

Agenda

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

Temporal Data Overview

Adam Mollenkopf



Temporal Data Overview

Temporal, Time, and Tracks

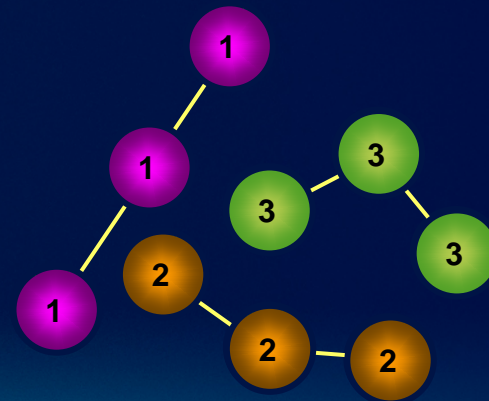
- Temporal means “of or relating to time”.
- Temporal data is data which is related along the dimension of time.
 - May be correlated by a unique attribute to form a Track
 - Often ordered by how the feature’s events occurred chronologically

Time



Allows data to be shown at a specific time

Tracks



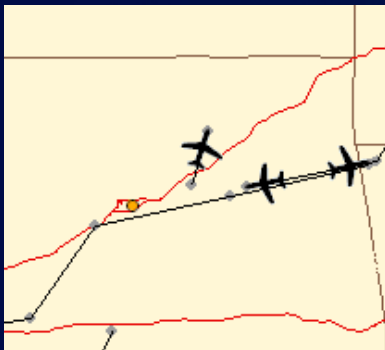
Allows grouping by track

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

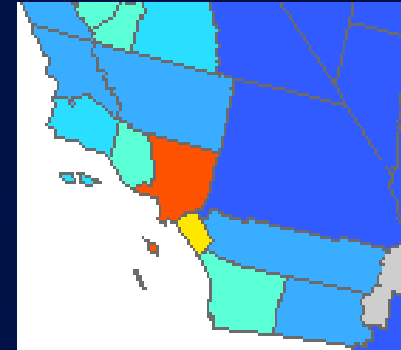
stands still but
records changes



- Weather Stations
- Traffic Sensors
- Air Quality Sensors

Change

change or growth



- Population
- Distribution
- Fire Perimeter

Visualizing and Analyzing Temporal Data on the Desktop

Adam Mollenkopf



Visualizing/Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst



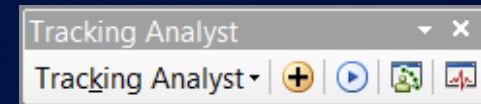
- **ArcGIS Tracking Analyst**

- **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/Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst

- **Playback Manager**
 - Playback historical data
 - Visualize live streaming data
 - Analyze Temporal patterns in data



A screenshot of the 'Playback Manager' window. It features a large purple histogram showing data over time. Below the histogram, there are controls for Start, Current, and End times, all set to 2/18/2008. There are also playback controls including a 'Loop' checkbox, a 'Slower' to 'Faster' slider, and a 'Per 1.00 Seconds' rate. At the bottom, there are options to set the playback window to temporal extent of '< All Temporal Layers >' and checkboxes for 'Cumulative' and 'Hide Histogram'.

Visualizing/Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst

- **Exploratory Analysis of Temporal Data**

- **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)



**Highlight
Track**

- **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)



**Hide Other
Tracks**

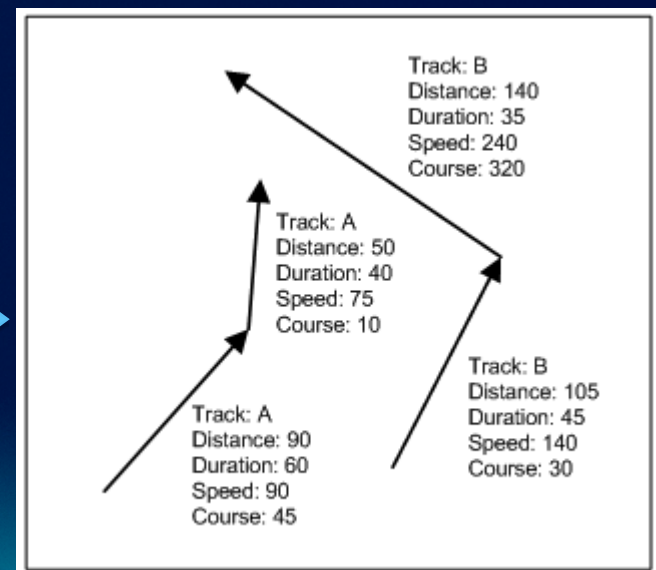
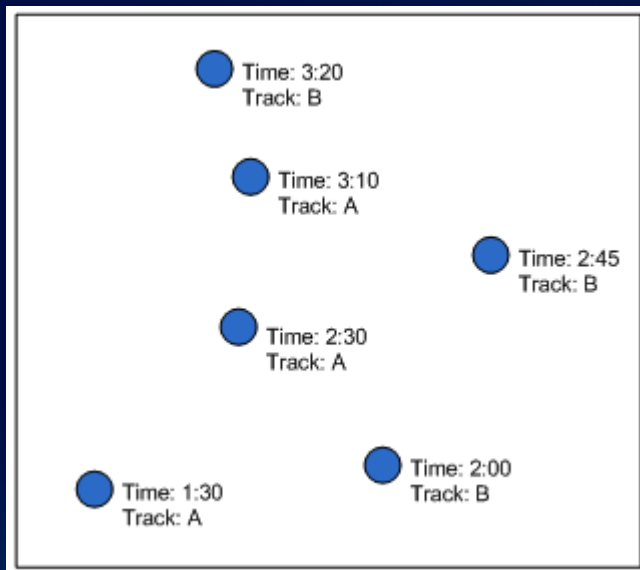
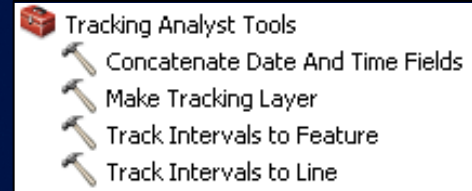
Visualizing/Analyzing Temporal Data on Desktop

