Agenda

Goal : Provide an overview of the tools and techniques used to deliver dynamic content to a web app.

- **Activities Covered**
  - **Collecting live streams of data**
  - **Analyze and react to geographic events**
  - **Deliver analysis results to the user**
 - **Allow user to interact with the data**

- **Products Used**
  - **GeoEvent Extension for Server**
  - **ArcGIS API for JavaScript**

# ArcGIS GeoEvent Extension 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**

GeoEvent Services

GeoEvent Extension

ArcGIS Server

Input Connectors

ws://

Output Connectors
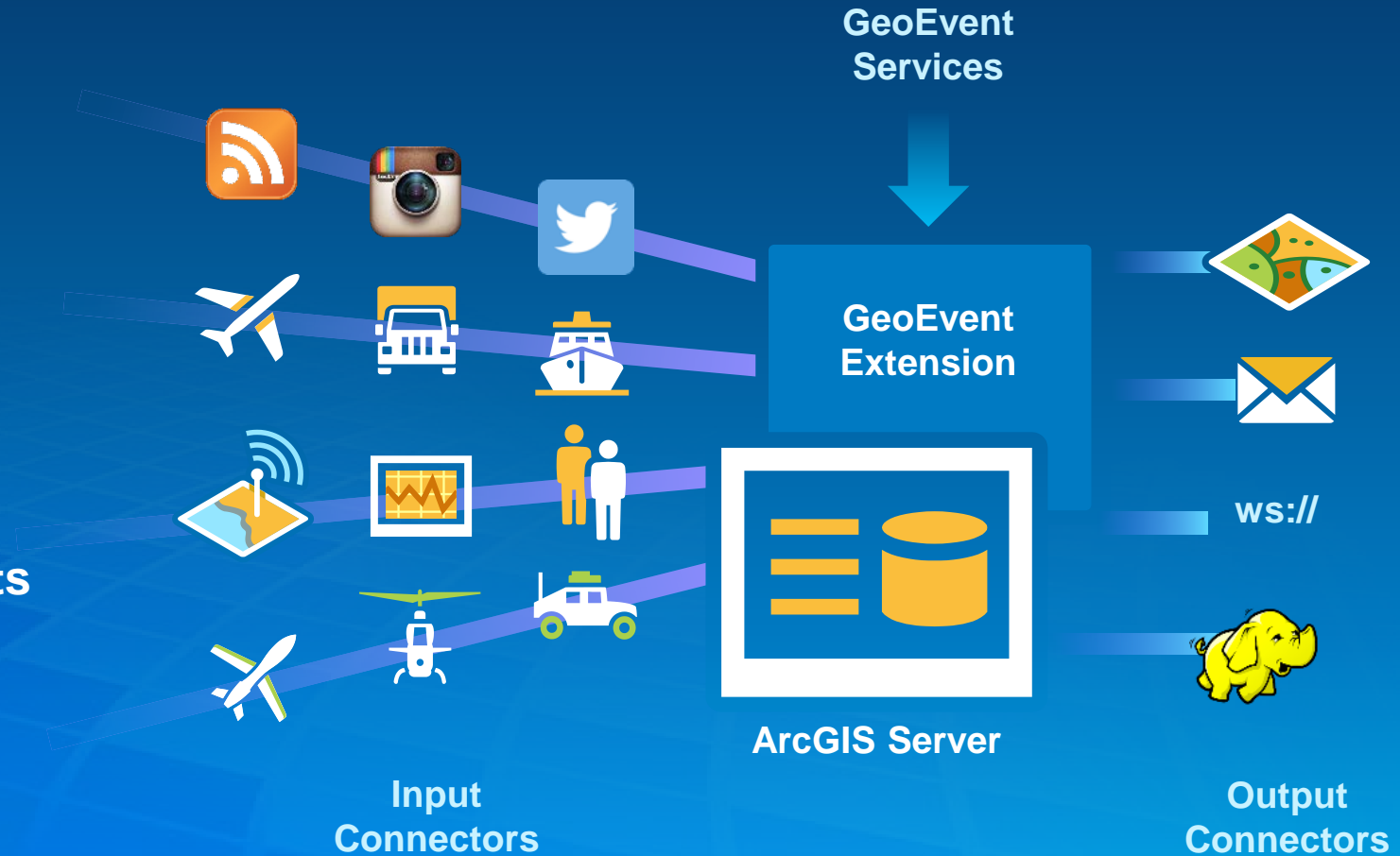
ArcGIS Web API for JavaScript

- **Gives developers tools to add GIS functionality to web applications**

  - **Interactive maps for visualizing data.**

  - **Widgets for finding addresses, editing data, making legends…**

  - **Analysis – Run a model and view results, enrich existing data with detailed demographic information**

  - **Embed into existing web page or make new focused application**

Max state population(2007): 5M
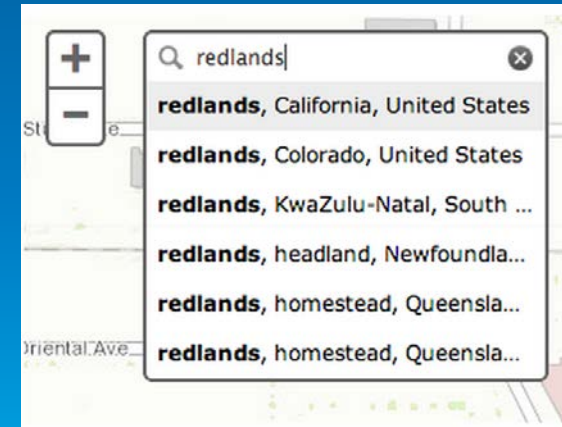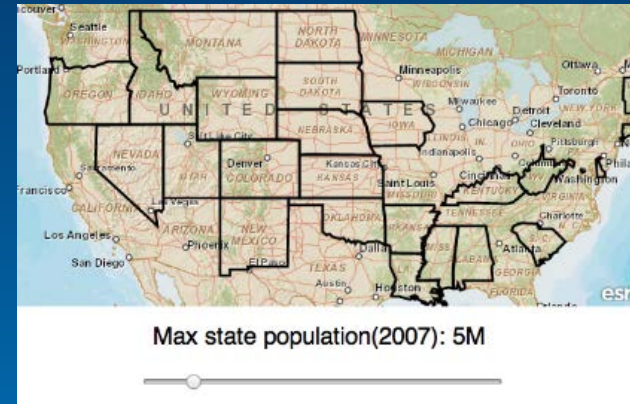
Demonstration

