application Templates**: Ready to use configurations of GeoEvent Server that enable it for a targeted use.
  - **Applications**: Ready to use Applications. Each application works with a corresponding Application Template.
ArcGIS GeoEvent Server

Application Templates

• The Catalog includes the following Application Templates:
  - Automatic Vehicle Location (AVL)
  - Mobile Resource Management (MRM)
  - Command and Control (C2)
  - Intelligence, Surveillance, and Reconnaissance (ISR)

• You can:
  - Adjust an Application Template to your specific needs
  - Create your own Application Template
  - Contribute your Application Template to the Catalog
ArcGIS GeoEvent Server
Automatic Vehicle Location (AVL) Application Template

- Assets
- GeoFences
- GeoEvent Services
  - Speed Monitoring
  - Idle/Stop Monitoring
  - Territory Monitoring
  - Dangerous Area Monitoring
- AVL Asset Monitoring Application
- Asset Managers
ArcGIS GeoEvent Server
Mobile Resource Management (MRM) Application Template

Vehicles

Workers

Stops

Routes

GeoFences

GeoEvent Services

- Vehicle Monitoring
- Worker Monitoring
- Idle/Stop Monitoring
- Territory Monitoring
- Dangerous Area Monitoring
- Auto-Arrival / Auto-Departure
- Continuous ETA
- Route Adherence

Dispatchers

MRM Dispatch Application

Fleet Managers

MRM Field Worker Application
ArcGIS GeoEvent Server
Mobile Resource Management (MRM) Application Template
ArcGIS GeoEvent Server
Mobile Resource Management (MRM) Application Template
MRM Dispatch and Field Worker Applications

Planning

MRM Dispatch Application
- Dynamic Dispatch
- Real-Time Monitoring

MRM Field Worker Application
- Messages
- Route
- Stops

GeoEvent Server w/ MRM Template
- Location Updates
- Stop Updates
- Messages

ArcGIS for Transportation Analytics
Route Planning Application or 3rd Party System

Vehicle

ArcGIS GeoEvent Server
Mobile Resource Management (MRM) Application Template
MRM Dispatch and Field Worker Applications

Planning

MRM Dispatch Application
- Dynamic Dispatch
- Real-Time Monitoring

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- Stops

GeoEvent Server w/ MRM Template
- Location Updates
- Stop Updates
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ArcGIS for Transportation Analytics
Route Planning Application or 3rd Party System

Vehicle
Demonstration:
Mobile Resource Management (MRM)
Application Template
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ArcGIS GeoEvent Server
Mobile Resource Management (MRM) Field Worker Application
ArcGIS GeoEvent Server
Receiving GeoEvent Streams

- **Input Streams** are configured to receive GeoEvents in any format from any source
  - **Transports** perform the communication protocol
  - **Adapters** translate input format into GeoEvents
ArcGIS GeoEvent Server
Producing GeoEvent Streams

- **Output Streams** are configured to produce GeoEvents in any format to any destination
  - **Adapters** translate GeoEvents into output format
  - **Transports** perform the communication protocol
ArcGIS GeoEvent Server
Performing Continuous Analysis on GeoEvent Streams

- GeoEvent Services configure
  - GeoEvent Stream Processors
  - what Stream(s) the Processors should be applied to
  - where the resulting output should be sent

Processors
- Field Enricher
- Field Calculator
- Field Reducer
- Field Mapper
- Incident Detector
- Idle/Stop Detector
- Gap Detector
- E-Mail Notifier

ArcGIS GeoEvent Server Diagram:
- Streams 1, 2, 3, and 4
- Processors 1, 2, 3, 4, and 5
- Outputs 1, 2, 3, and 4
- Transports and Adapters
- GeoEvent Services
- Feature Service
- Database
- File
- CSV
- JSON
- TCP
- UDP
- JMS
ArcGIS GeoEvent Server