ArcGIS Tracking Analyst

- **Exploratory Analysis of Temporal Data**

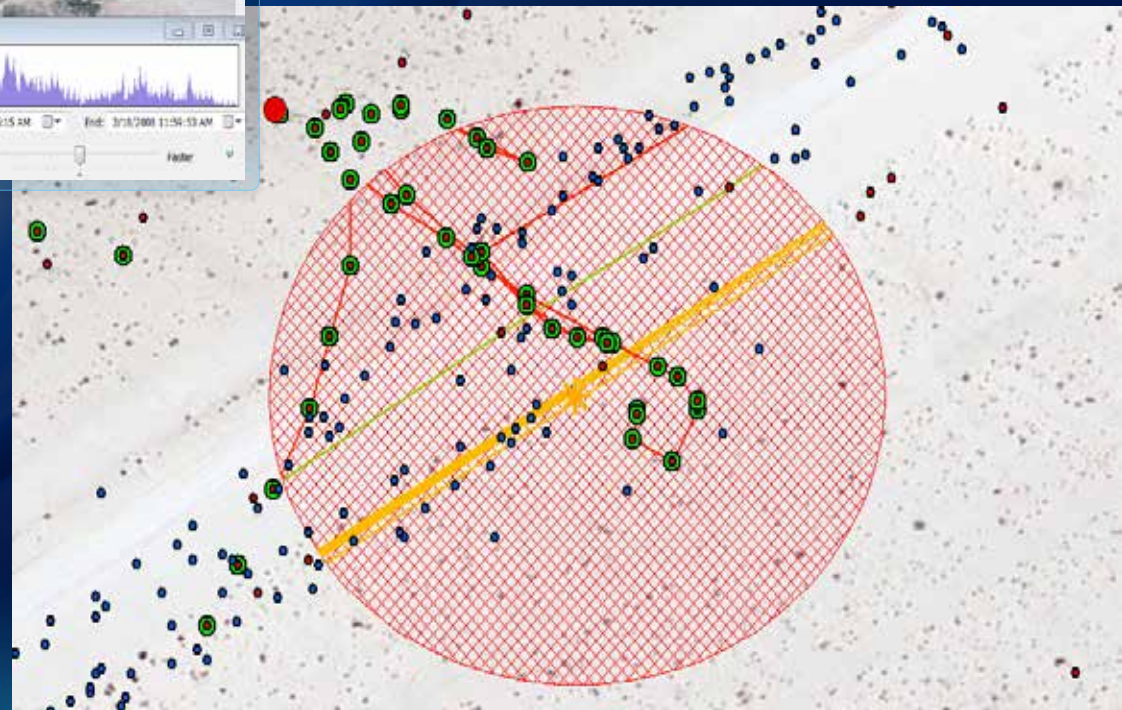
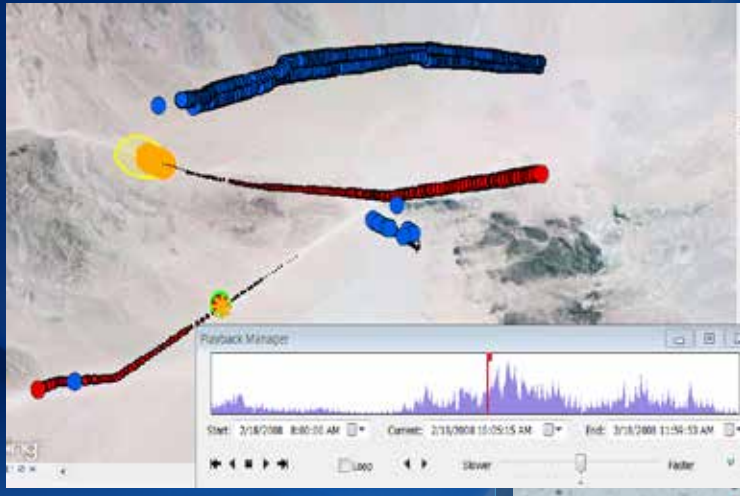
- **Geoprocessing tools for Track Analysis**
- **Calculate** values on Temporal Data

- Given successively ordered features in a track **calculate** values for distance, duration, speed, and course.