International Space Station
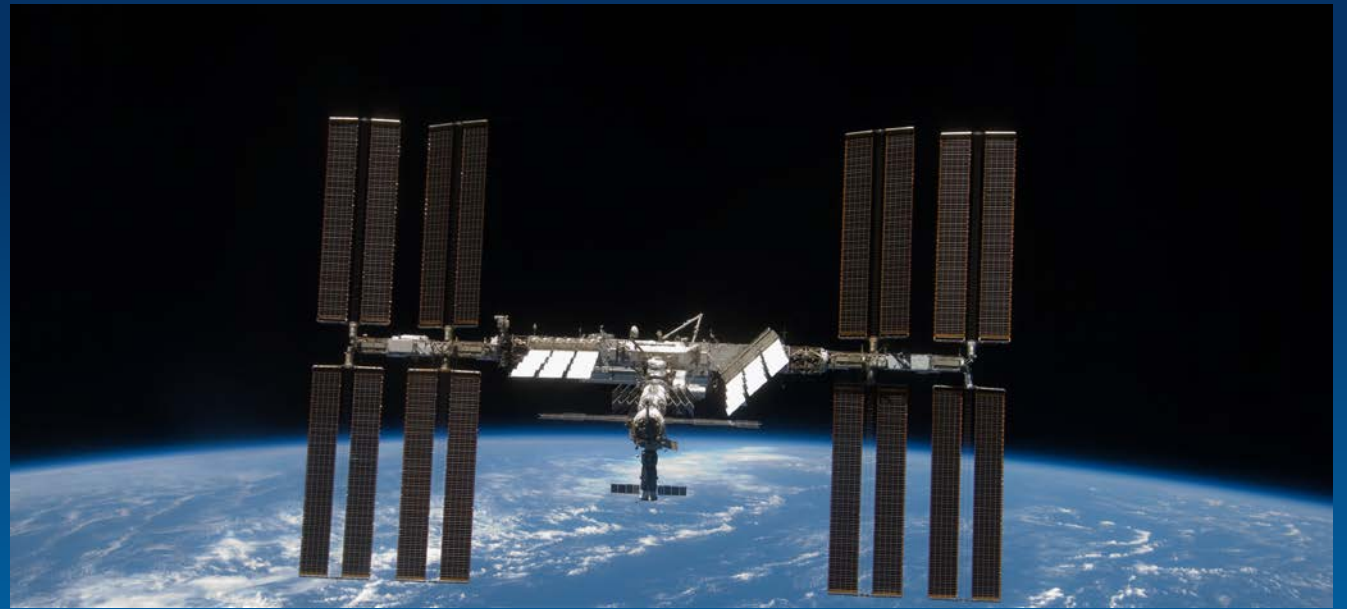
Displaying Real-Time data with Feature Layer and Stream Layer

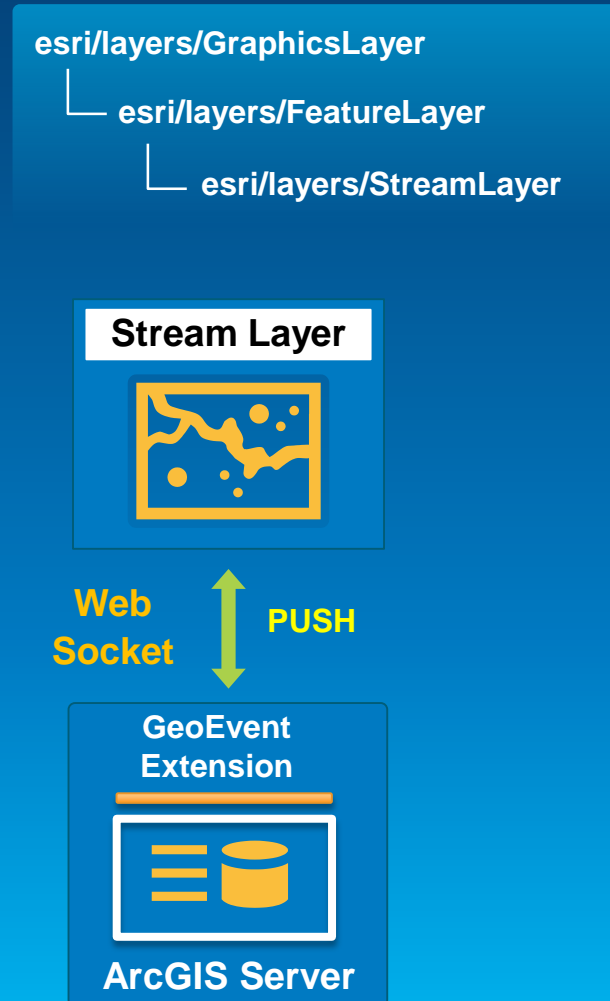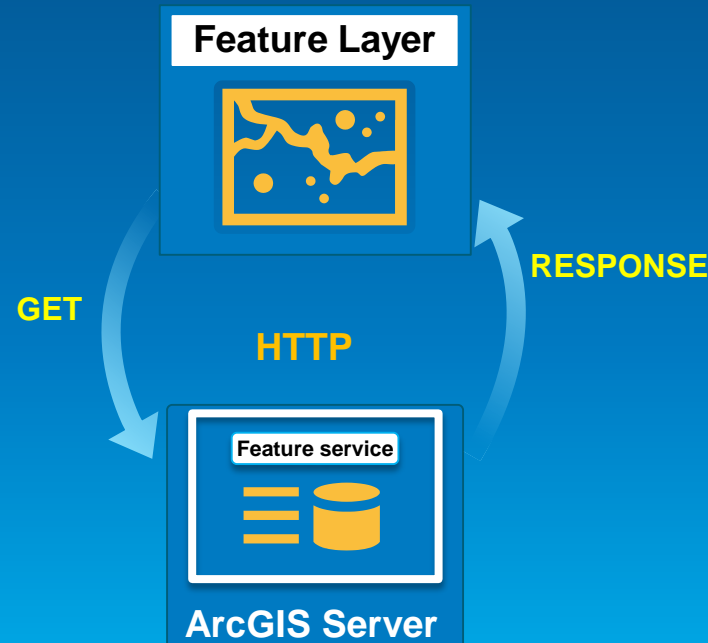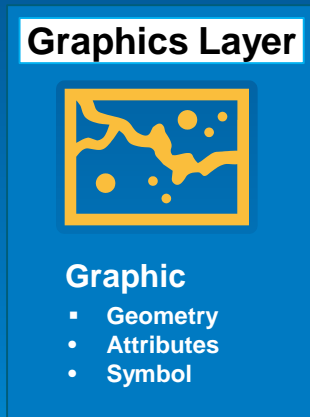# Sending Real-time Events to Clients

Patterns – pull and push

- **Pull from a Feature Services**
  - Must be backed by an enterprise geodatabase (EGDB)
  - Clients poll to get updates

