

# ArcGIS for Intelligence: Discern Activities of Interest Through Advanced Analysis

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# Challenges



# Demo

## Movement Pattern Dashboard

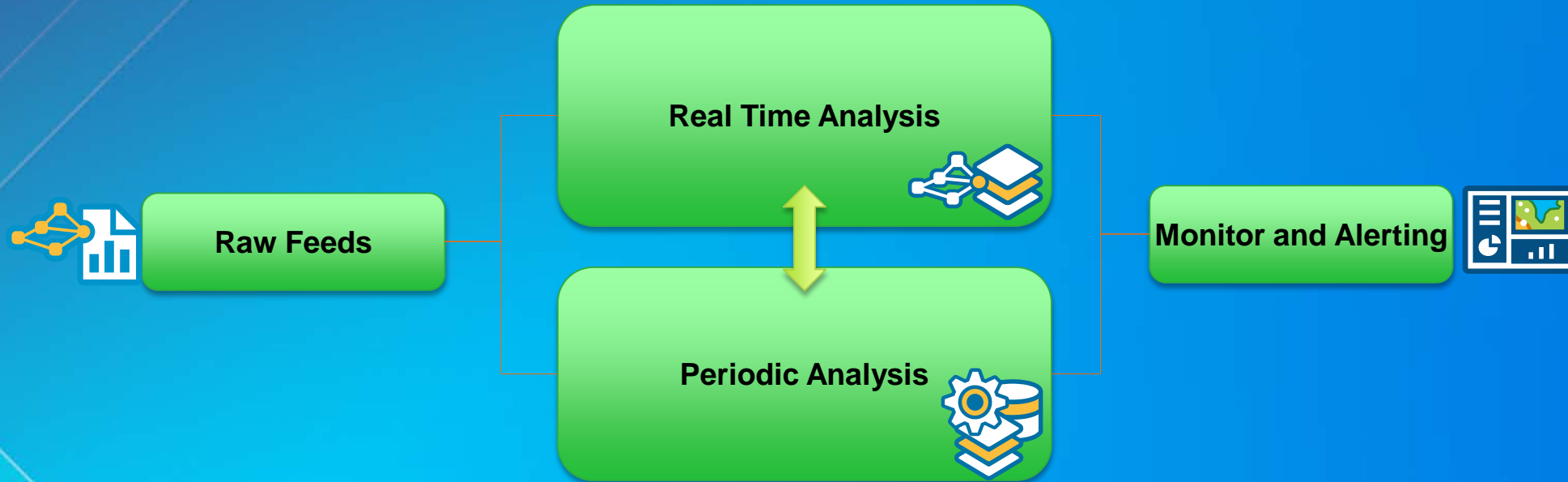


The background features a vibrant blue gradient. On the left side, there are several overlapping geometric shapes: a large purple triangle pointing upwards, a yellow triangle pointing downwards, and a dark purple triangle pointing downwards. The yellow triangle contains a faint, light-colored map of a region, possibly a state or county. The text 'Key Concepts' is centered in the upper half of the image.

# Key Concepts



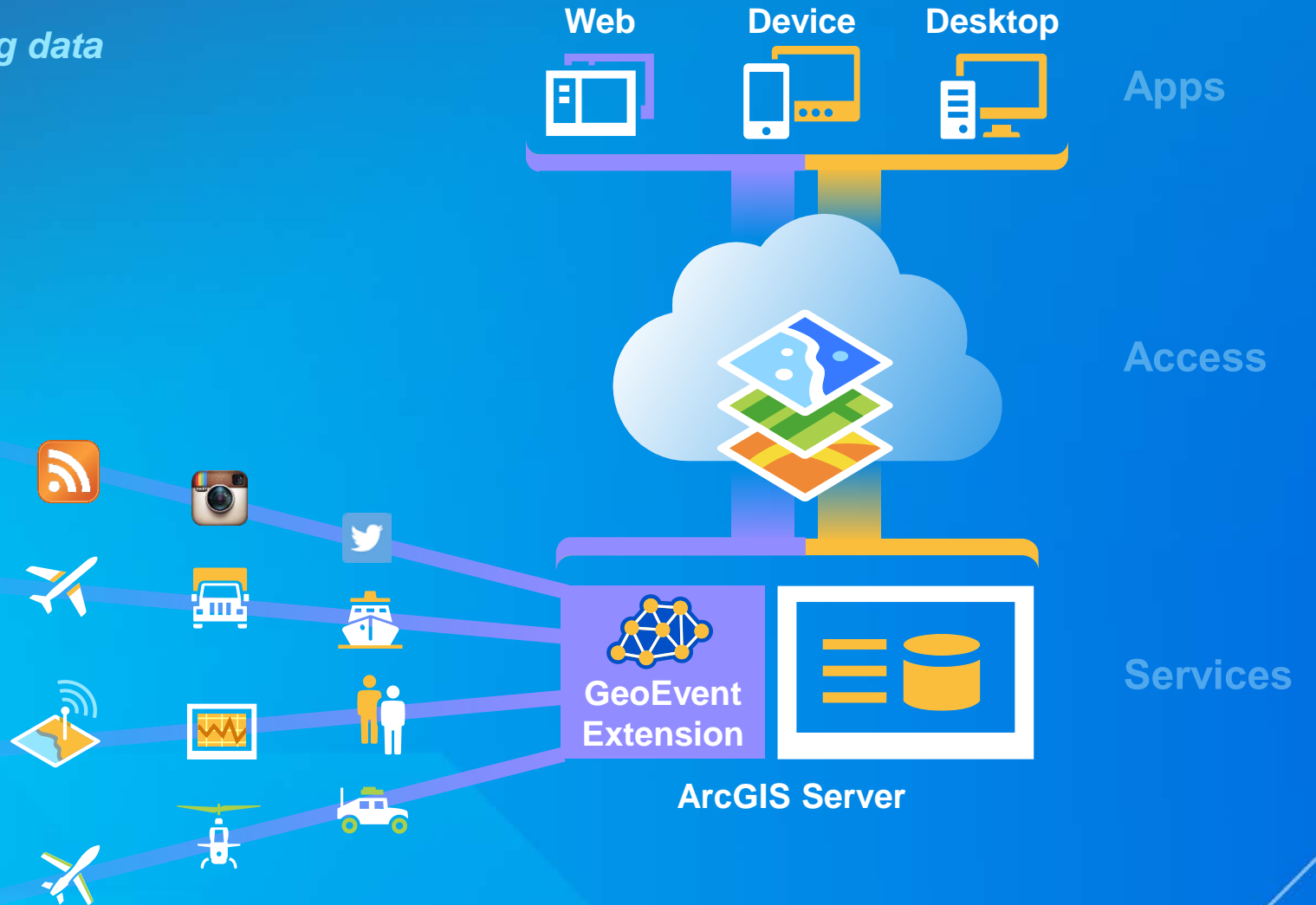
# New Analytic Workflow for Pattern Detection



