ArcGIS API for JavaScript: Real-time Data Visualization and Analytics

Julie Powell

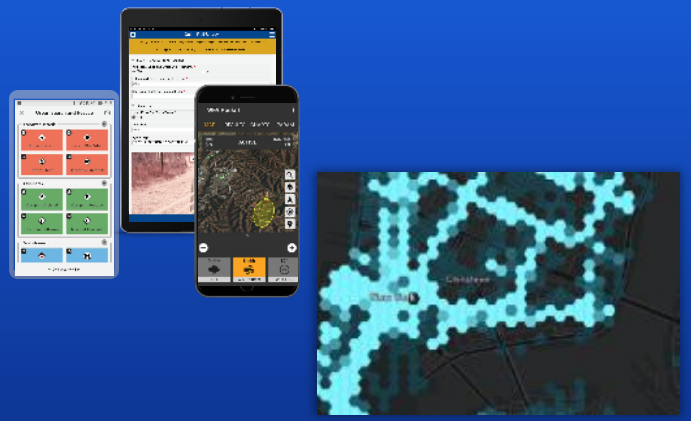
Matthew George

René Unrau

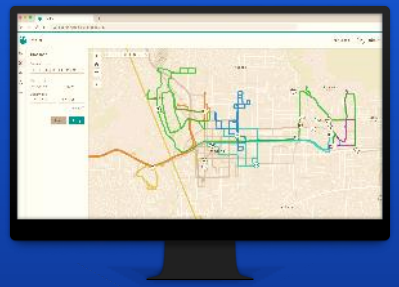
2021 ESRI DEVELOPER SUMMIT

Use cases in real-time visualization & analytics

Personnel Tracking

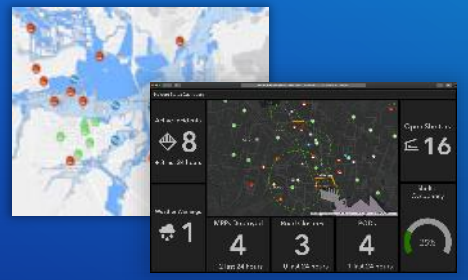


Resource Optimization



Asset & Entity Tracking

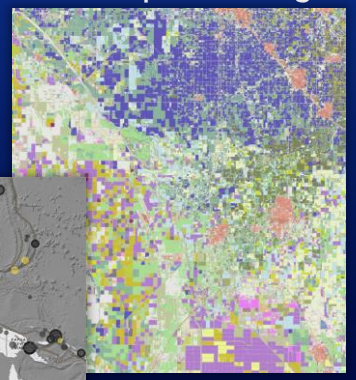
Infrastructure Protection



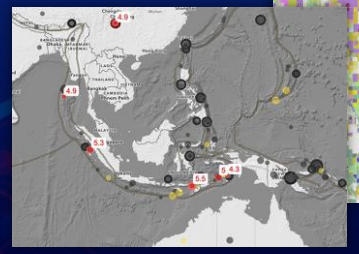
Operations Monitoring

SCADA Integration

Soil & Crop Monitoring

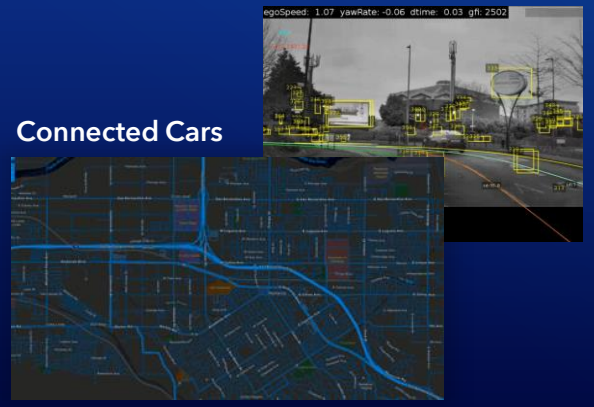


Anomaly Detection



Air Quality Monitoring

Connected Cars



Real-Time in the ArcGIS Platform

Real-Time Visualization & Analytics

ArcGIS GeoEvent Server

Real-time mapping and analytics

Software:

ArcGIS Enterprise + GeoEvent Server (+ GeoAnalytics Server)

Target:

Savvy IT / GIS Staff
On premises or single tenant cloud
Closed environments / networks
Extensible

ArcGIS Velocity

Analyze real-time and big data

Capability:

ArcGIS Online + ArcGIS Velocity

Target:

No GIS admin needed
Public cloud
Feeds with internet access
Scalable and resilient
High velocity and volume

Tuesday
6 April 2021

3:15 p.m.

ArcGIS Velocity: An Introduction

3:15 p.m. – 4:15 p.m.