- **Push via Send Features to a Stream Service output**
  - Low latency, high throughput
  - Clients subscribe to features of interest
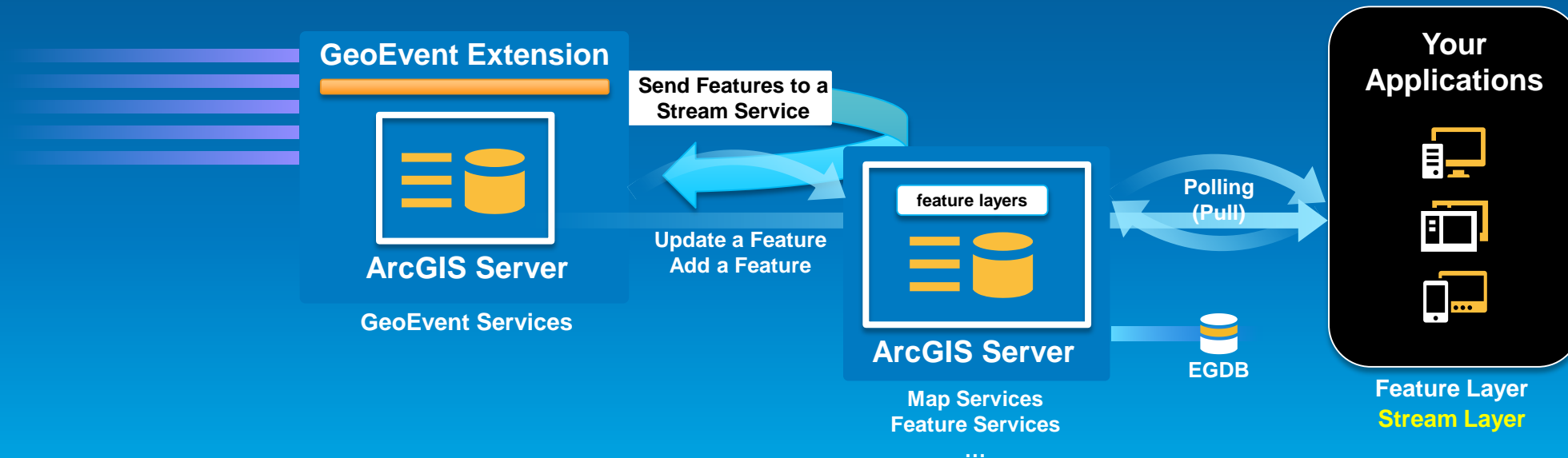
Stream Layer

What is it?

- **A layer in the Javascript API**
  - Available since version 3.6
- **Draws data on map using client-side graphics**

esri/layers/GraphicsLayer
└── esri/layers/FeatureLayer
        └── esri/layers/StreamLayer

Graphics Layer

Graphic
- Geometry
- Attributes
- Symbol

Feature Layer

GET

RESPONSE

HTTP

Feature service

ArcGIS Server

Stream Layer

Web Socket

PUSH

GeoEvent Extension

ArcGIS Server

Stream Layer

Lifecycle

GeoEvent Extension

ArcGIS Server

StreamLayer

Stream Layer (Constructor)
new StreamLayer(featureCollection, options)

Map
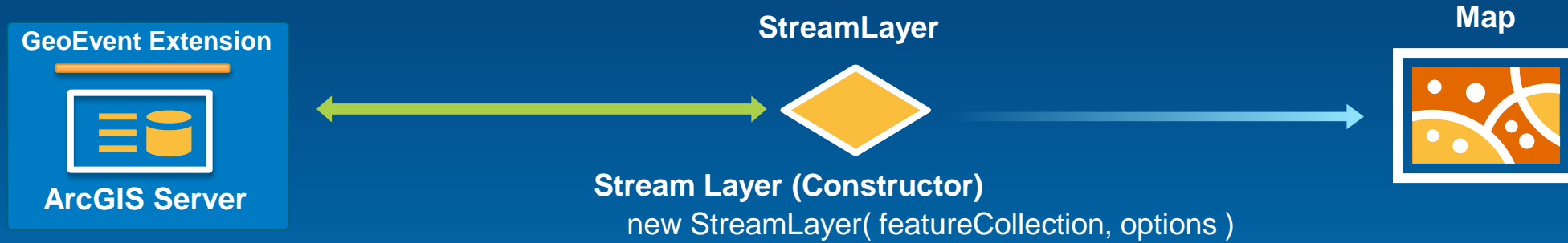
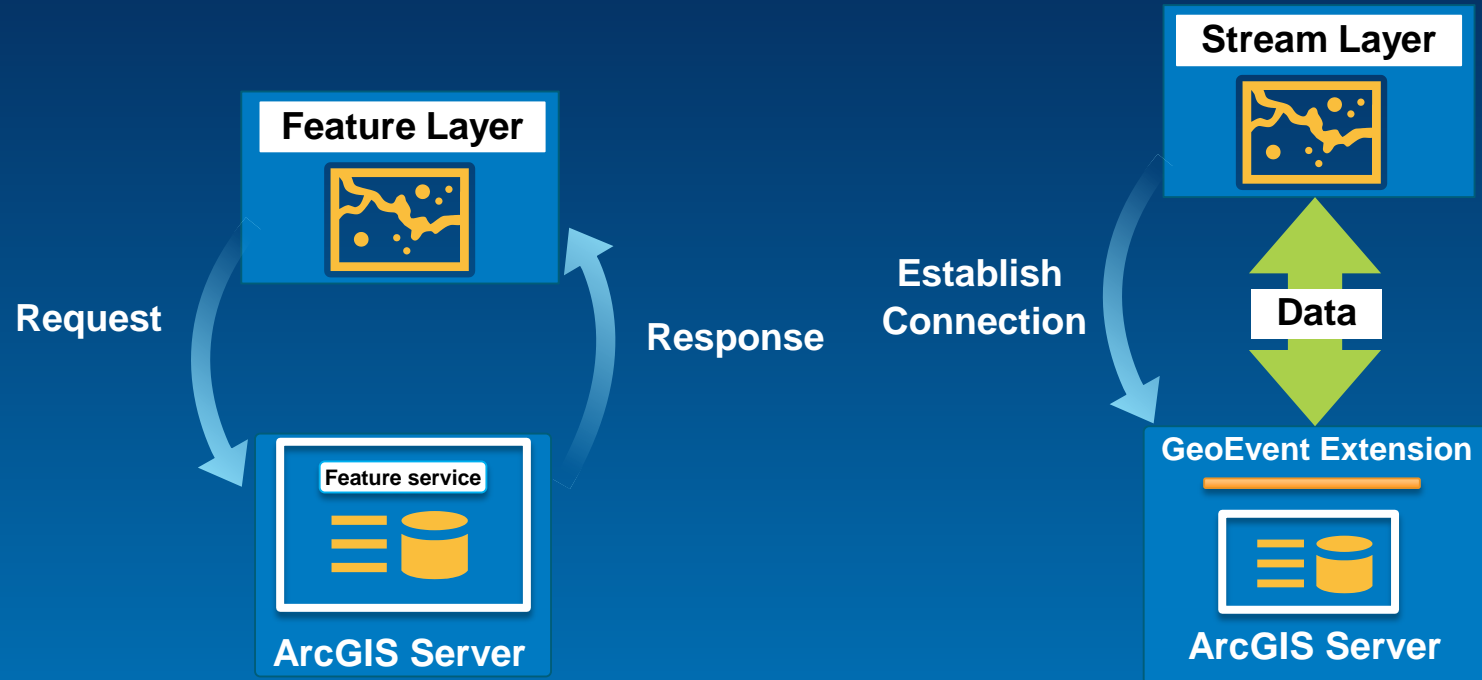**FeatureCollection:**
  { layerDefinition**:**
    { geometryType: esriGeometryPoint,
      timeInfo: {
        startTimeField: "StartTime",
        trackIdField: "Name" },
        fields: […] },
    featureSet**:** null }