# Real-Time GIS

*Integration & exploitation of streaming data*

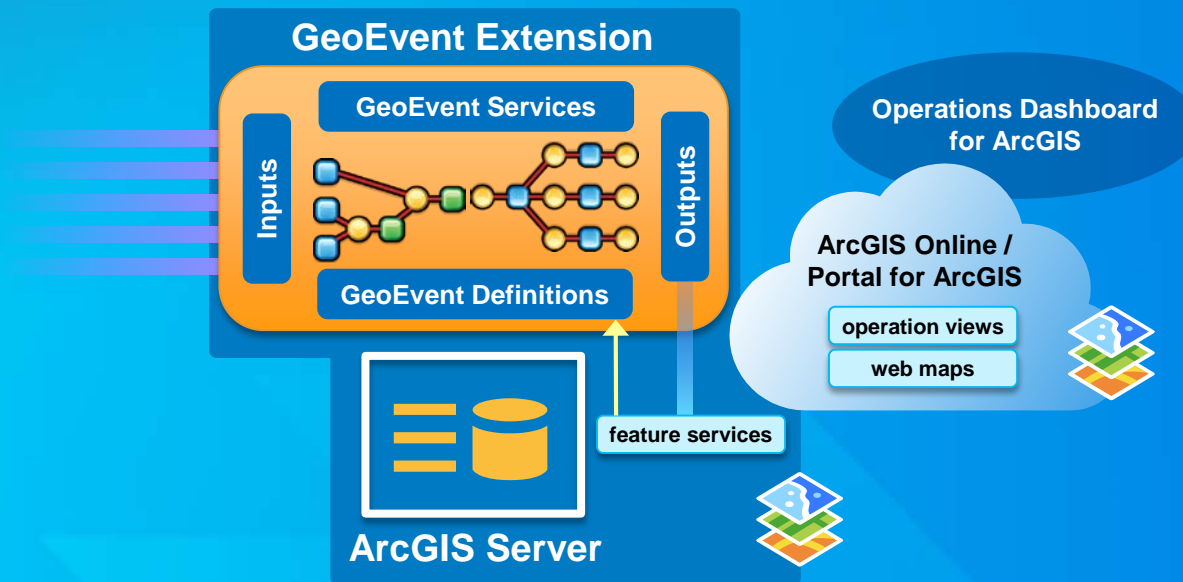
- Integrates real-time streaming data into ArcGIS
- Performs continuous processing and real-time analytics
- Sends updates and alerts to those who need it where they need it



# Working with Real-Time Data

*Making features come alive*

- Import your feature layer's schema as a **GeoEvent Definition**
- Connect an **output** to your feature service
- Configure an **input** to receive real-time data
- Author and publish a **GeoEvent Service**
- Visualize your real-time features





# Receiving Real-Time Data









Easily integrate real-time streaming data into ArcGIS using an Input Connector

## GeoEvent Extension
















You can create your own connectors.

### Out of the Box

-  Poll an ArcGIS Server for Features
-  Poll an external website for GeoJSON, JSON, or XML
-  Receive Features, GeoJSON, JSON, or XML on a REST endpoint
-  Receive GeoJSON or JSON on a WebSocket
-  Receive RSS
-  Receive Text from a TCP or UDP Socket
-  Subscribe to an external WebSocket for GeoJSON or JSON
-  Watch a Folder for New CSV or JSON Files

### Esri Gallery

-  ActiveMQ
-  CAP
-  CoT Cursor-on-Target
-  esd Exploitation Support Data
-  GeoMessage
-  Instagram
-  KML
-  Kafka \*
-  NMEA 0183
-  RabbitMQ \*
-  Sierra Wireless (RAP)
-  Trimble (TAIP)
-  Twitter

### Partner Gallery

-  CompassCom CompassLDE
-  enviroCar enviroCar
-  exactEarth exactEarth AIS
-  FAA (ASDI) \*
-  GNIP \*
-  Verizon Networkfleet \*
-  osisoft OSisoft \*
-  Valarm
-  ZONAR Zonar \*

# Sending Real-Time Data











*Easily disseminate notifications, alerts, and updates using an Output Connector*

## GeoEvent Extension











You can create your own connectors.

