ArcGIS GeoEvent Extension for Server: Building Real Time Web Applications

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Real-Time GIS
Real-Time GIS

- *Integration & exploitation of streaming data*

- Integrates real-time streaming data into ArcGIS

- Performs continuous processing & real-time analytics

- Sends updates & alerts to those who need it where they need it
Real-Time GIS

10.3

Stream Layer

Web | Device | Desktop

Apps

Access

Services

Stream Service

GeoEvent

ArcGIS Server
Getting Real-Time data into Web Applications
Receiving Real-Time Data

- Easily integrate real-time streaming data with ArcGIS by using an input connector.
Receiving Real-Time Data

*Input Connector = Transport + Adapter*

**GeoEvent Extension**

**Connectors**
- **WebSocket**: Receive JSON on a WebSocket
- **REST**: Receive GeoJSON on a REST endpoint

**Transport**
- WebSocket

**Adapters**
- JSON
- GeoJSON

**Transports**
- ActiveMQ
- IRC
- Kafka
- RabbitMQ
- Twitter
- Feature Service
- File
- HTTP
- HTTP+BasicAuth
- HTTP+OAuth
- TCP
- UDP
- WebSocket

**Adapters**
- Feature-JSON
- GeoJSON
- JSON
- RSS
- Text
- XML

**Services**
- CAP
- Cursor-on-Target
- GeoMessage
- Instagram
- NMEA
- Sierra Wireless (RAP)
- Trimble (TAIP)
- Twitter
- VMF
Collecting Real-Time Data

Stream Service Intro

International Space Station (ISS)
Getting Real-Time Data into Web Apps

- **Feature Layers pull from feature services**
  - Web app poll to get periodic updates
  - Must be backed by an enterprise geodatabase

- **Stream Layers subscribe to stream services**
  - Web apps subscribe to immediately receive data
  - Low latency and high throughput
Stream Services
The Foundation for Real-Time Web Apps

- Are **discoverable** via services directory
  - http://<your server>/arcgis/rest/services/iss-stream/StreamServer

- Can be **secured** just like any other ArcGIS Server service using
  - ArcGIS internal user store
  - Active Directory/LDAP
  - PKI

- Can be **scaled** using clustering
Real-Time in Server
Stream Service
Stream Layers

Enabling real-time web wpps

- Part of the ArcGIS API for JavaScript
- Subscribe to stream services
  - Immediately receive and render data
  - Configurable symbology with familiar api
  - Direct access to data on arrival
- Can filter on
  - An area of interest
  - Field Values
- Steam services communicate over a web socket
  - Web socket protocol must be allowed on a network
  - Client must have a browser that supports web sockets
    - http://caniuse/websockets
Demo

Real-Time in Web Maps

Stream Service
Stream Layer Deployment Patterns

Enabling real-time web wpps

- Configure in a Web Map and
  - Just share it
  - Web App Template
  - Web App Builder

- Custom JavaScript apps
Building Real-Time Web Maps With the JavaScript API
ArcGIS JavaScript API
StreamLayer: API class

Class: StreamLayer

```javascript
[ AMD Module Require | Legacy Module Require ]

require(['esri/layers/StreamLayer'], function(StreamLayer) {
  /* code goes here */
});
```

Class hierarchy

```
esri/layers/Layer
  |_esri/layers/GraphicsLayer
  |_esri/layers/FeatureLayer
  |__esri/layers/StreamLayer
```

https://developers.arcgis.com/javascript/jsapi/streamlayer-amd.html
ArcGIS JavaScript API
StreamLayer: Constructors

Constructors

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>new StreamLayer(url, options?)</td>
</tr>
</tbody>
</table>

```javascript
function makeStreamLayer()
{
  var url = "http://yourMachine:6080/arcgis/services/Flights/StreamServer",
  options = {
    purgeOptions: { displayCount: 10000 },
    maximumTrackPoints: 1,
    outFields: ["Name","Altitude","Destination"]
  };

  var layer = new StreamLayer(url, options);
}
```
ArcGIS JavaScript API

StreamLayer: Methods

- Add / remove StreamLayer to / from a map

```javascript
function addNewStreamLayer() {
    streamLayer = makeStreamLayer();
    map.addLayer(streamLayer);
}
```

```javascript
function connectStreamLayer() {
    streamLayer.connect();
}
```

```javascript
function disconnectStreamLayer() {
    streamLayer.disconnect();
}
```

```javascript
var layer = new StreamLayer(url, options);
purgeOptions: { displayCount: 10000 },
maximumTrackPoints: 1,
outFields: ["Name","Altitude","Destination"]
```

```javascript
map.removeLayer(streamLayer);
```
ArcGIS JavaScript API