- **Options**
  - **webSocketUrl:**
      ws://gep:6180/urlpath
  - **purgeOptions:**
      { displayCount: 500 }

Stream Layer

Advantages

Feature Layer

Request

Response

Feature service

ArcGIS Server

Establish Connection

Stream Layer

Data
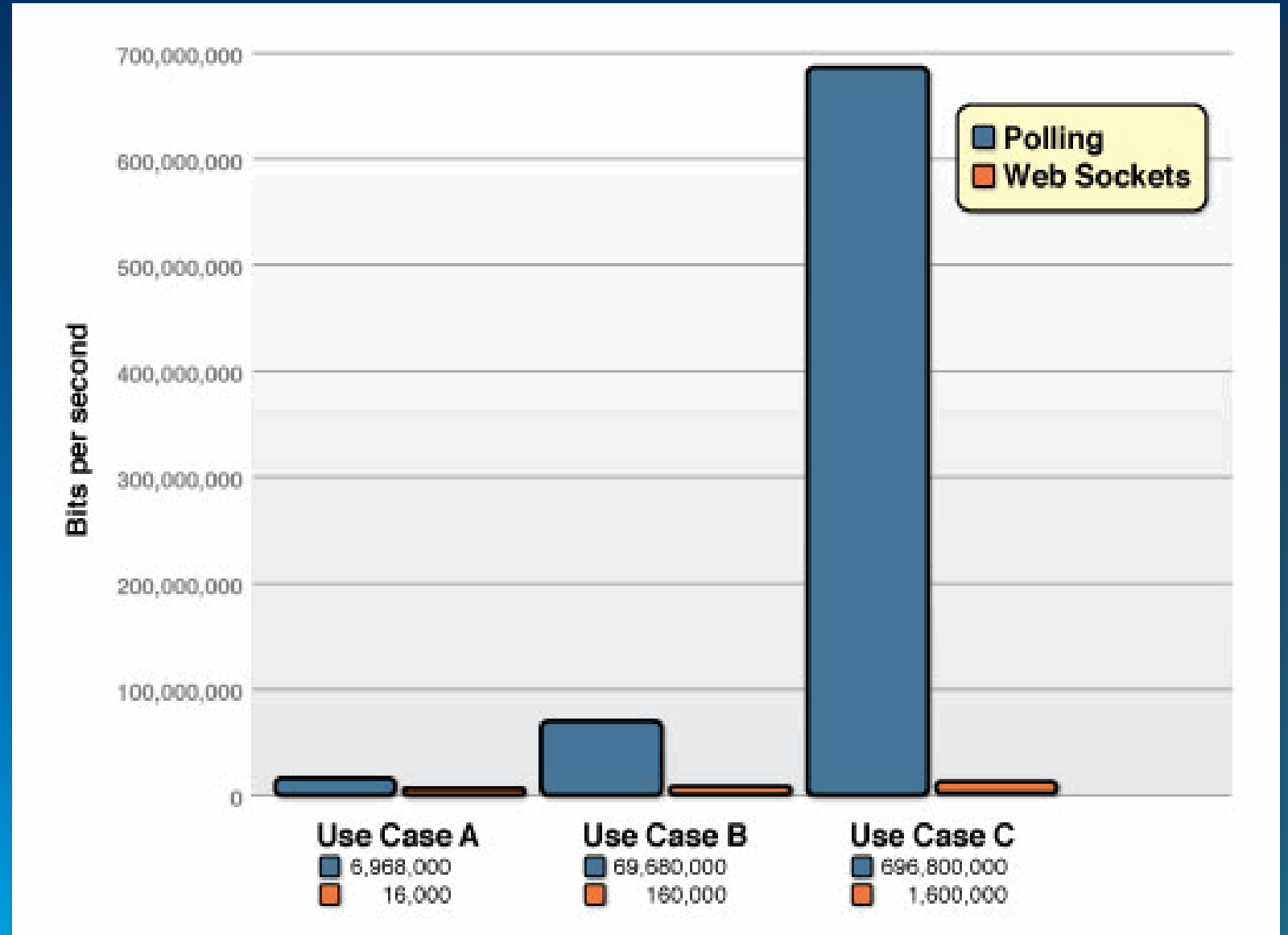
GeoEvent Extension

ArcGIS Server

- **More responsive**
  - Features appear on the map right away.

- **More efficient transfer of data.**
  - Features are only sent once.
  - Messages sent without extra headers

Performance
Web Sockets versus Http Polling

- **HTTP Headers can add a lot of overhead**

- **Polling overhead**
  - **One frame = 871 bytes**

- **Web Socket overhead**
  - **One frame = 2 bytes**

**(credit: www.websockets.org/quantum.html)**

Stream Layer
What is needed

- **GeoEvent Extension Output Connector**
  - **Send Features to a Stream Service**