### Out of the Box

-  Add or Update a feature
-  Publish Text to a UDP Socket
-  Push GeoJSON or JSON to an external Website
-  Push GeoJSON or JSON to an external WebSocket
-  Push Text to an external TCP Socket
-  Send a Text Message
-  Send an Email
-  Send an Instant Message
-  Send Features to a Stream Service
-  Write to a CSV, GeoJSON, or JSON File

### Esri Gallery

-  ActiveMQ
-  Cursor-on-Target
-  Hadoop
-  Kafka \*
-  MongoDB
-  MQTT
-  RabbitMQ
-  Twitter

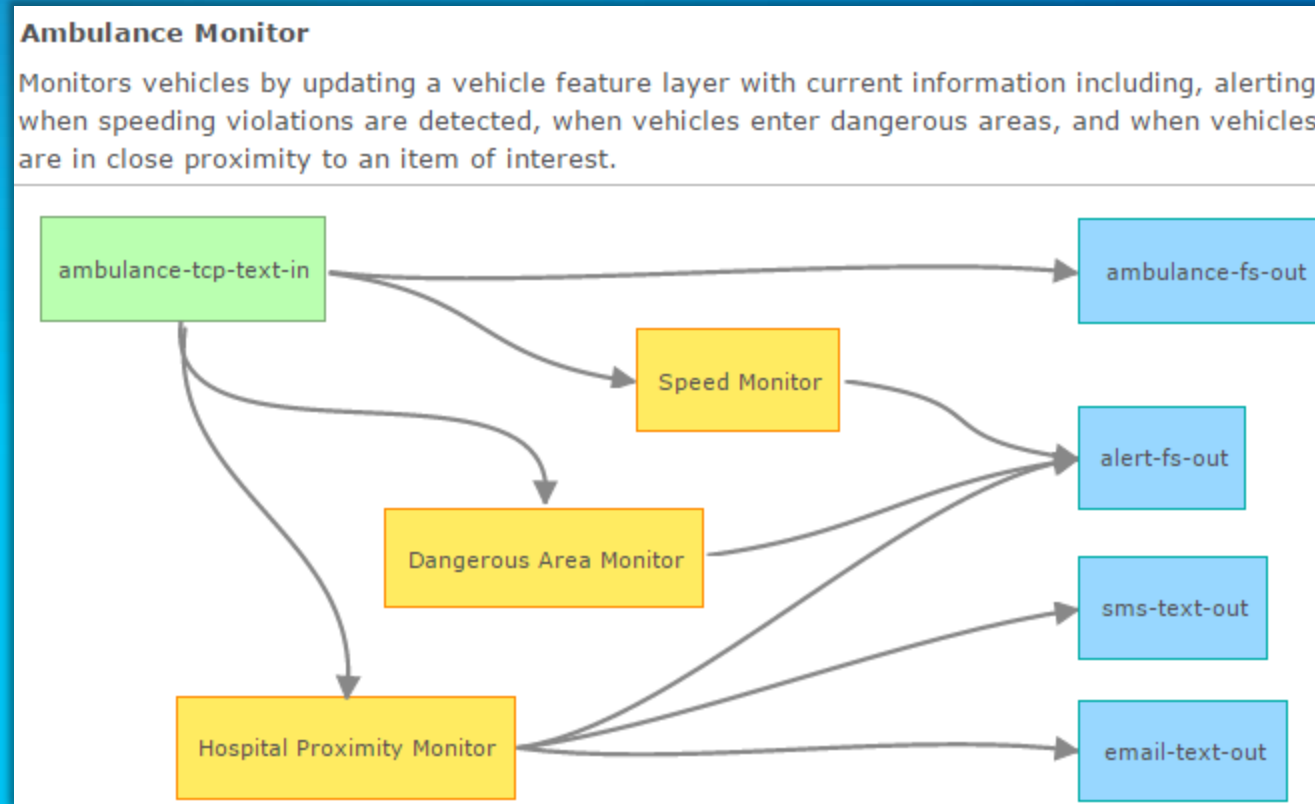
### Partner

-  Cesium \*

# Applying real-time analytics

## GeoEvent Services

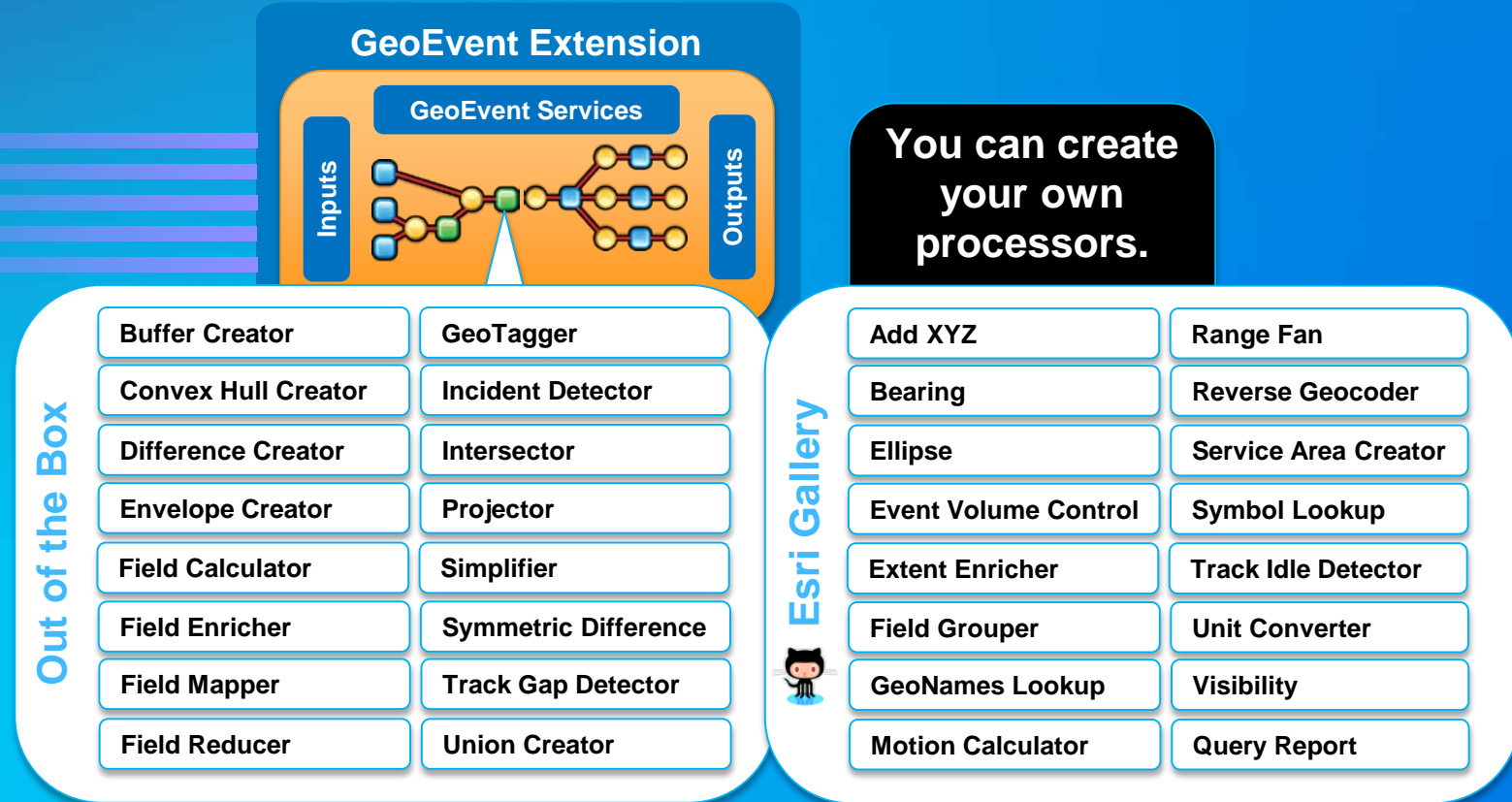
- A **GeoEvent Service** defines the flow of GeoEvents,
  - The **Filtering** and **Processing** steps to perform
  - what input(s) to apply them to
  - and what output(s) to send the results to