Streaming Live

ESRI TECHNICAL SESSION

ArcGIS Velocity is a new real-time and big data processing and analysis capability in ArcGIS Online. It enables you to ingest, visualize, analyze, store, and act upon data from Internet of Things (IoT) sensors. Join the discussion showcasing how to connect to virtually any type of streaming data, perform real-time analytics and processing on the streaming data, and automatically disseminate information and alert personnel when specified conditions occur. Design analytic models to process high-volume historical data to gain insights into patterns, trends, and anomalies in your big data. Keywords – Velocity, Real-time, Analytics, Big data, IoT

Gregory Christakos, Suzanne Foss

Wednesday
7 April 2021

10:15 a.m.

ArcGIS GeoEvent Server: Working with Real-Time Analysis

10:15 a.m. – 11:15 a.m.

Streaming Live

ESRI TECHNICAL SESSION

Looking for a deeper dive into ingesting and analyzing real-time data? Join our discussion highlighting enhancements to ArcGIS GeoEvent Server coming in the first release of 2021. New capabilities will be demonstrated which offer analysts options to streamline the filtering and processing workflows GeoEvent Services use to perform real-time analysis and detect patterns of interest. Rethink how your real-time services are designed and learn what's new and what's coming next to provide greater transparency about your real-time data processing solutions. Keywords: Geoevent, Server, Real-time, Analytics, IoT

RJ Sunderman, Eric Ironside

Introducing the StreamLayer

Julie Powell

Poll vs. Push

- How frequently does your data change?
- How quickly do you need updates?

Refresh interval

```
// the layer will be refreshed every minute.
layer.refreshInterval = 1;
```

WebSocket

```
streamLayer = new StreamLayer({
  url: streamURL,
  purgeOptions: {
    displayCount: 10000
  }
}
```

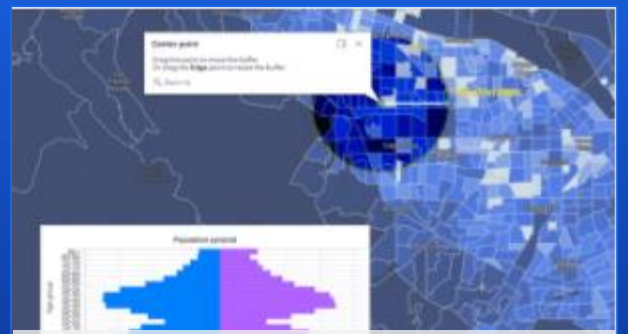
StreamLayer

StreamLayer basics

- 2D / 3D support
- Track-aware: multiple observations for a single object
- Define a renderer *
- Purge options: How to manage stale features?
  - Max observations
  - Max age of features
  - Max number of features
- Same client-side capabilities as other layers