- **Browser that supports Web Sockets**
  http://caniuse.com/websockets

- **Web Socket protocol allowed on network**
  ws://, wss://

- **No Plugins Required (standard JavaScript)**

10 +

6 +

14 +

6 +

Demo

Demonstration

Consuming Streams of Features with
the Stream Layer
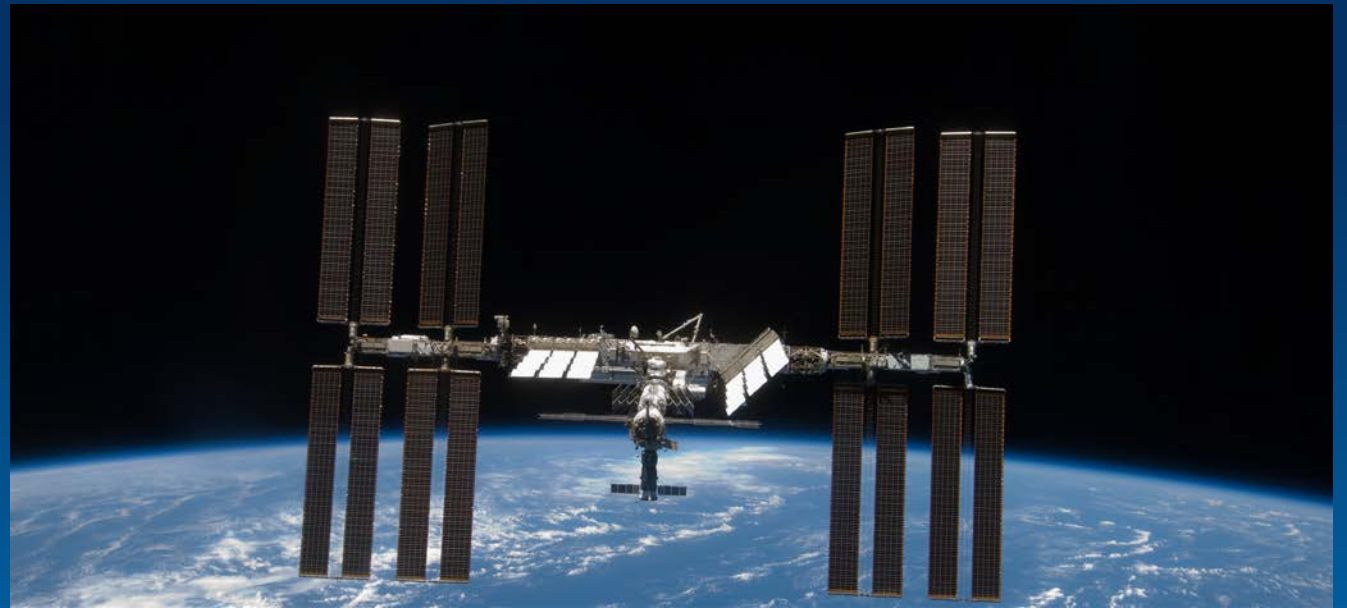
```javascript
// Instantiate StreamLayer
// 1. socketUrl is the url to the GeoEvent Processor web socket.
// 2. purgeOptions.displayCount is the maximum number of features the
//     layer will display at one time
// 3. trackIdField is the name of the field that groups features
var layer = new StreamLayer(featureCollection, {
  socketUrl: txtWsUrl.value,
  purgeOptions: { displayCount: 500 },
  trackIdField: featureCollection.layerDefinition.timeInfo.trackIdField,
  infoTemplate: new InfoTemplate("Route Id: ${message}", "Timestamp: ${timestamp}" )
});
```
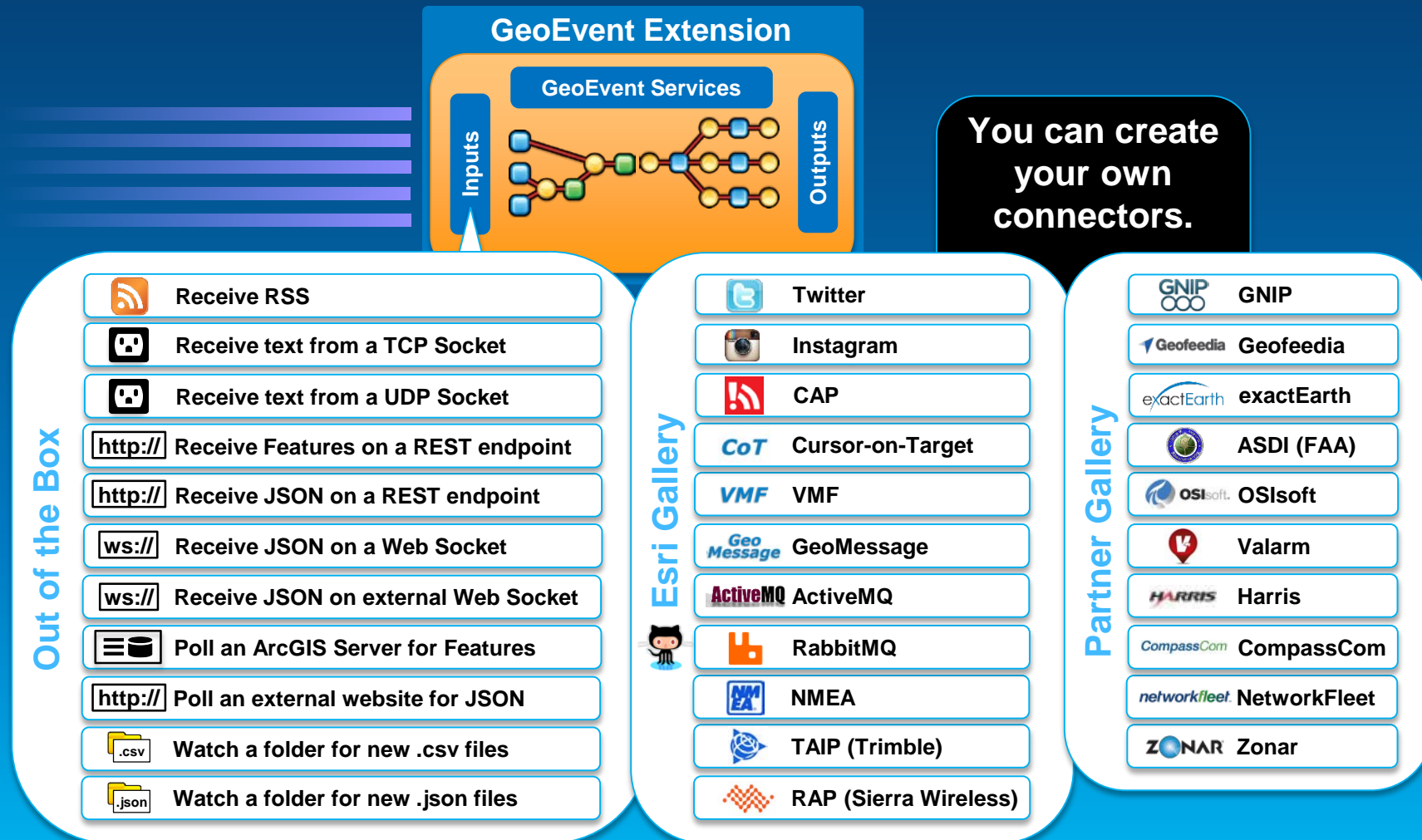
Finding and Consuming Real-Time Data

Receiving Real-Time Data

Input Connectors

- **Easily integrate real-time streaming data with ArcGIS by using an input connector.**

GeoEvent Extension

GeoEvent Services

Inputs

Outputs

You can create your own connectors.

Out of the Box

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

Esri Gallery

	Twitter
	Instagram
	CAP
CoT	Cursor-on-Target
VMF	VMF
Geo Message	GeoMessage
ActiveMQ	ActiveMQ
	RabbitMQ
NMEA	NMEA
	TAIP (Trimble)
	RAP (Sierra Wireless)

Partner Gallery

GNIP	GNIP
Geofeedia	Geofeedia
exactEarth	exactEarth
	ASDI (FAA)
OSIsoft	OSIsoft
	Valarm
HARRIS	Harris
CompassCom	CompassCom
networkfleet	NetworkFleet
ZONAR	Zonar