Exploratory Analysis on Desktop

Adam Mollenkopf



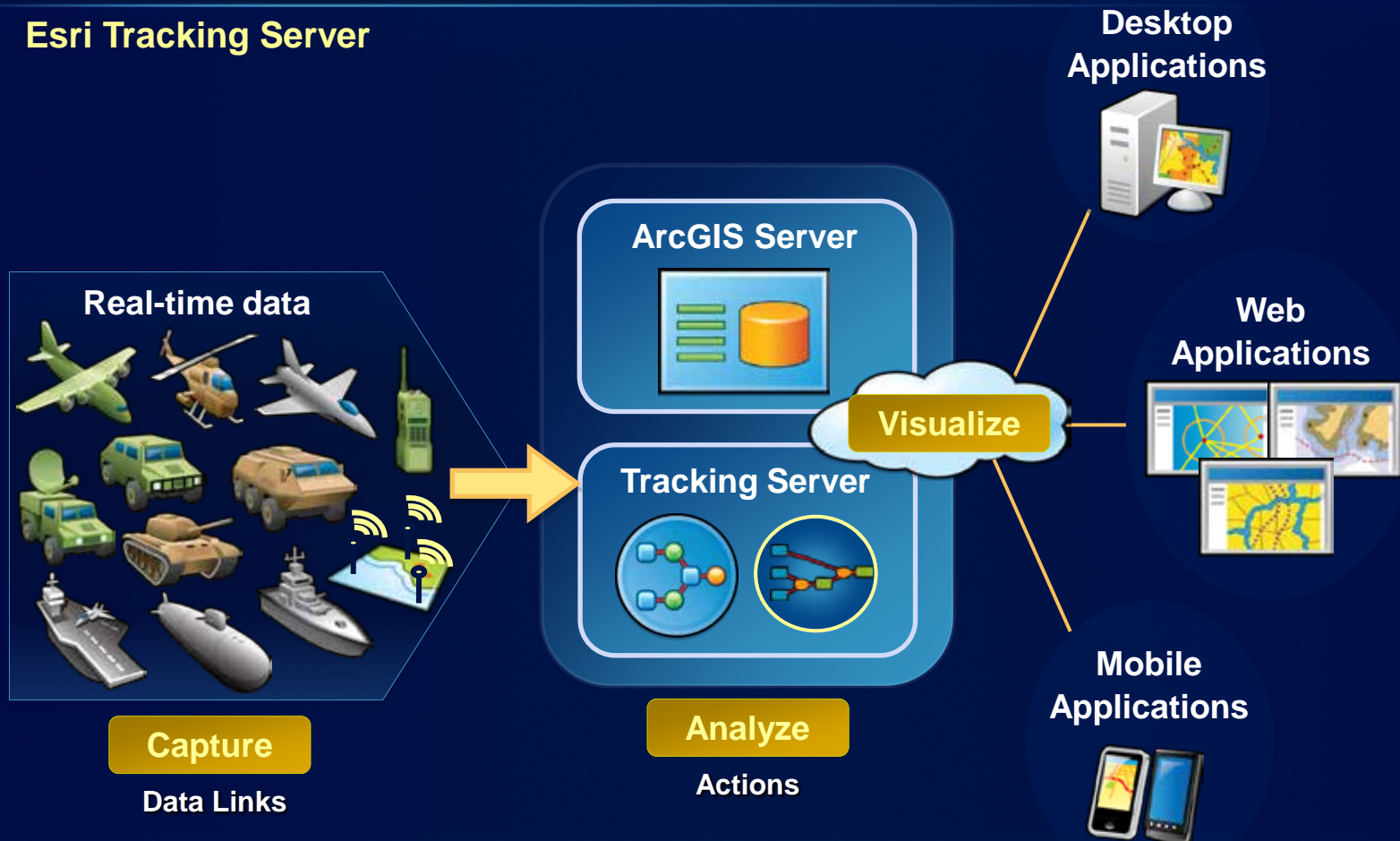
Capturing and Analyzing Temporal Data on the Server

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Capturing/Analyzing Temporal Data on Server

Esri Tracking Server

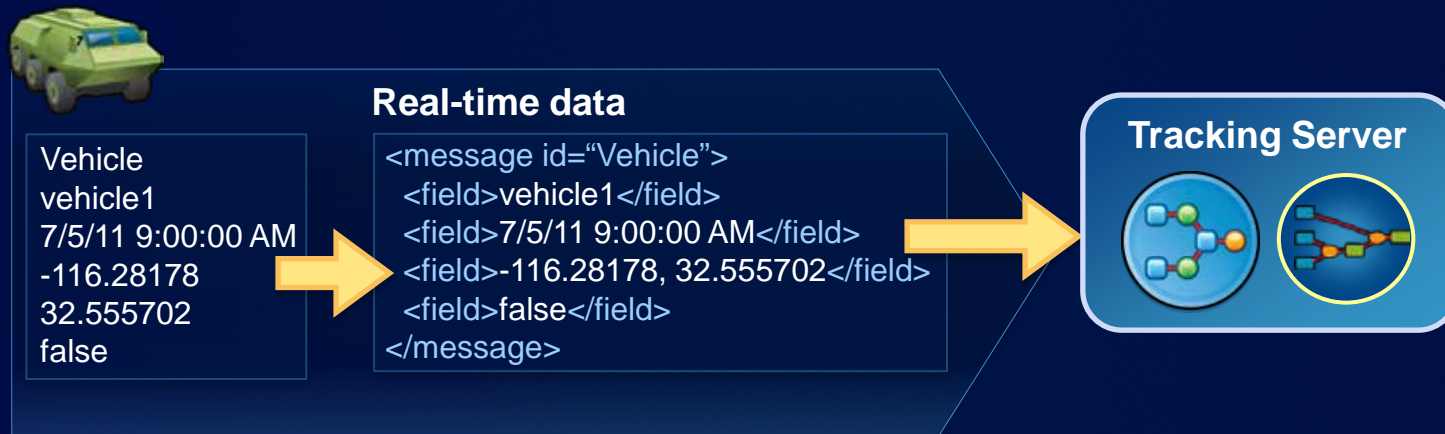


... Enabling ArcGIS with real-time data and analysis

Capturing/Analyzing Temporal Data on 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' Message Definition:

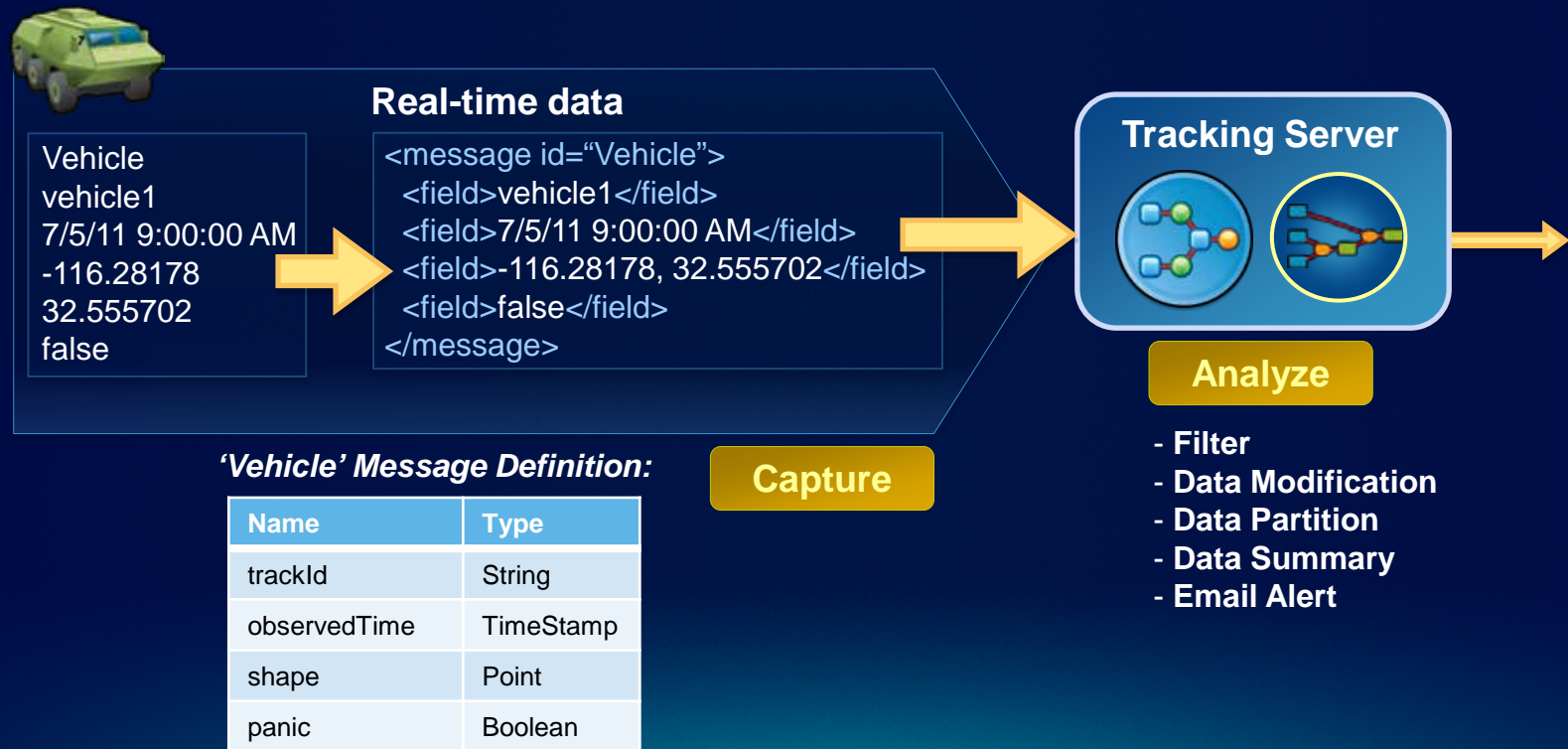
Name	Type
trackId	String
observedTime	TimeStamp
shape	Point
panic	Boolean

Capture

Capturing/Analyzing Temporal Data on 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.



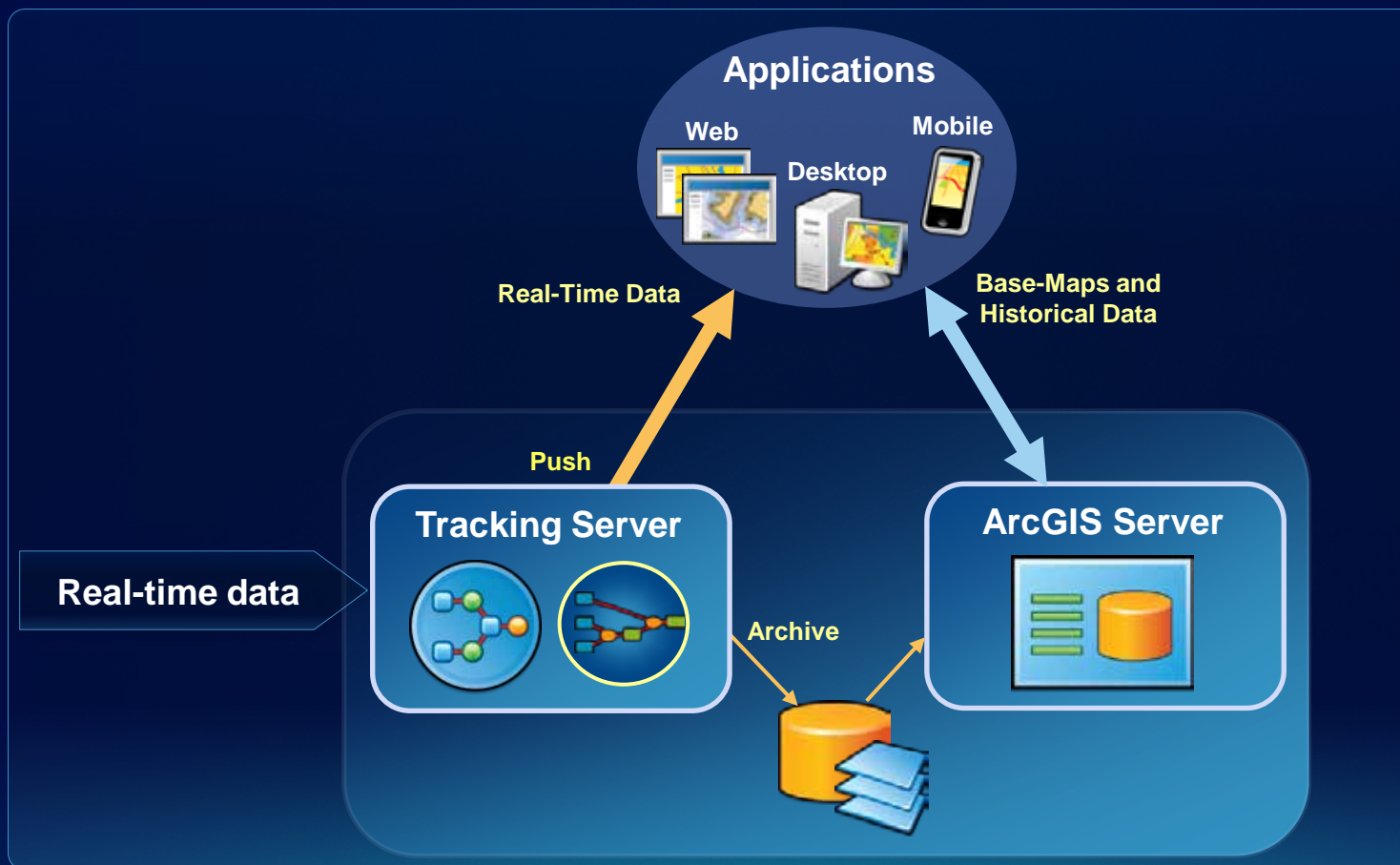
Visualizing and Analyzing Temporal Data on the Web