# Applying Real-Time Analytics

## GeoEvent Processing

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

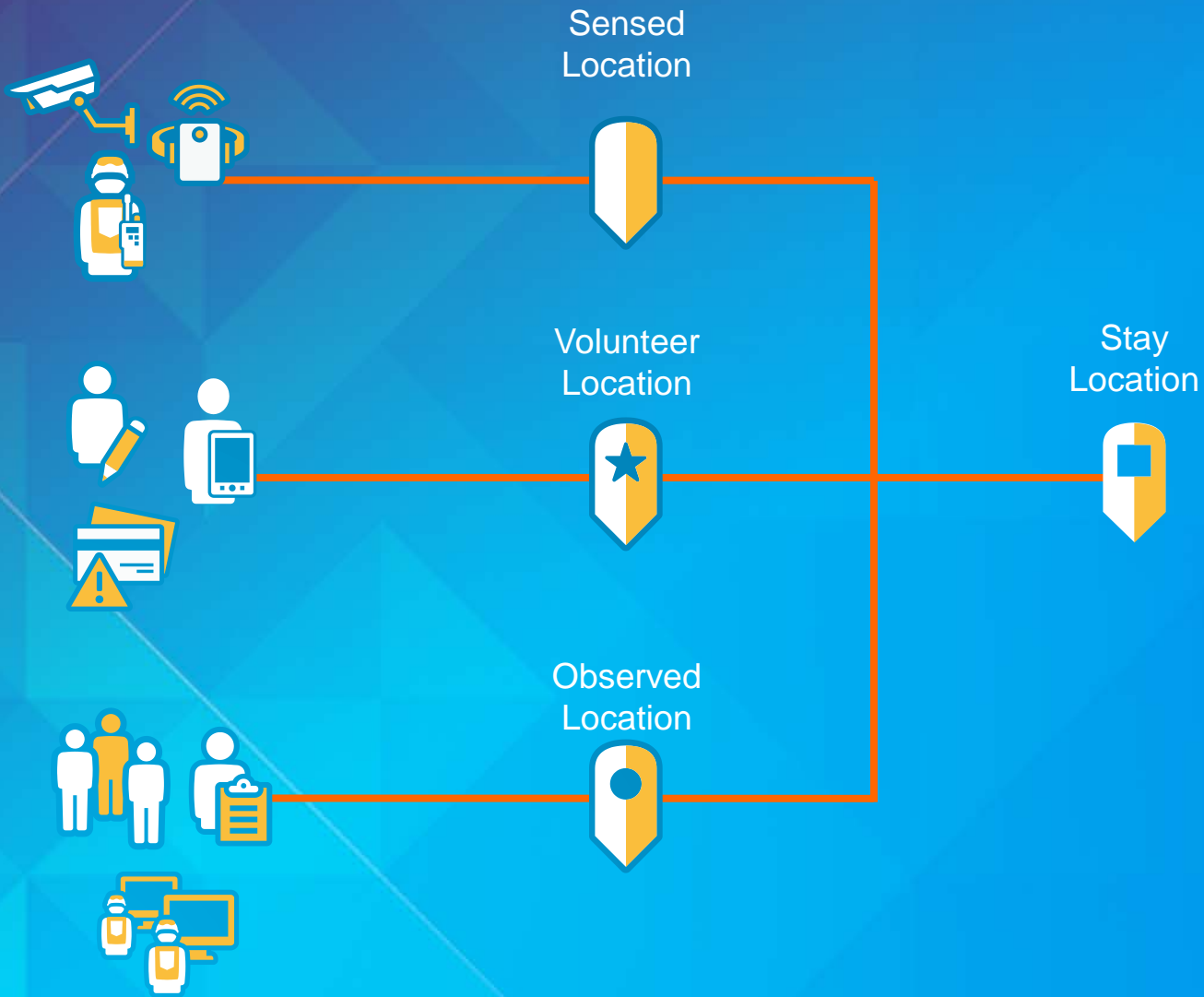


The background features a vibrant blue gradient. On the left side, there are several overlapping geometric shapes: a large purple triangle pointing upwards, a yellow triangle pointing downwards, and a dark purple triangle pointing to the right. These shapes are layered, creating a sense of depth. The text 'Movement Analysis' is centered in the upper half of the image in a bold, white, sans-serif font.