That means…

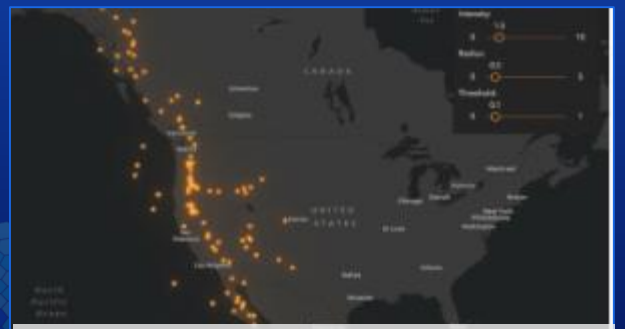
Blending



Client-side queries

Client-side filtering

Rendering



Effects

Filter effect

Statistics

…

Demo: Stream Layer Visualization Examples

René Unrau

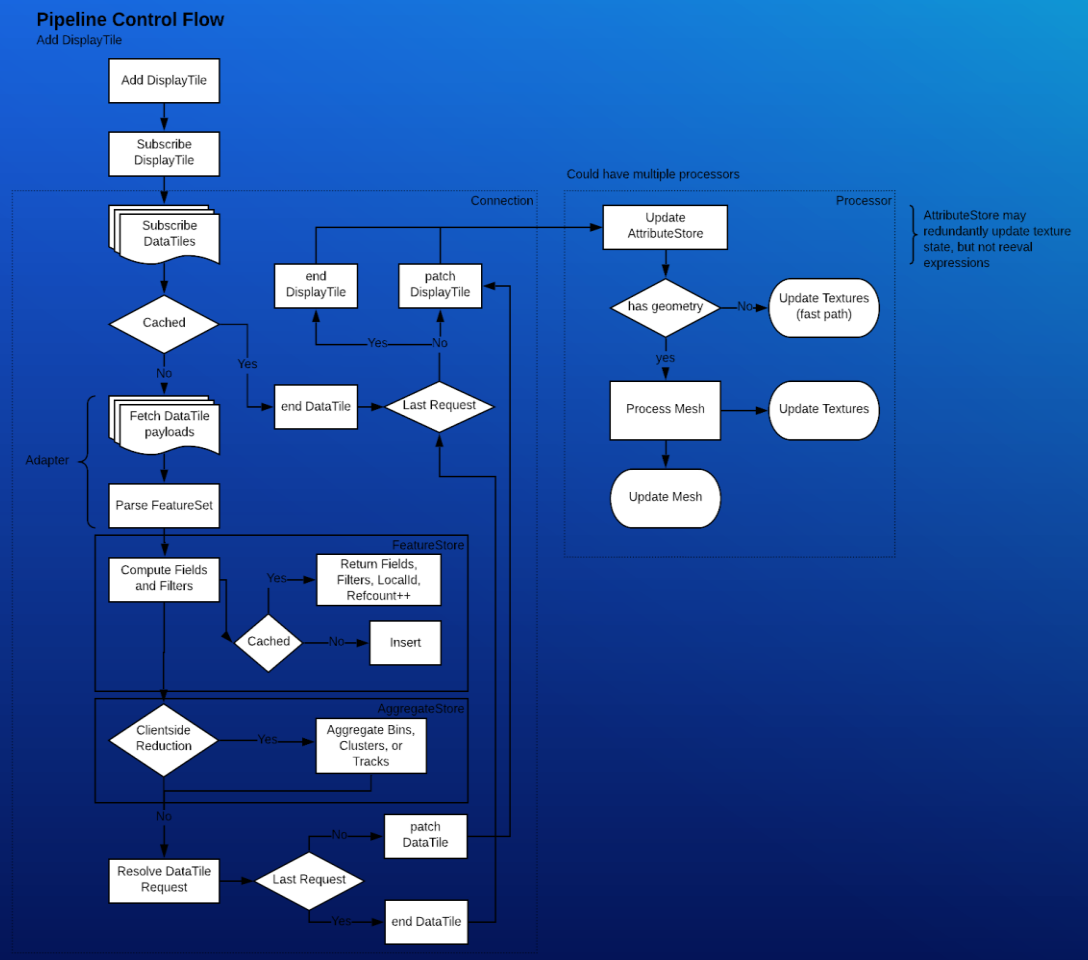
Stream Layer Updates

Matt George

Unified Feature Pipeline

- Feature and Stream rendering unified
  - All feature source types treated as streams
  - All feature/stream data goes through the same symbol processing pipeline

- What this means for users:
  - Feature Layer APIs available to the Stream Layer:
    - SimpleRenderer, ClassBreaksRenderer, UniqueValueRenderer, Dictionary Renderer
    - CIM Support
    - FeatureFilter / FeatureEffect
    - Client-side queries



Auto-reconnection

- Versus 3.x, WebSocket handling is now automated.
- When connections are lost, the API will automatically attempt to reconnect
  - Customize with the new maxReconnectionAttempts and maxReconnectionInterval options

Stability & Performance

- Before – difficult for users to dial in the right push rate for a variety of clients
  - Stream processing has been overhauled to handle backpressure (4.17)
  - Stream feature processing will automatically throttle for slow clients
  - Will attempt to drop obsolete messages first
  - Use the new update-rate event to transparently see server and client update rates!
  - Further customize maximum client speed with the new updateInterval property
- Under the hood tweaks to optimize how fast we can push stream features. In 4.19, a new stream-layer specific mesh patching mode

Custom Stream Layers

- Introduced 4.17 (2D) and 4.18 (3D)
- Allow for pushing streaming updates to the JSAPI via custom WebSocket services
- Developer must provide an implementation that supports projection, server-side filtering, and other logic required by clients

Custom Stream Layers - Protocol

- **Unlike with StreamServices, no metadata document. Instead, a quick client-server handshake:**

```
interface IHandshakeMessage {
  format: "json"; // currently only JSON is supported (over WebSocket text frames only)
  spatialReference: {
    wkid: number
  },
  outFields?: string[]
}
```