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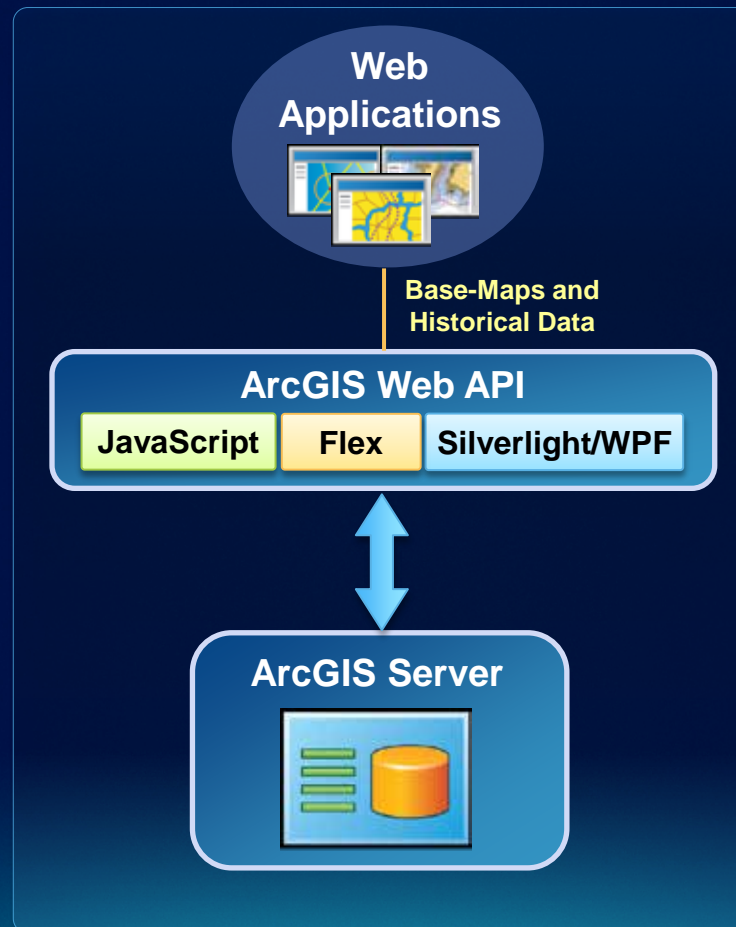
Visualizing/Analyzing Temporal Data on the Web

Tracking Server complements **ArcGIS Server** by adding capabilities that enable web applications with real time data and analysis.