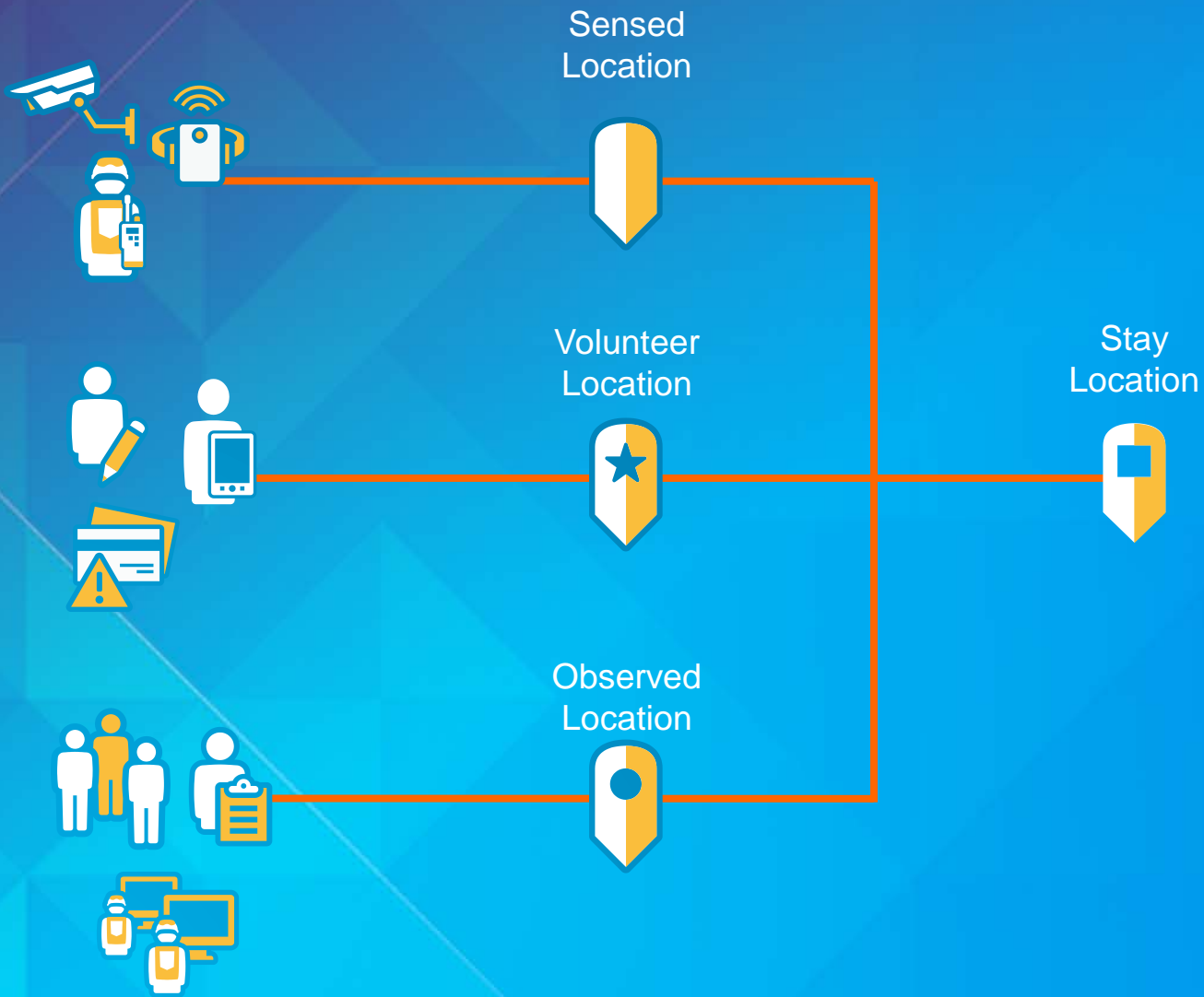
# Movement Analysis



# Real Time Analysis Data Flow



# Location Sources



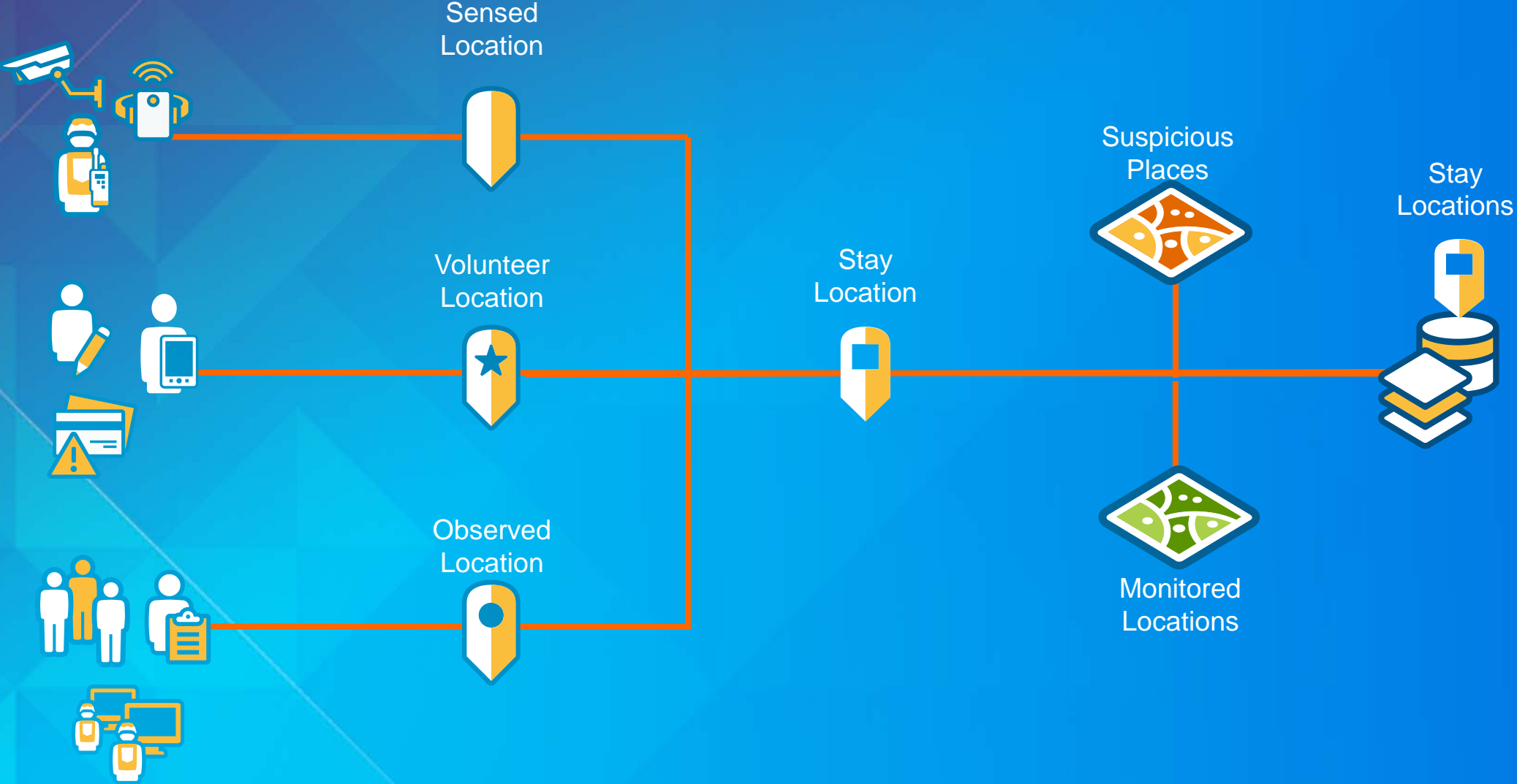


# Stay Locations

- **Locations where individuals spend time**
- **Includes Key Attributes for pattern analysis.**
  
- **Can be used at different scales**
  - **Individual**
  - **Neighborhood**
  - **Regional**

Attribute	Description
Geometry	Polygon and Point
IndividualID	ID for individual at Stay Location
LocationID	Unique ID for location
PreviousLocationID	ID for Previous Location reported, blank if no locationID
StartTime	UTC Time of location at start
EndTime	UTC Time of location of departure or last report at stay location