StreamLayer: Event handler

- Subscribe to event of the StreamLayer

```javascript
// On connect, change UI
layer.on("Connect", function()

 dojo.byId("txtWsUrl").style.backgroundColor = "green";
);

// On disconnect, change UI
layer.on("Disconnect", function()

 dojo.byId("txtWsUrl").style.backgroundColor = "red";
);
```

StreamService: http://localhost:6080/arcgis/rest/services/Flights/StreamServer
ArcGIS JavaScript API
StreamLayer: Properties

- Set a renderer for the StreamLayer

```javascript
// Make renderer
function makeRenderer(){
  var renderer = new SimpleRenderer(
    new PictureMarkerSymbol('./symbol/plane.png', 20, 20)
  );
  renderer.setRotationInfo({field: "heading");
  return renderer;
}
return renderer;
```

- SimpleRenderer
- TemporalRenderer
- ClassBreaksRenderer
- UniqueValueRenderer
- DotDensityRenderer
- ScaleDependentRenderer
ArcGIS JavaScript API
StreamLayer: Properties

- Set a renderer for the StreamLayer

```javascript
var temporalRenderer = new TemporalRenderer(
    obsRenderer, latestObsRenderer, trackLineRenderer, obsAger
);
return temporalRenderer;
```

```javascript
// Make renderer
function makeRenderer() {
    var renderer = new SimpleRenderer(
        new PictureMarkerSymbol('./symbol/plane.png', 20, 20)
    );
    renderer.setRotationInfo({field: "heading"});
    return renderer;
}
```

- SimpleRenderer
- TemporalRenderer
- ClassBreaksRenderer
- UniqueValueRenderer
- DotDensityRenderer
- ScaleDependentRenderer
Specify an attribute or spatial filter

```javascript
// Set attribute filter
var expression = "Destination = 'DCA'";

function setWhere(expression){
    streamLayer.setDefinitionExpression(expression);
}

// Set spatial filter
var extent = new esri.geometry.Extent({
    "xmin":-122.68,"ymin":45.53,"xmax":-122.45,"ymax":45.6,
    "spatialReference":{"wkid":4326}
});

function setExtent(extent){
    streamLayer.setGeometryDefinition(extent);
}
```
• Intercepting messages received by the StreamLayer

```javascript
layer.on("message", function(evt){
    if (evt.attributes.Name == "ASA2"){
        map.centerAt(evt.geometry);
    }
});
```
ArcGIS JavaScript API
StreamLayer: Functionalities

- Store latest Features
Combining real-time with static data

ArcGIS Server
GeoEvent Extension

Stream Services
Common Join field

Related Features
EGDB

Stream Layer
ArcGIS JavaScript API
StreamLayer: Functionalities

- Use a related Features
Summary

- **Stream Services**
  - Enable low-latency immediate delivery of data
  - Are discoverable, securable and scalable

- **StreamLayer**
  - Consume and display streams of features
  - Configurable symbology
  - Filter by geometry and attribute
  - Available in the ArcGIS online web maps
  - Available in the JavaScript API
GeoEvent What’s Next?

• 10.4 – Spatiotemporal Big Data Store. Apache Elastic Search
  - Publish from GeoEvent
  - Workflows in line with SDE for Enterprise projects
  - 4000 Events per second
  - 100,000 BDS events written per second

• 10.4.1
  - 100,000+ events per second – per node

Let’s Talk.
Where to learn more?

Resources

• To learn more, visit the ‘Get Started’ area of the GeoEvent Extension product page:
  - [http://links.esri.com/geoevent](http://links.esri.com/geoevent)
    - Introduction
    - Notifications
    - Stream Services
    - RSS, HTTP, Files
    - REST Admin API
    - Clustering

• Ask questions on the GeoEvent Forum:
  - [https://links.esri.com/geoevent-forum](https://links.esri.com/geoevent-forum)

The GeoEvent SDK – Local Install dir:
C:\Program Files\ArcGIS\Server\GeoEvent\sdk

Find sample application at:
[https://github.com/tompa0003/FlightDemo](https://github.com/tompa0003/FlightDemo)
GeoEvent and JavaScript at Dev Summit

• **Tuesday, 10 November**
  - ArcGIS API for JavaScript: An Introduction

• **Wednesday, 11 November**
  - ArcGIS API for JavaScript: What’s New for 4.0
  - ArcGIS API for JavaScript: Data Visualization
  - Choosing the Best JavaScript Framework for You
  - ArcGIS API for JavaScript: Tips and Tricks for Developing and Debugging Apps
  - ArcGIS GeoEvent Extension for Server: An Introduction

• **Thursday, 12 November**
  - ArcGIS API for JavaScript: What’s New for 4.0 (second session)
  - ArcGIS API for JavaScript: Build 3D Web Apps
  - Web AppBuilder for ArcGIS: Customizing and Extending
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