Mobile Resource Management (MRM) Application Template

- The **MRM** Application Template configures:
  - Two Input Streams: Vehicles, Workers
  - Multiple Outputs: Vehicles, Workers, Stops, Alerts, Messages
  - Multiple **GeoEvent Services**:
    - Vehicle Monitoring
    - Worker Monitoring
    - Idle/Stop Monitoring
    - Territory Monitoring
    - Dangerous Area Monitoring
    - Auto-Arrival / Auto-Departure
    - Continuous ETA
    - Route Adherence
ArcGIS GeoEvent Server

Exploring the ‘MRM-VehicleMonitoring’ GeoEvent Service

- Each GeoEvent from the ‘VehiclesInput’ Stream:
  - Updates the ‘Vehicle’ Feature Service
  - Writes a new entry to the Vehicles Log File
  - Gets Processed by an Incident Detector.

<table>
<thead>
<tr>
<th>TCP Transport</th>
<th>CSV Adapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port</td>
<td>MessageSeparator, AttributeSeparator</td>
</tr>
<tr>
<td>5565</td>
<td>\n</td>
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<table>
<thead>
<tr>
<th>JSON Adapter</th>
<th>Feature Service Transport</th>
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</thead>
<tbody>
<tr>
<td>CharSet</td>
<td>ArcGISServer</td>
</tr>
<tr>
<td>UpdateInterval</td>
<td>/</td>
</tr>
<tr>
<td>File Transport</td>
<td>ServiceName</td>
</tr>
<tr>
<td>CharSet</td>
<td>mrm</td>
</tr>
<tr>
<td>UpdateInterval</td>
<td>Layer</td>
</tr>
<tr>
<td>JSON Adapter</td>
<td>Vehicles</td>
</tr>
<tr>
<td>Path</td>
<td>TrackIDField</td>
</tr>
<tr>
<td>CharSet</td>
<td>VehicleName</td>
</tr>
<tr>
<td>UpdateInterval</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Incident Detector Tool</th>
<th>Filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>SpeedingMonitor</td>
</tr>
<tr>
<td>IncidentType</td>
<td>Cumulative</td>
</tr>
<tr>
<td>AlertType</td>
<td>Warning</td>
</tr>
<tr>
<td>OpenCondition</td>
<td>SPEED &gt; 70</td>
</tr>
<tr>
<td>CloseCondition</td>
<td></td>
</tr>
</tbody>
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<td>Alerts</td>
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<tr>
<td>Path</td>
<td>TrackIDField</td>
</tr>
<tr>
<td>CharSet</td>
<td>id</td>
</tr>
</tbody>
</table>

| File transport        |                             |
| Folder                | folder1                      |
| BaseFileName          | alerts                       |
| FileExtension         | csv                          |
ArcGIS GeoEvent Server

Exploring the ‘MRM-VehicleMonitoring’ GeoEvent Service

- Each GeoEvent from the ‘VehiclesInput’ Stream:
  - Updates the ‘Vehicle’ Feature Service
  - Writes a new entry to the Vehicles Log File
  - Gets Processed by an Incident Detector.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>LastUpdated</td>
<td>2012-07-24T08:03:00</td>
</tr>
<tr>
<td>Geometry</td>
<td>-104.993,39.562</td>
</tr>
<tr>
<td>VehicleName</td>
<td>CargoVan-01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>SpeedingMonitor</td>
</tr>
<tr>
<td>Description</td>
<td>Ended at Tue Jul 24 08:02:00, lasted 2 minutes</td>
</tr>
<tr>
<td>AlertType</td>
<td>Warning</td>
</tr>
<tr>
<td>Geometry</td>
<td>-104.993,39.562</td>
</tr>
</tbody>
</table>
ArcGIS GeoEvent Server
Exploring the ‘MRM-GeoFenceMonitoring’ GeoEvent Service

- Each GeoEvent from the ‘VehiclesInput’ Stream:
  - Gets evaluated by three Incident Detectors for
    - is the Geometry of the GeoEvent ‘Inside’ a ‘DangerousArea/*’ GeoFence.
    - is the Geometry of the GeoEvent ‘Inside’ a ‘AutoArrival/*’ GeoFence.
    - is the Geometry of the GeoEvent ‘Outside’ a ‘Territory/*’ GeoFence.
  - Any Incident Detector that evaluates ‘true’
    - ‘Starts’ a new alert, Updates an ‘Ongoing’ Alert, or ‘Ends’ an Alert.