Duration	Duration at Stay Location
LocationSource	Source Data for stay location id
Source	Source data for the reported location

# Known Location Information



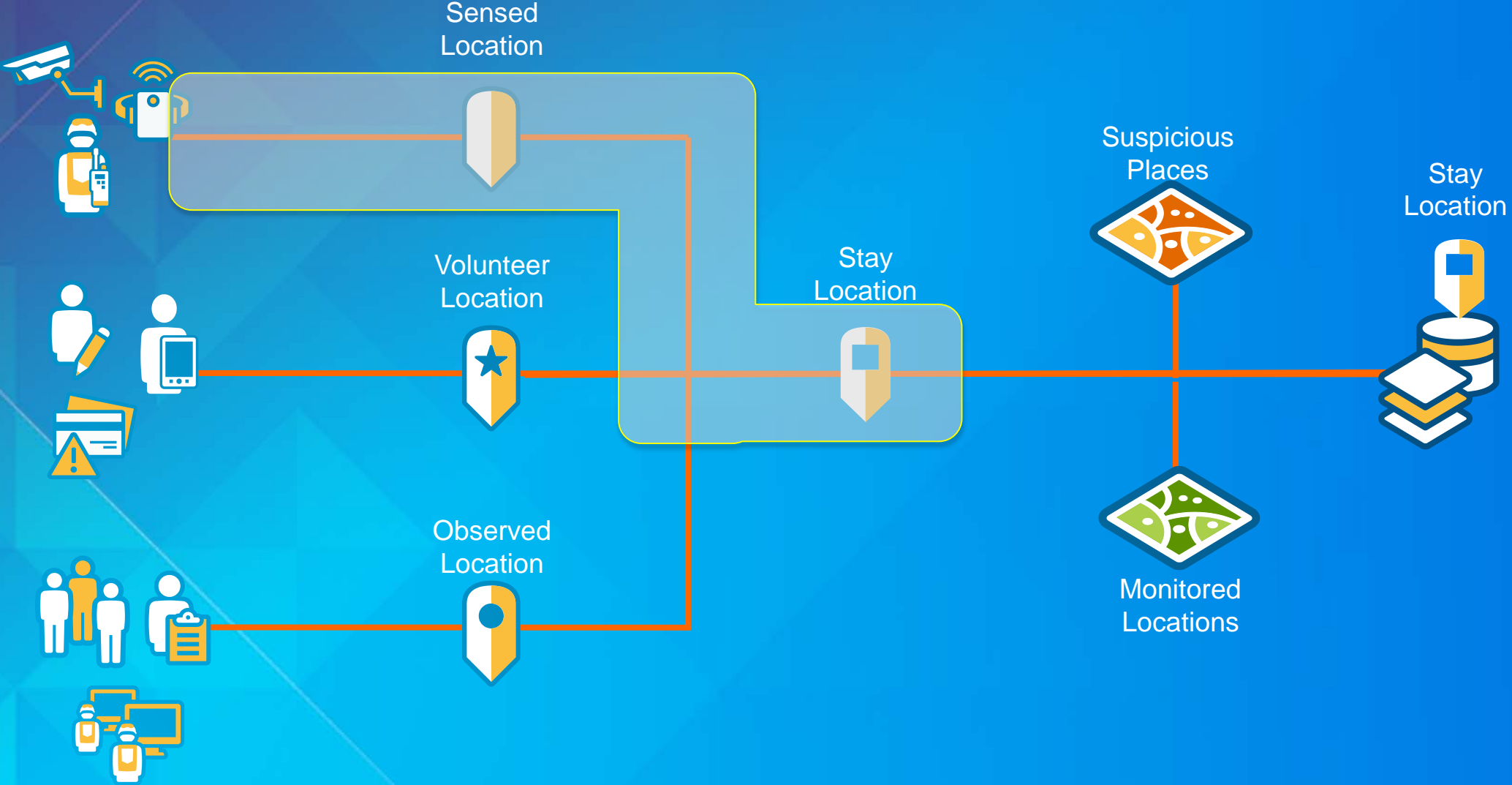
# Suspicious Places

- **Predefined Locations for monitoring**
  - Home, Work, Meeting Areas
  - Key POIs (Place of Worship, Restaurants, Internet Café)
- **Location Pattern Model**
  - Discrete - Location is only used by a certain individual or type of individual
  - Semi-Discrete –Used by similar groups of individuals but not distinct
  - Non-Discrete - If a location is used by all types of people regardless of
  - Unknown - The nature of the location is unknown