Demonstration

Connecting to Real-Time Data Feeds

Applying Real-Time Analytics
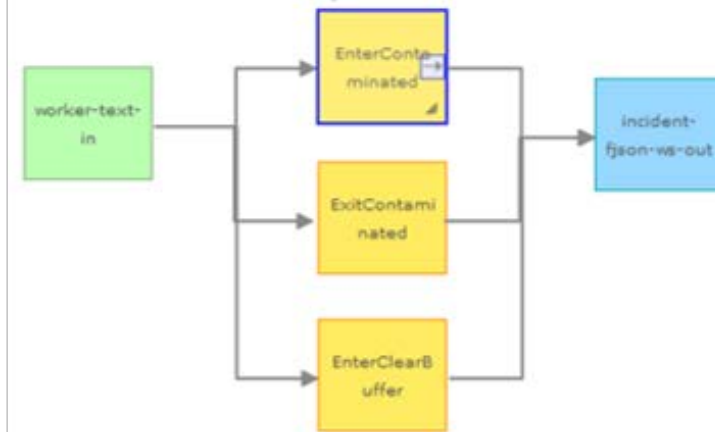
Applying real-time analytics
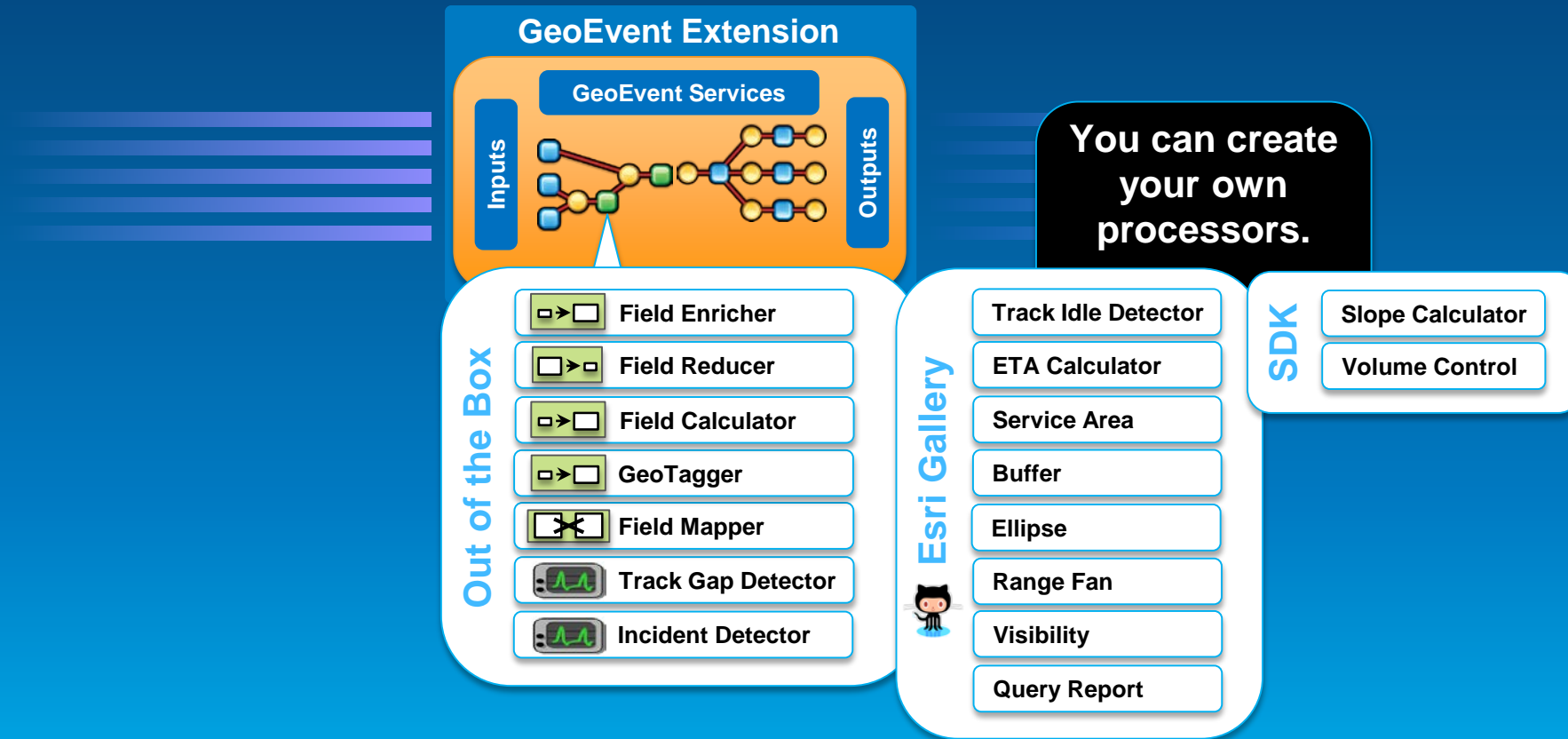*GeoEvent Services*

- 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.
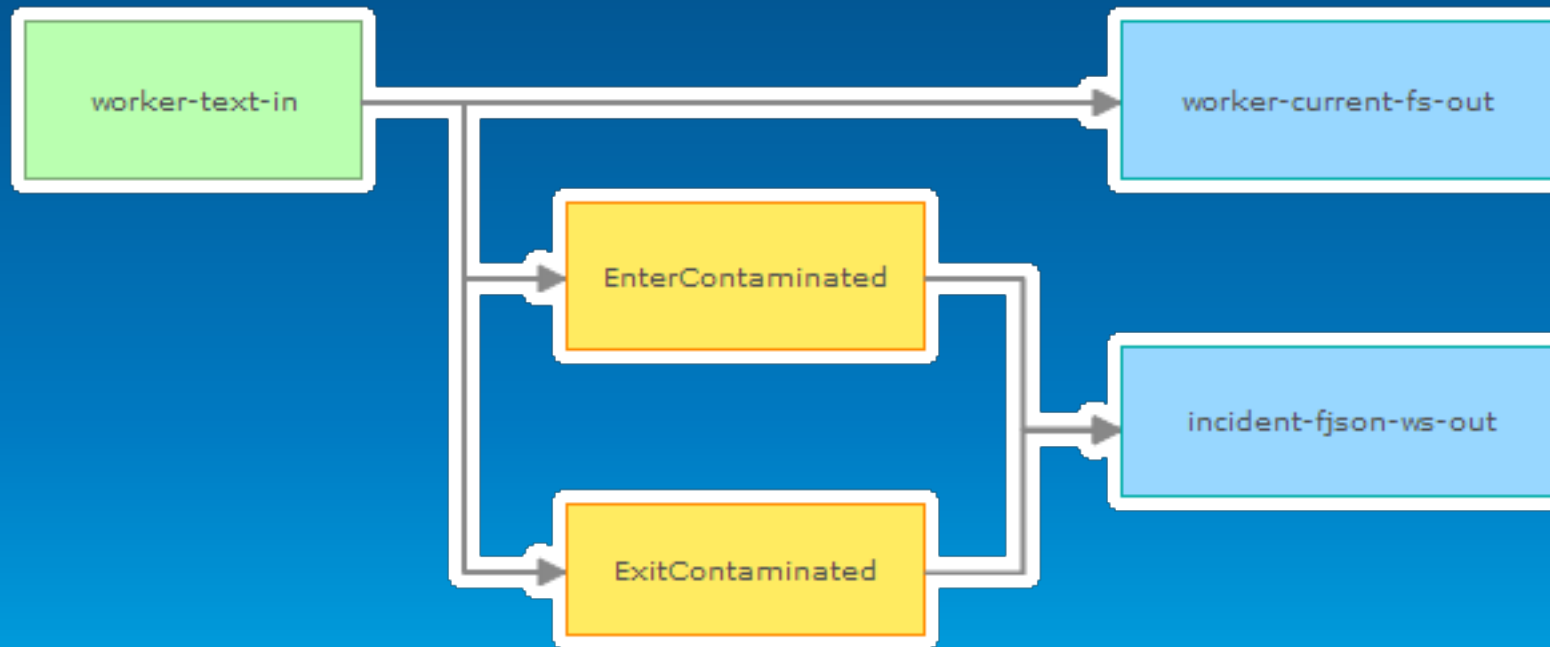
Applying real-time analytics
GeoEvent Processing

- You can perform continuous analytics on GeoEvents as they are received using a **processor**.