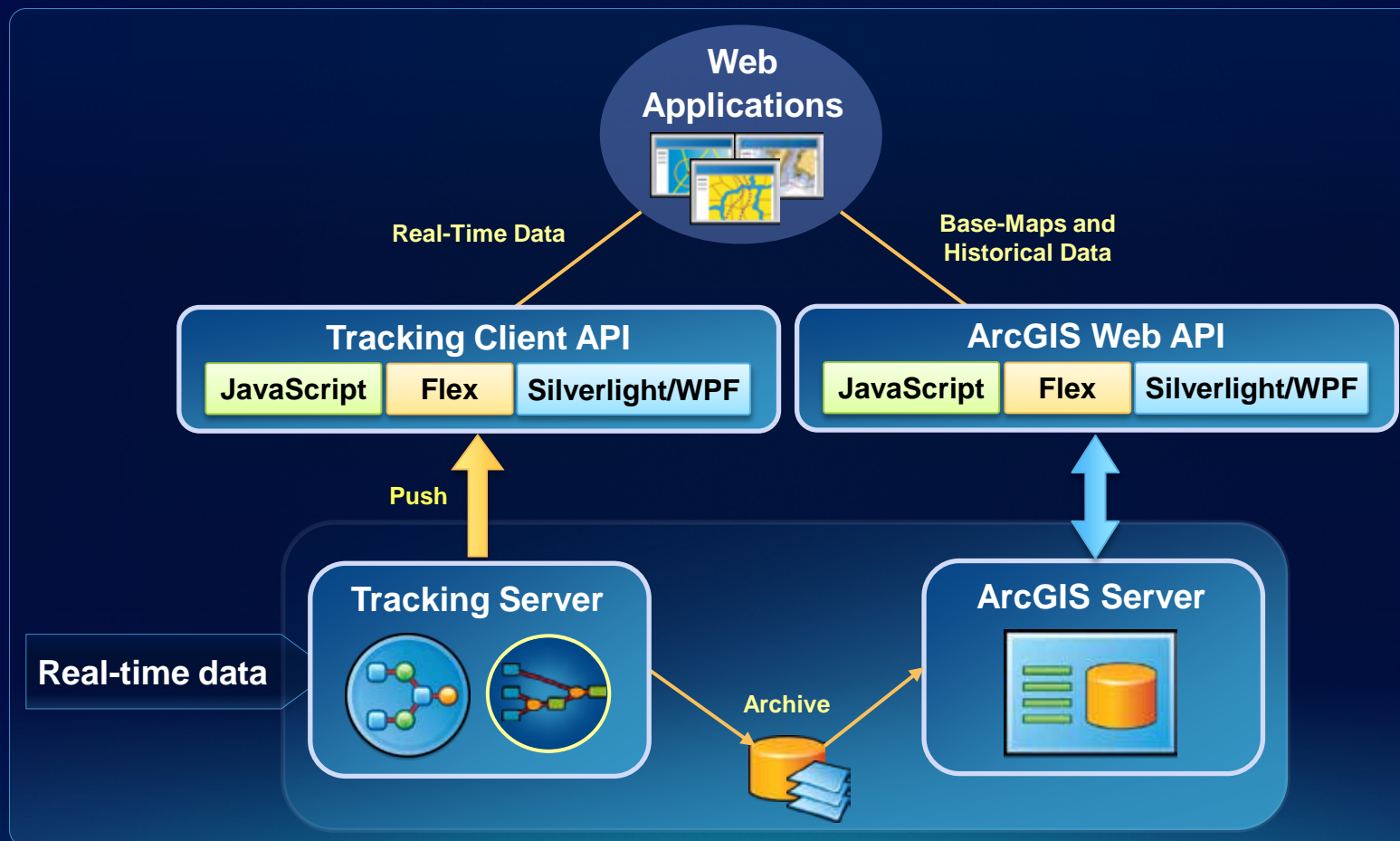
Visualizing/Analyzing Temporal Data on the Web

The **ArcGIS Web API** enables web applications to become spatially enabled.



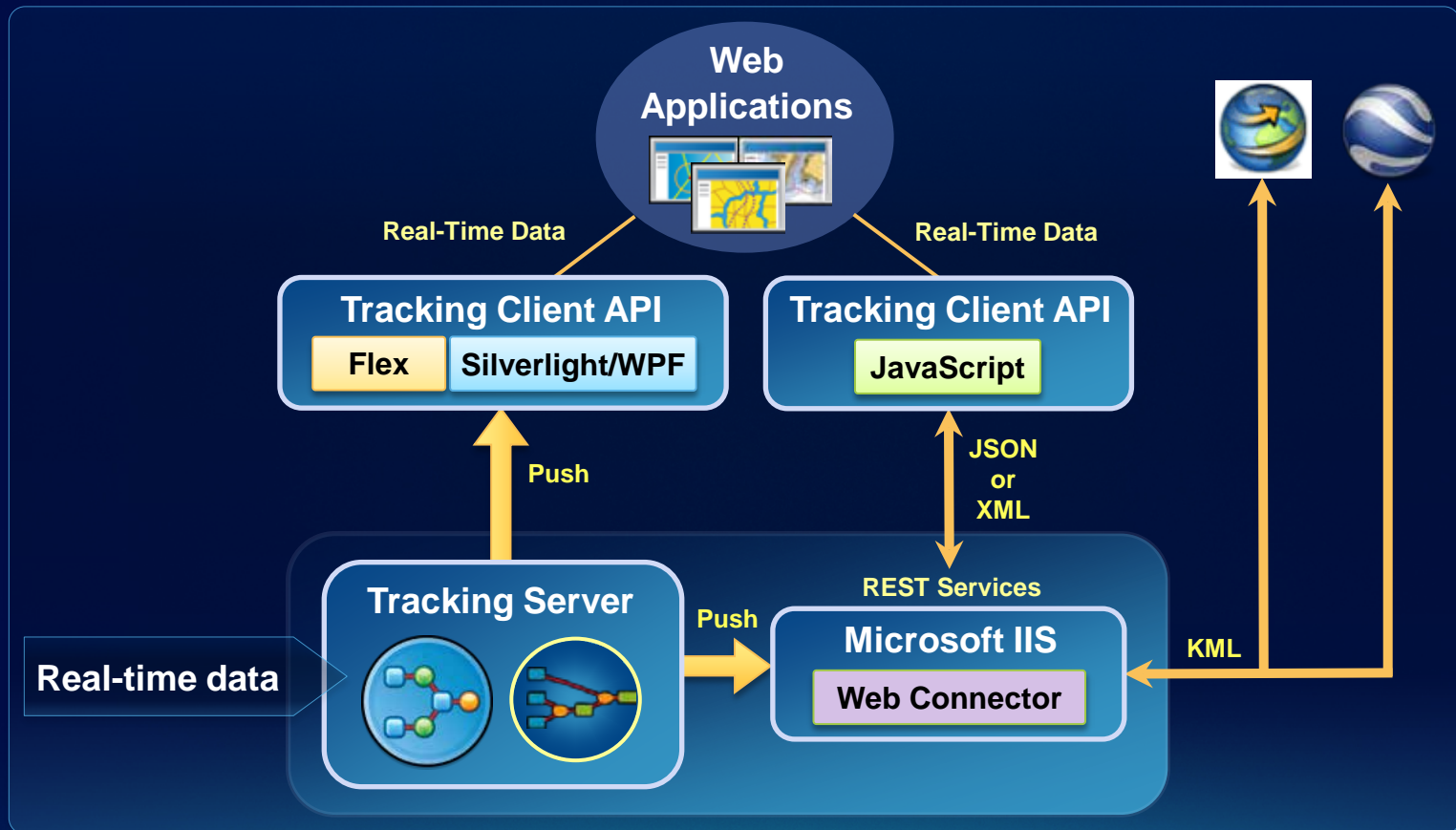
Visualizing/Analyzing Temporal Data on the Web