Attribute	Description
Geometry	Polygon
LocationID	Unique ID for location
LocationName	Common name for the location
LocationCategory	General Category for the Location
LocationActivity	Type of activity typically observed at location
LocationModel	Discrete, Semi-Discrete, Non-Discrete
LocationSignificance	A subjective numerical value
LocationSource	Source of information for the suspicious Location



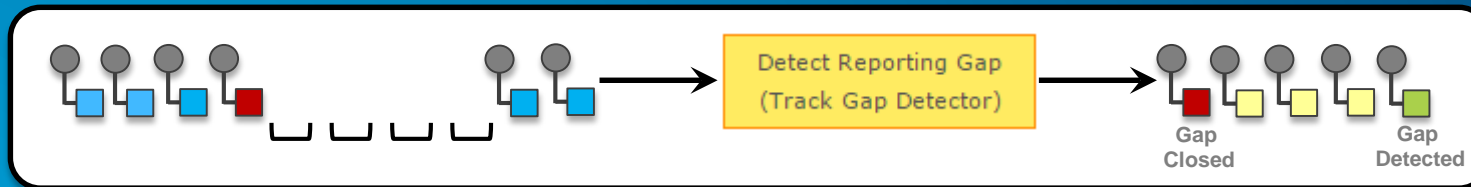
# Location Capture



# GeoEvent processing

*Notify about the absence of events*

- A **Track Gap Detector** processor
  - Detects the absence of events and alerts about the situation.
- A **Track Idle Detector** processor
  - Detects the lack of movement even while events are received and alerts about the situation.



SuspectID	V10987
Date	1405176945553
Geometry	-117.123..., 36.064...

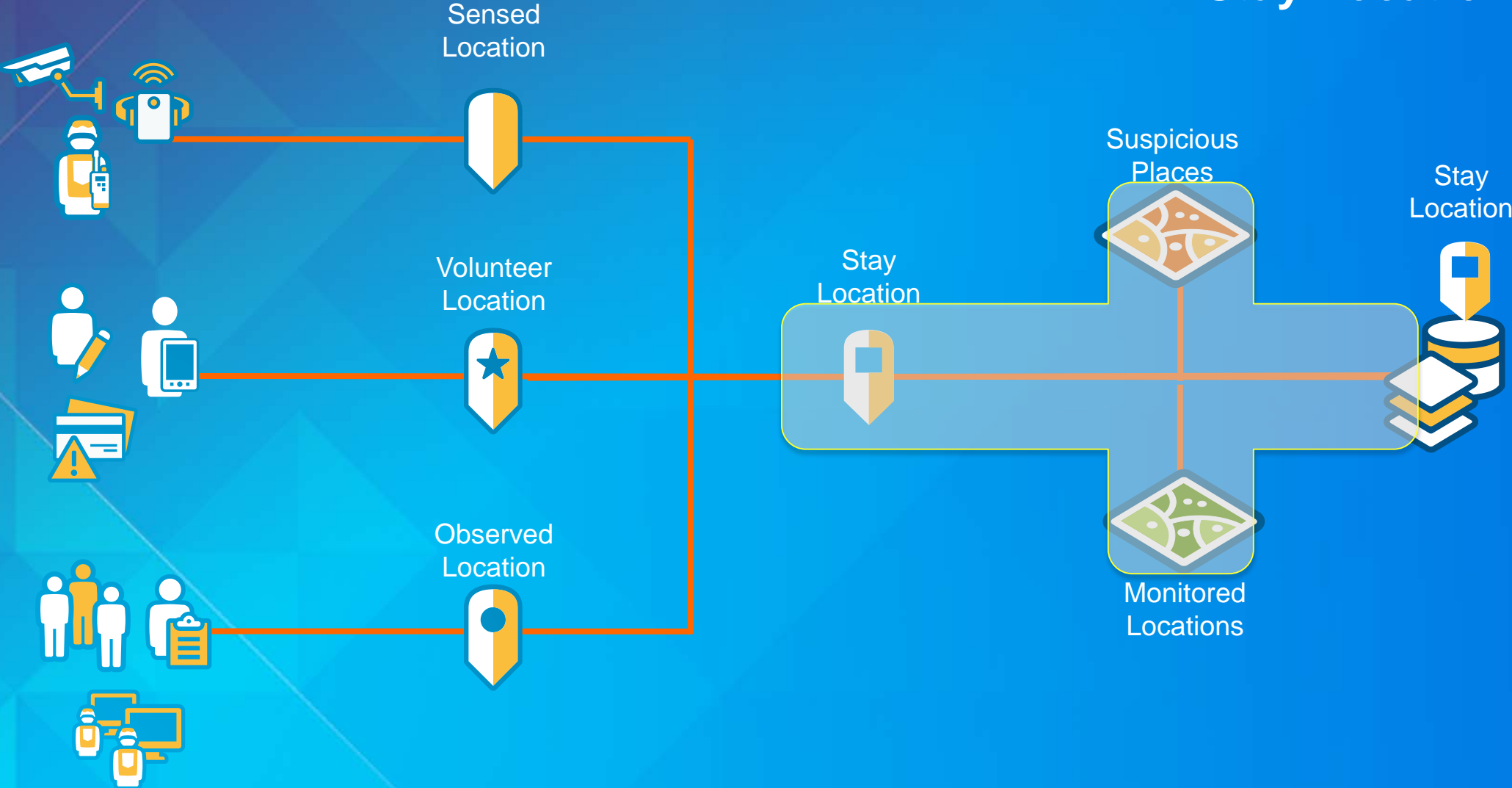
trackId	V10987
gap	false
lastReceived	1405176915553
geometry	-117.123..., 36.064...