GeoEvent Extension

GeoEvent Services

Inputs

Outputs

You can create your own processors.

Out of the Box

	Field Enricher
	Field Reducer
	Field Calculator
	GeoTagger
	Field Mapper
	Track Gap Detector
	Incident Detector

Esri Gallery

Track Idle Detector

ETA Calculator

Service Area

Buffer

Ellipse

Range Fan

Visibility

Query Report

SDK

Slope Calculator

Volume Control

Stream Services

Real-Time GIS Apps using Stream Services

- **Developer Productivity**
  - Make streams of data easy to discover and use.

- **Customizable**
  - Individualized client connections provide filtering and projection.

- **Scalable**
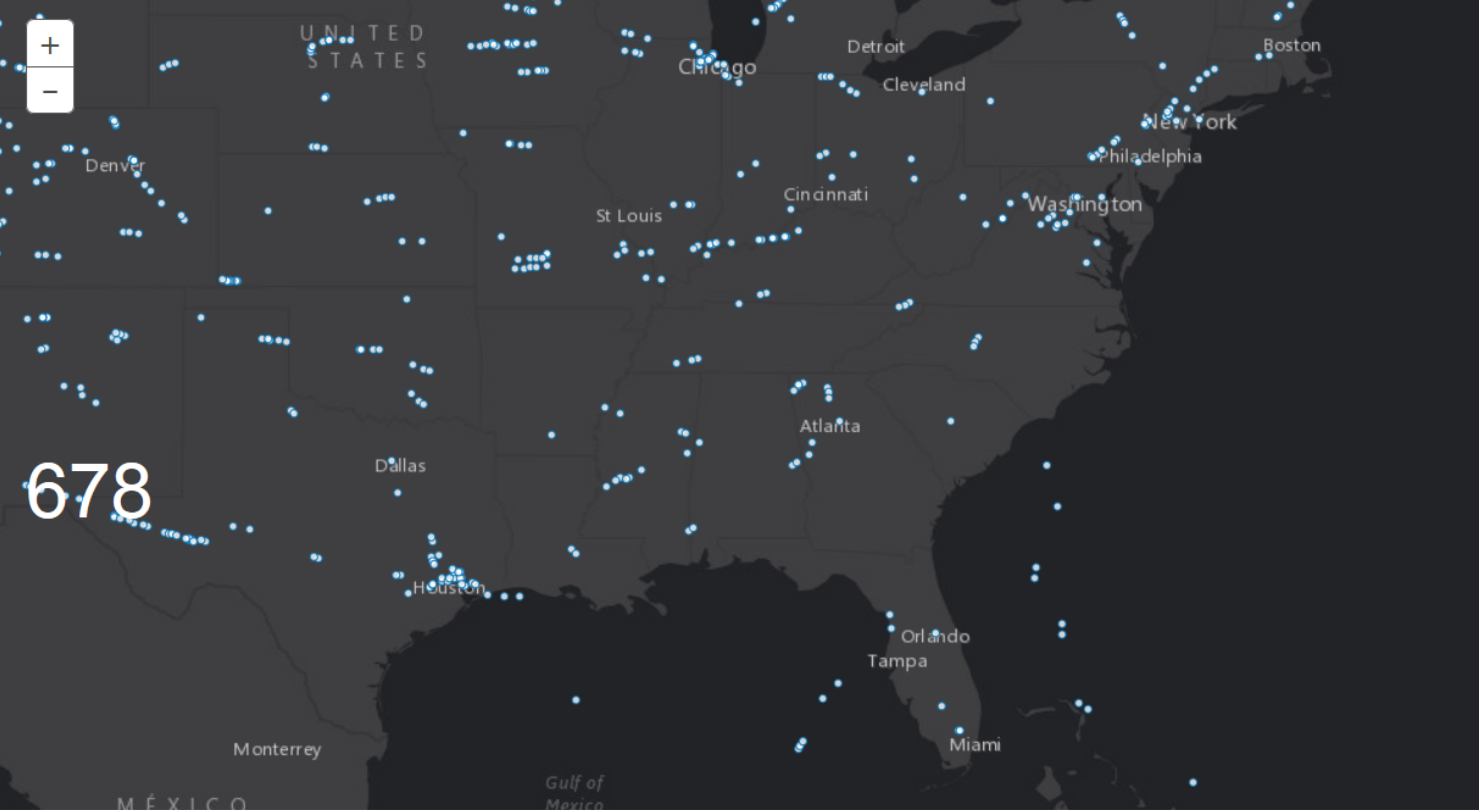 - Features published to a stream services are accessible from any machine in the cluster.