TCP Transport
- Port 5565

CSV Adapter
- MessageSeparator | \n- AttributeSeparator | ,

JSON Adapter
- CharSet | UTF-8
- UpdateInterval | 1000

Feature Service Transport
- ArcGISServer | ags1
- Path | /
- ServiceName | mrm
- Layer | Alerts
- TrackIDField | id

File Transport
- Folder | folder1
- BaseFileName | alerts
- FileExtension | csv

Incident Detector Tool
- Incident Type: DangerousAreaMonitor
  - Open Condition: Inside DangerousArea/*
  - Close Condition: 

Incident Detector Tool
- Incident Type: TerritoryMonitor
  - Open Condition: Outside Territory/*
  - Close Condition: 

Filter
- Incident Type: Cumulative
- Alert Type: Urgent

Filter
- Incident Type: Cumulative
ArcGIS GeoEvent Server

GeoEvent Service Designer

- **GeoEvent Service Designer** is an Authoring, Testing, Debugging, and Publishing Tool for GeoEvent Services.
ArcGIS GeoEvent Server
MRM Application Template Review

Vehicles
Workers

Stops
Routes
GeoFences

GeoEvent Services
- Vehicle Monitoring
- Worker Monitoring
- Idle/Stop Monitoring
- Territory Monitoring
- Dangerous Area Monitoring
- Auto-Arrival / Auto-Departure
- Continuous ETA
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Dispatchers
MRM Dispatch Application
Fleet Managers

MRM Field Worker Application
C2 and ISR
Application Templates
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ArcGIS GeoEvent Server
Command and Control (C2) and Intelligence, Surveillance, and Reconnaissance (ISR) Application Templates
ArcGIS GeoEvent Server
Command and Control (C2) and Intelligence, Surveillance, and Reconnaissance (ISR) Application Templates
ArcGIS GeoEvent Server
Command and Control (C2) and
Intelligence, Surveillance, and Reconnaissance (ISR) Application Templates

• The C2 and ISR Application Templates will be covered in more detail and demonstrated at the following session:
  - Applications of Tracking products for C2 and ISR
    - Wed, July 25, 1:30-2:00pm, Defense and Intelligence Demo Theater

• Other related sessions:
  - ArcGIS 10.1 Military Messaging, and You
    - Tue, July 24, 3:00-4:00pm, Defense and Intelligence Demo Theater
    - Wed, July 25, 3:00-4:00pm, Defense and Intelligence Demo Theater
  - Defense Logistics SIG
    - Wed, July 25, 4:30-6:00pm, Room 15 B
  - Military Planning and Operations
    - Thu, July 26, 1:30-3:00pm, Omni Ballroom A/B
ArcGIS GeoEvent Server

Summary

• ArcGIS GeoEvent Server makes it simple for ArcGIS Users to configure and use Streaming Data.

• You can quickly be up and running by utilizing the Catalog of:
  - Applications and Application Templates for AVL, MRM, C2, and ISR
  - Transports and Adapters for specific Event Stream Formats
  - GeoEvent Stream Processors

• First Release is planned for Q1 2013
Tracking Server 10.1 and ArcGIS Tracking Analyst 10.1 provide powerful features that you can utilize today.

You can learn more about what’s available now by attending the following sessions:

- Leveraging Temporal Data with ArcGIS Tracking Analyst and Tracking Server
  - Wed, July 25, 10:15-11:30am, Room 28 C
- Developing a Real-Time Web Application using the Tracking Client API for JavaScript
  - Tue, July 24, 4:30-5:00pm, Web & Server GIS Demo Theater
  - Thu, July 26, 1:00-1:30pm, Web & Server GIS Demo Theater
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