# Demo

Location Capture from GPS



# Stay Location Tagging



# Demo

## Stay Location Tagging



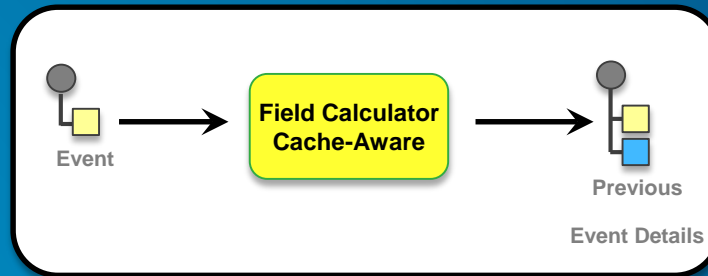


# GeoEvent Processing

*Enrich a GeoEvent with new fields*

- A **Cache Aware Field Calculator** processor
  - Uses information for the Previous Track to calculate values on the current event
  - Tracks are based on Individual ID
  - Allows for calculation of Previous Location and Duration Tracking

IndividualID	V10987
Date	1405176845553
LocationID	House
geometry	-117.123..., 36.064...



IndividualID	V10987
Date	1405176845553
LocationID	Work
geometry	-117.123..., 36.064...
PreviousLocationID	Work
geometry	-117.123..., 36.064...

# Demo

## Stay Location Tracking



# Stay Location Analysis and Visualization

- **Periodic Analysis Workflows**

- **Measure Significant Pattern based on Individual and Location ID**
- **Summary Statistics for**
  - **Location, Location Sequence, Time of Day, Day of Week, Week of Year**

- **Real-Time Visualization**

- **Movement Reporting Dashboard**
- **Individual Pattern Viewer**

# Demo

## Movement Dashboard Configuration



# Want to learn more?

- **Documentation**

- <http://solutions.arcgis.com/>
- <https://github.com/conklinbd/MovementAnalysis>

- **Learn More about GeoEvent Processor**

- <http://links.esri.com/geoevent>
- <https://links.esri.com/geoevent-forum>

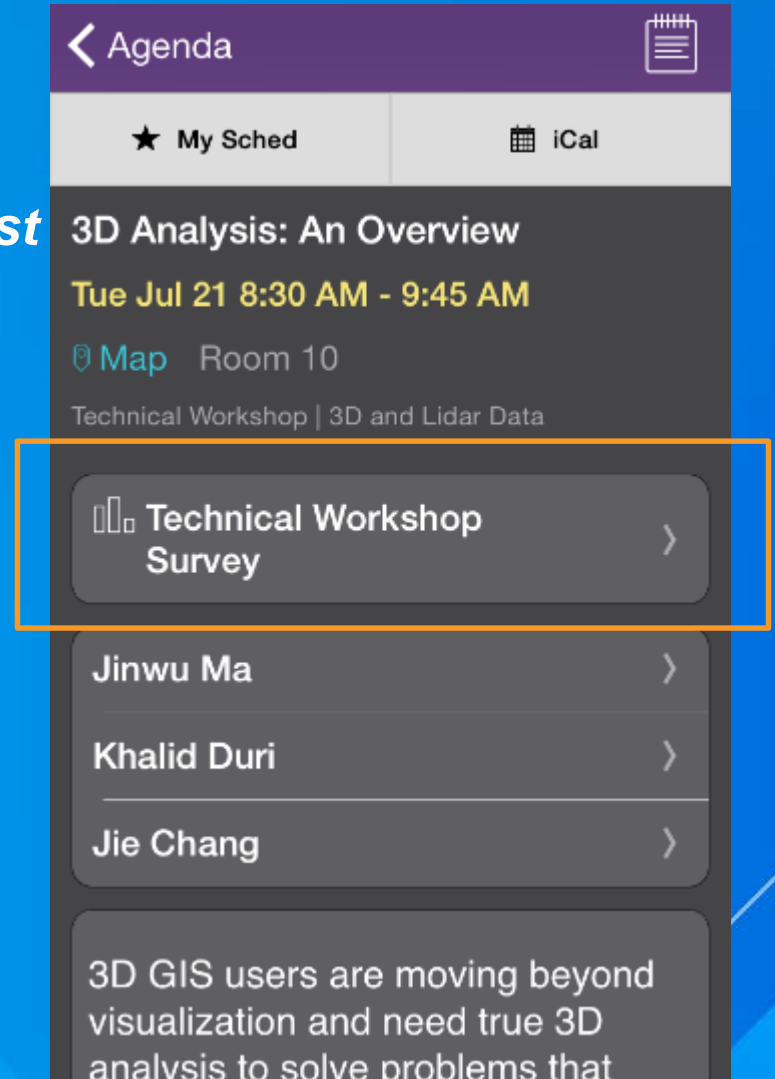


# Remaining Real-Time GIS Sessions

- **Real-Time GIS: The Road Ahead**
  - Wed 1:30-2:45pm, Room 14 B
- **Real-Time GIS: Best Practices**
  - Thu 8:30-9:45am, Room 14 B
- **Real-Time GIS for Asset Readiness, Event Preparation, and Intervention**
  - Thu 8:30-9:45am, Room 29 C

# Thank you...

- Please fill out the session survey in your mobile app
- Select *ArcGIS for Intelligence: Discern Activities of Interest Analysis* in the Mobile App
  - Use the Search Feature to quickly find this title
- Click “Technical Workshop Survey”
- Answer a few short questions and enter any comments





Understanding our world.