Leveraging Temporal Data with ArcGIS Tracking Analyst and Tracking Server

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Leveraging Temporal Data

Agenda

• Temporal Data Overview

• Capturing, Visualizing, and Analyzing Temporal Data
  - on the Desktop
  - on the Server
  - on the Web
Temporal Data Overview

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Temporal Data Overview
Temporal, Time, and Tracks

- Temporal means “of or relating to time”.
- Temporal data is data which is related along the dimension of time.
  - May be correlated by a unique attribute to form a Track
  - Often ordered by how the feature’s events occurred chronologically
Temporal Data Overview

Types of Temporal Data

Dynamic
something that moves
- Planes
- Vehicles
- Animals
- Satellites
- Storms

Discrete
something that “just happens”
- Crimes
- Lightning
- Accidents

Stationary
stands still but records changes
- Weather Stations
- Traffic Sensors
- Air Quality Sensors

Change
change or growth
- Population
- Distribution
- Fire Perimeter
Visualizing and Analyzing Temporal Data on the Desktop

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Visualizing and Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst

- ArcGIS Tracking Analyst

  - Is an ArcGIS for Desktop Extension that extends the time-aware capabilities of ArcGIS.

  - Provides advanced functions to let you Visualize and Analyze:
    - Spatial Patterns
    - Trends in the context of Time

- Allows you to
  - Visualize live streaming data
  - Playback historical data while performing Exploratory Analysis
Visualizing and Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst

• Playback Manager
  - Playback historical data
  - Visualize live streaming data
  - Analyze Temporal patterns in data
Visualizing and Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst

- Track Manager

  - Manages tracks as unique entities, like features
  - Highlight Track
  - Hide Other Tracks
  - Follow Track
  - Zoom to Track
  - Analyze Track
  - Hide Track
  - Show Track
  - Purge Track
  - Stop Purging Track
Visualizing and Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst

- **Highlight** things that are important
  - Highlight things that enter my area (location)
  - Highlight dangerous objects for me (attribute)
  - Highlight the current location of each object (age)

- **Hide** things that are in the way
  - Hide things outside my area of interest (location)
  - Hide a certain category of objects (attribute)
  - Hide old observations (age)
Visualizing and Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst

- Exploratory Analysis of Temporal Data
  - Geoprocessing tools for Track Analysis
  - **Calculate** values on Temporal Data
    - Given successively ordered features in a track **calculate** values for distance, duration, speed, and course.
Demonstration: Exploratory Analysis on Desktop
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Capturing and Analyzing Temporal Data on the Server

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Capturing and Analyzing Temporal Data on the Server

Tracking Server enables ArcGIS with Real-Time data and Analysis
Capturing and Analyzing Temporal Data on the Server

Tracking Server

- **Messages** coming into Tracking Server must have a format that matches a **Message Definition** in order for it to be processed.

- The **Generic Input** Data Link allows messages that are formatted as text (CSV or XML) to be pushed into Tracking Server.

```
Vehicle
vehicle1
7/5/12 9:00:00 AM
-116.28178, 32.555702
false
```

**Vehicle** Message Definition:

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>trackId</td>
<td>String</td>
</tr>
<tr>
<td>observedTime</td>
<td>TimeStamp</td>
</tr>
<tr>
<td>shape</td>
<td>Point</td>
</tr>
<tr>
<td>panic</td>
<td>Boolean</td>
</tr>
</tbody>
</table>

Real-time data:
```
<message id="Vehicle">
  <field>vehicle1</field>
  <field>7/5/12 9:00:00 AM</field>
  <field>-116.28178, 32.555702</field>
  <field>false</field>
</message>
```
Capturing and Analyzing Temporal Data on the Server

**Tracking Server**

- **Actions** apply analysis and operations to incoming messages as they are received by Tracking Server.
- For example, a **Filter** action keeps (or discards) messages that meet the criteria of attributes or location queries.

### ‘Vehicle’ Message Definition:

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Visualizing and Analyzing Temporal Data on the Web

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Visualizing and Analyzing Temporal Data on the Web

Approaches for Getting Real-Time data into Web Applications

• Using the ArcGIS Web API
• Using the Tracking Client API
Visualizing and Analyzing Temporal Data on the Web

ArcGIS Web API

- The **ArcGIS Web API** enables web applications to become spatially enabled.
Visualizing and Analyzing Temporal Data on the Web

ArcGIS Web API – Using GeoDatabase Features

- Tracking Server Adds Features to an Enterprise GDB
- Publish Feature Services
- Applications use Feature Services

ArcGIS for Desktop

MXD w/ Features

Publish Service

Real-time data

Tracking Server

Author

ArcGIS Web API

ArcGIS Server

Web Applications
Demonstration:
Visualizing and Analyzing Temporal Data using GeoDatabase Features

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ArcGIS Web API – Using Tracking Server Connection

- Publish a Map Service with Tracking Layers
- Applications use a Dynamic Map Service / Feature Services
Demonstration: Visualizing and Analyzing Temporal Data using a Tracking Server Connection

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Visualizing and Analyzing Temporal Data on the Web

Tracking Client API

- The **Tracking Client API** complements the **ArcGIS Web API** by adding capabilities that enable web applications with real time data and analysis.
The Tracking Web Connector adds a set of REST services that enable clients such as JavaScript and ArcGIS Explorer.
Demonstration: Visualizing and Analyzing Temporal Data using the Tracking Client API

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Conclusion

- **ArcGIS Tracking Analyst and Tracking Server:**
  - enable ArcGIS with real-time data and analysis
  - provides capabilities for Capturing, Visualizing, and Analyzing real-time data.
  - can be applied in a variety of environments including:
    - Desktop, Web, and Mobile
To Learn More


- ArcGIS 10.1 Resource Center:  [http://resources.arcgis.com](http://resources.arcgis.com)
  - click ‘Communities’ > ‘Tracking Server’

- Applications of Tracking products for C2 and ISR
  - Wed, July 25, 1:30-2:00pm, Defense and Intelligence Demo Theater

- Developing a Real-Time Web Application using the Tracking Client API for JavaScript
  - Thu, July 26, 1:00-1:30pm, Web & Server GIS Demo Theater
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