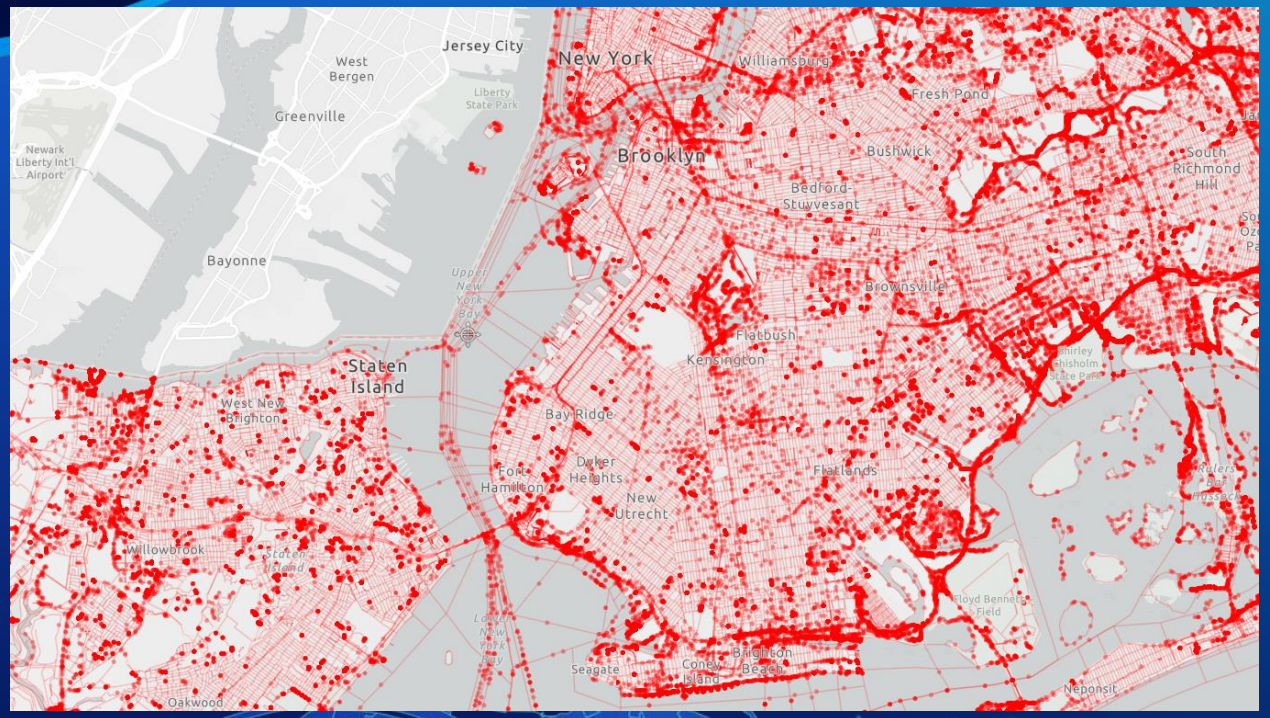
  - **Format to return the data (only JSON for now)**
  - **Spatial Reference to return the data**
  - **List of outFields to include per feature**

Custom Stream Layers - Protocol

- **After the handshake, feature messages should use the following format:**

```
interface FeatureResult {
  type: "featureResult";
  features: Feature[];  // Encoded in esriJSON
}
```

  - **Implementation tip: batch updates!**



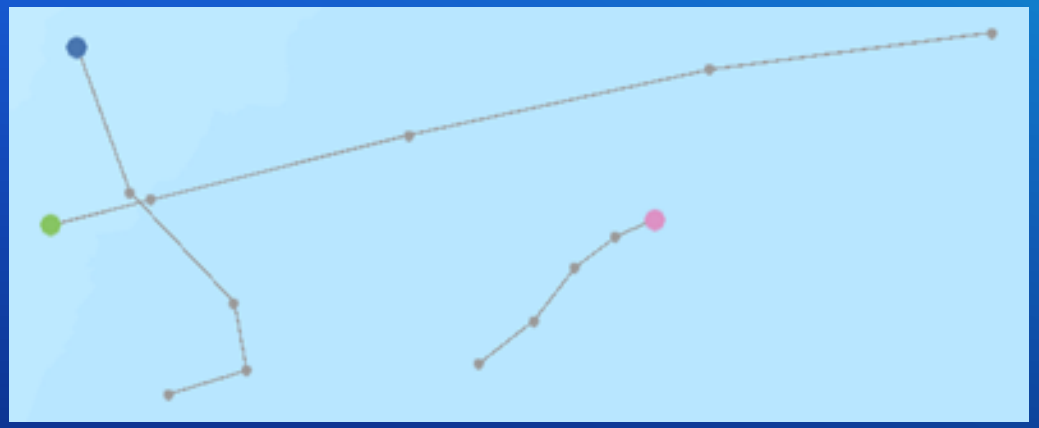
NYC (generated) Stream Service

Loading a custom stream service

The Future

- **A more high-level client-side stream layer – provide APIs for client-side projection, and allow for push arbitrary client data to a stream layer**

- **More advanced visualization options:**
  - **TrackRenderer**



A track-aware stream layer showing the current location of three features, along with four previous observations for each, all connected by track lines.

The Future

- **What would you like to see? Let us know!**

Want to learn more?

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