The **Tracking Client API** complements the **ArcGIS Web API** by adding capabilities that enable web applications with real time data and analysis.



Visualizing/Analyzing Temporal Data on the Web

The **Tracking Web Connector** complements **Tracking Server** by adding a set of **REST** services that enable clients such as **JavaScript** and **ArcGIS Explorer**.



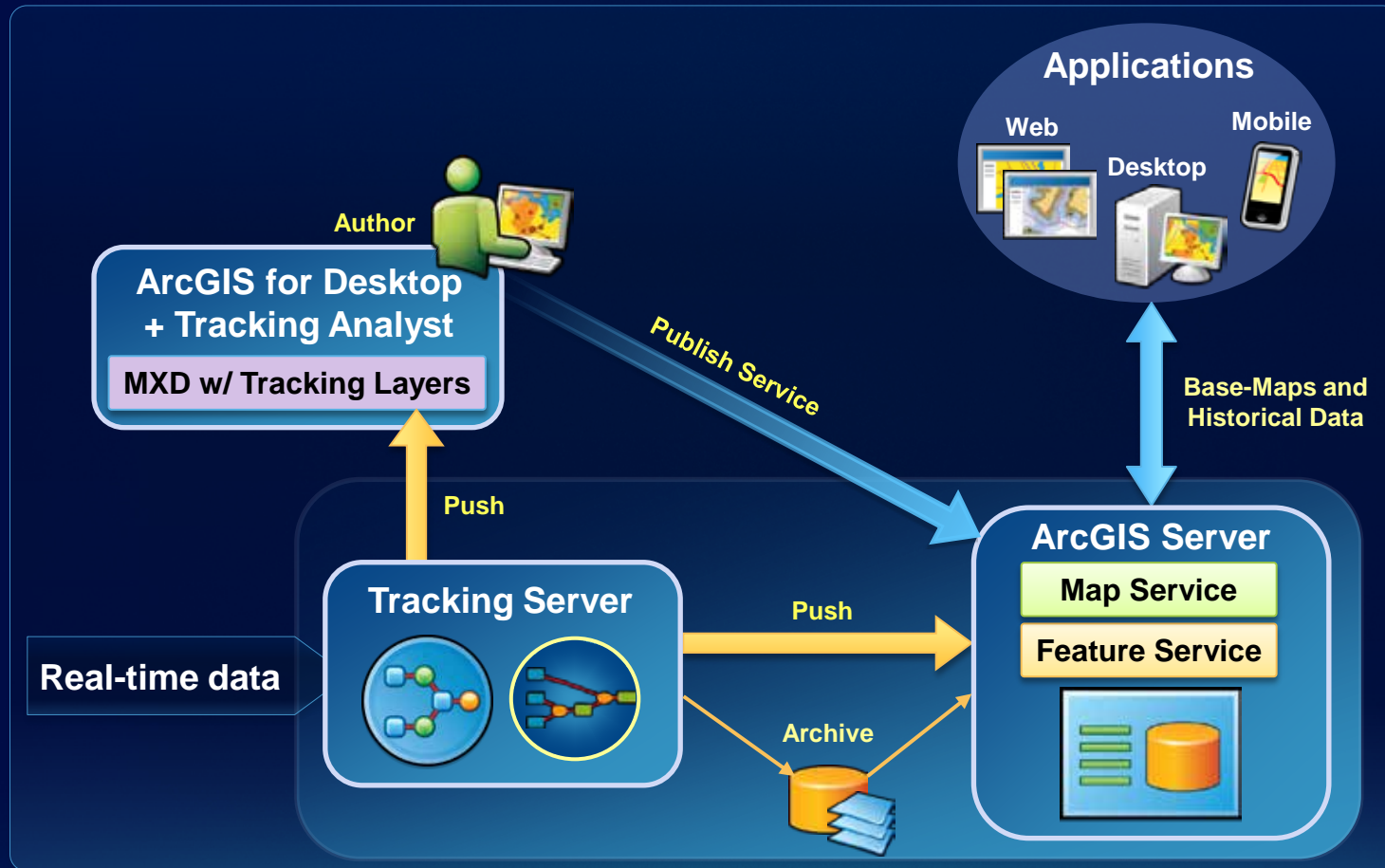
Visualizing/Analyzing Temporal Data on the Web

Publishing a Map Service with Tracking Layers

- **Another Web deployment option is to publish a Map Service that contains Tracking Layers to ArcGIS Server.**
 - **The map service will display tracks in images that get constructed on ArcGIS Server.**
 - **Keeps an active connection between ArcGIS Server and Tracking Server to continually update the Map Service with real-time data via a Dynamic Map Service Layer.**
 - **Adheres to normal Map or Time Extent changes and Tracks can be identified through normal Feature Service mechanisms.**
 - **Use this deployment pattern when:**
 - **You have a significantly large number of tracks to display that would be challenging to render efficiently with JavaScript, Flex, or Silverlight.**
 - **Slight latency is acceptable.**