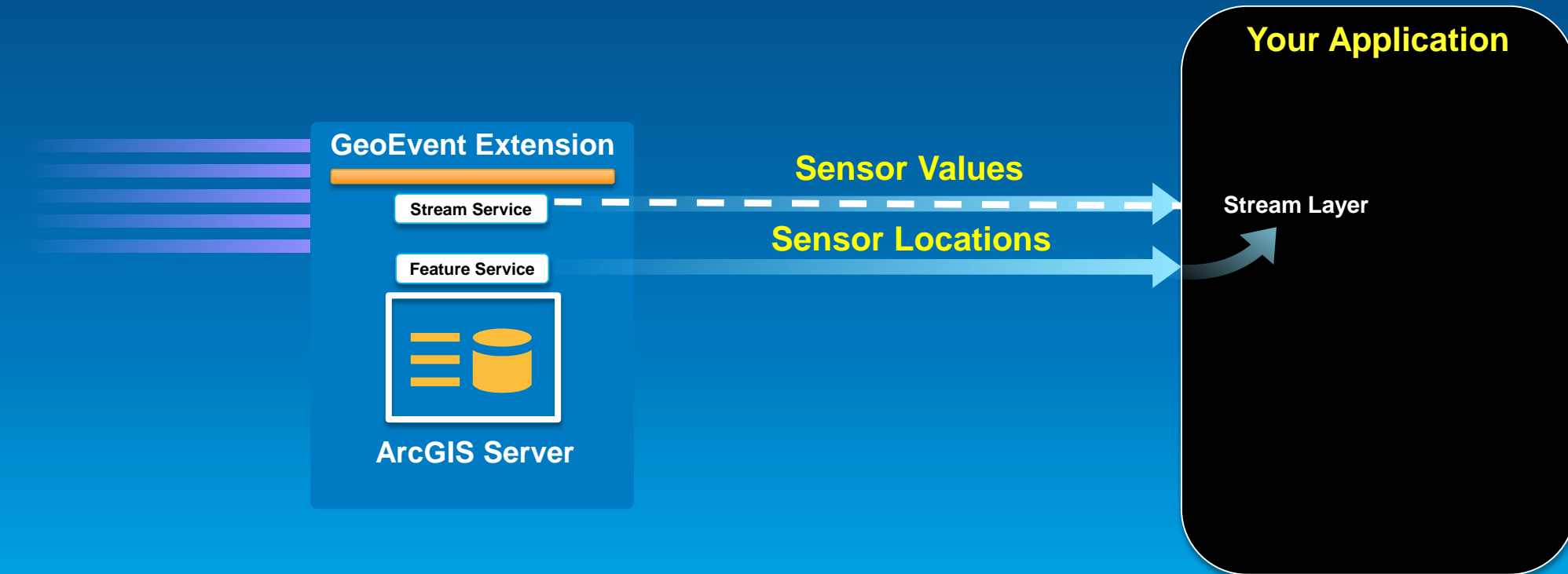# Stream Services – The Future of Streaming Data
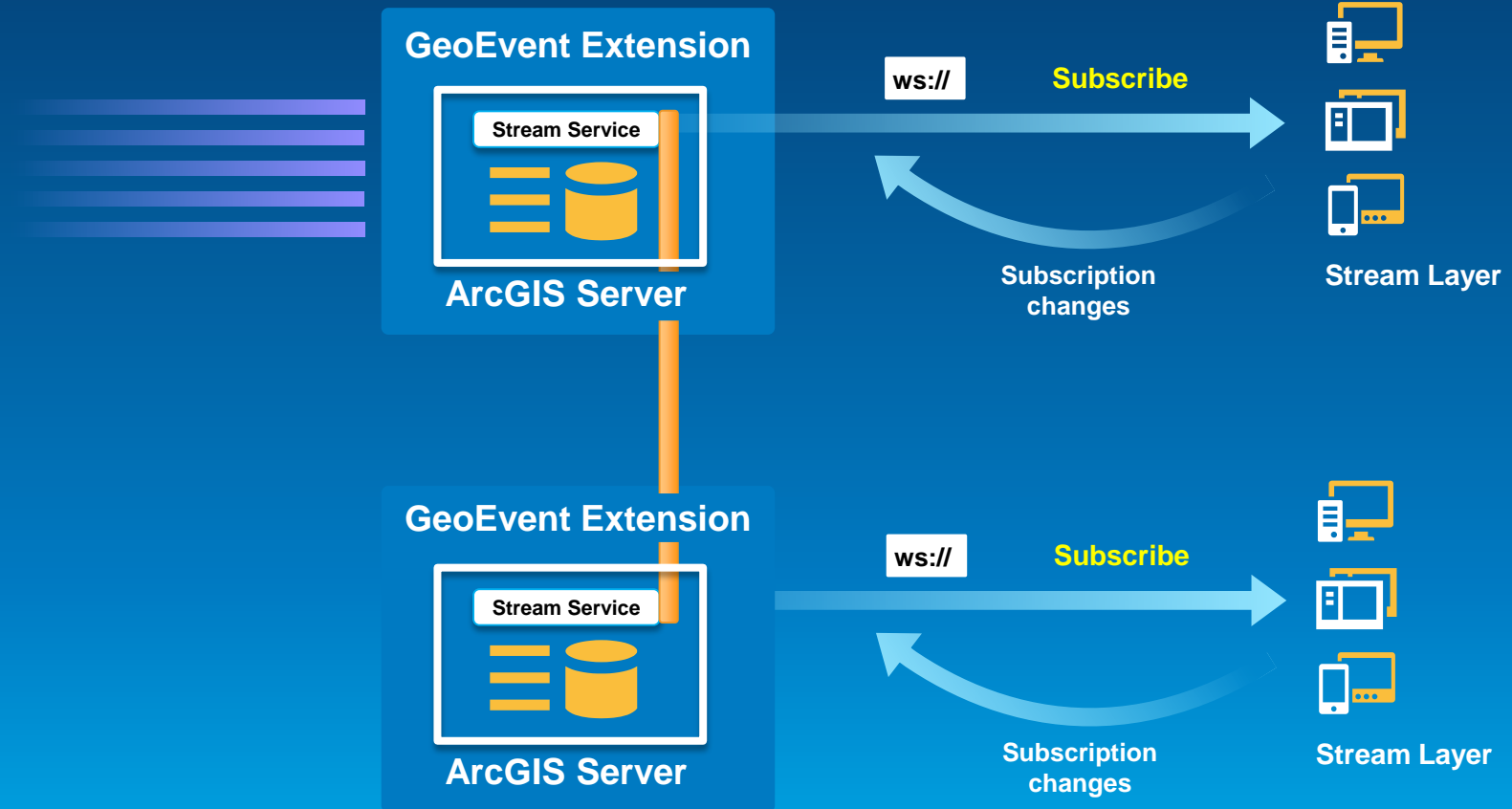
Stationary Sensor Data on a Real-Time Web App

- **Stationary geographic feature with attributes that change over time.**

Demonstration

Stream Gauge Sensor Display

What We Covered Today

- **Consumed Live data from Sensors and a Web Service**

- **Filtered and generated incidents from spatial behavior**

- **Pushed events to a web app through feature services and web sockets**

- **Used JavaScript API Stream Layer to receive messages pushed from server and display them on a map**

- **Saw a preview of the Stream Service that will allow developers to easily receive data through a web socket and set filters that are processed on the server**

Where to learn more?
Resources

- **To learn more, visit the tutorial in the Esri Gallery:**
  - **http://links.esri.com/geoevent-processor**
    - **Introduction**
    - **Notifications**
    - **RSS**
    - **Web Sockets**
    - **Working with HTTP**
    - **GeoEvent Caches**
    - **REST Admin API**

Tutorial - Introduction to GeoEvent Processor (ArcGIS 10.2.x)

This tutorial is the first in a series of tutorials introducing you to the capabilities of ArcGIS GeoEvent Processor for Server.

Code Sample by GeoEventTeam
Last Modified: March 22, 2014

(2 ratings, 0 comments, 1,311 downloads)

Tutorial - REST Admin API in GeoEvent Processor (ArcGIS 10.2.x)

This tutorial introduces you to working with the REST Admin API and GeoEvent Processor.

Code Sample by GeoEventTeam
Last Modified: March 14, 2014

(1 rating, 0 comments, 372 downloads)

Tutorial - WebSockets in GeoEvent Processor (ArcGIS 10.2.x)

This tutorial introduces you to working with WebSockets in GeoEvent Processor.

Code Sample by GeoEventTeam
Last Modified: March 27, 2014

(0 ratings, 0 comments, 0 downloads)

Additional resources

- **ArcGIS API for JavaScript Resource Center**
  https://developers.arcgis.com/javascript

- **Stream Layer Code Samples**
  https://developers.arcgis.com/javascript/jssamples/layers_streamlayer.html

Questions / Feedback?

To learn more:
https://developers.arcgis.com/javascript
http://pro.arcgis.com/share/geoevent-processor
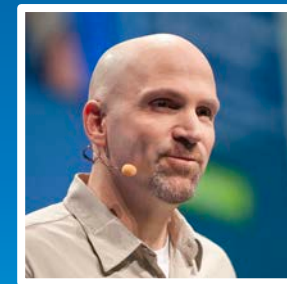
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Understanding our world.