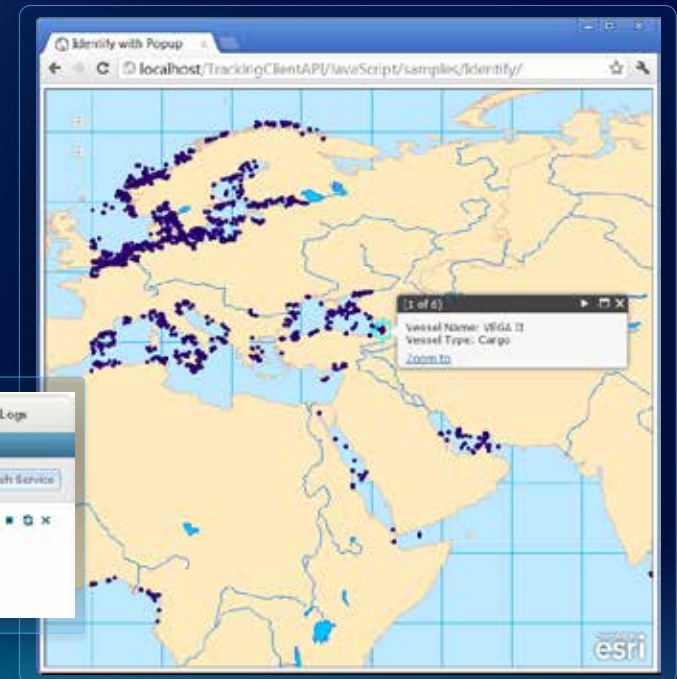
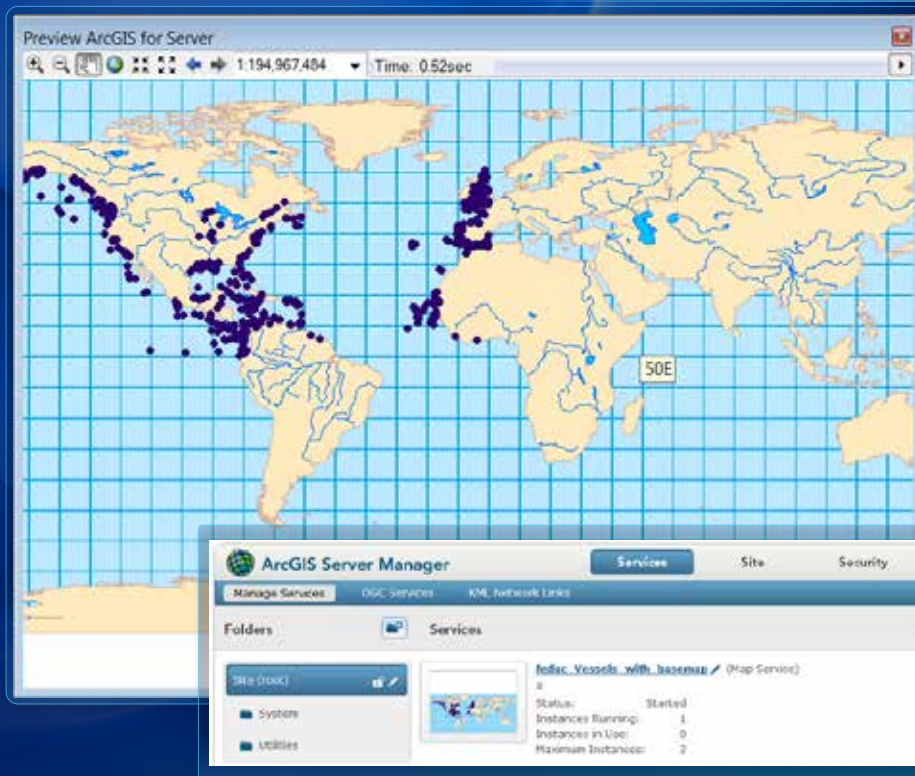
Visualizing/Analyzing Temporal Data on the Web

Publishing a Map Service with Tracking Layers



Publishing a Map Service with Tracking Layers

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Conclusion

- **ArcGIS Tracking Analyst and Esri 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**

Resources to get started

- **ArcGIS Tracking Analyst:**
<http://www.esri.com/trackinganalyst>
- **10.1 Resource Center**
<http://resourcesbeta.arcgis.com/>
click 'Communities' > 'Tracking Server'

Upcoming Events (www.esri.com/events)

March 8 - MeetUp at Esri (Vienna, VA)

April 12 - MeetUp in DC area (location TBD)

Mar 24-27 – Esri Partner Conference (Palm Springs, CA)

Mar 26-29 – Esri Developer Summit (Palm Springs, CA)

July 21-24 – Esri Homeland Security Summit (San Diego, CA)

July 23-27 – Esri International User Conference (San Diego, CA)



Thursday Evening Reception

- 6:30 – 9:30 pm
- **Smithsonian Air and Space Museum**
- **Logistics:**
 - 6:15 – 10:00 pm Buses transport between convention center and reception
 - Conference Badge needed for reception
 - Coat check – available at entrance
 - Serving hot hors d'oeuvres and beverages



Friday Closing Session and Hosted Lunch

- **Join conference attendees for lunch and closing session**
- **11:30 am – 1:30 pm**
- **Ballrooms A-C, Third Level**
- **Closing Speaker – Chris Smith, United States Department of Agriculture**
- **Wrap-up and request for feedback with Jack Dangermond**



Thank You

Please complete session evaluation form

