

ArcGIS GeoAnalytics Server: An Introduction

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Overview

- Introduction
- Demos
- Analysis Concepts using GeoAnalytics Server
- GeoAnalytics Data Sources
- GeoAnalytics Server Administration

What is GeoAnalytics Server?

*ArcGIS has a new way of processing **large vector and tabular data** with both spatial (location) and temporal (time) components that is designed for **fast distributed analytics** and storage*

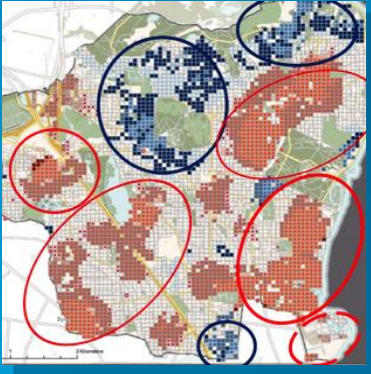


Answer questions like...

- Using millions of emergency calls accumulated over the last decade, which areas had the highest rates of emergency calls?
- What are the most popular locations for taxi pickups in New York City, and how is this trend changing weekly?
- What is the flight path of recorded GPS tracks, and how many of those paths occurred within 100 km of a no fly zone in 2015?

GeoAnalytics Server | Extends ArcGIS Analysis Capabilities

Geoprocessing



Powerful analytics



GeoAnalytics



**Distributed analytics
and distributed storage**



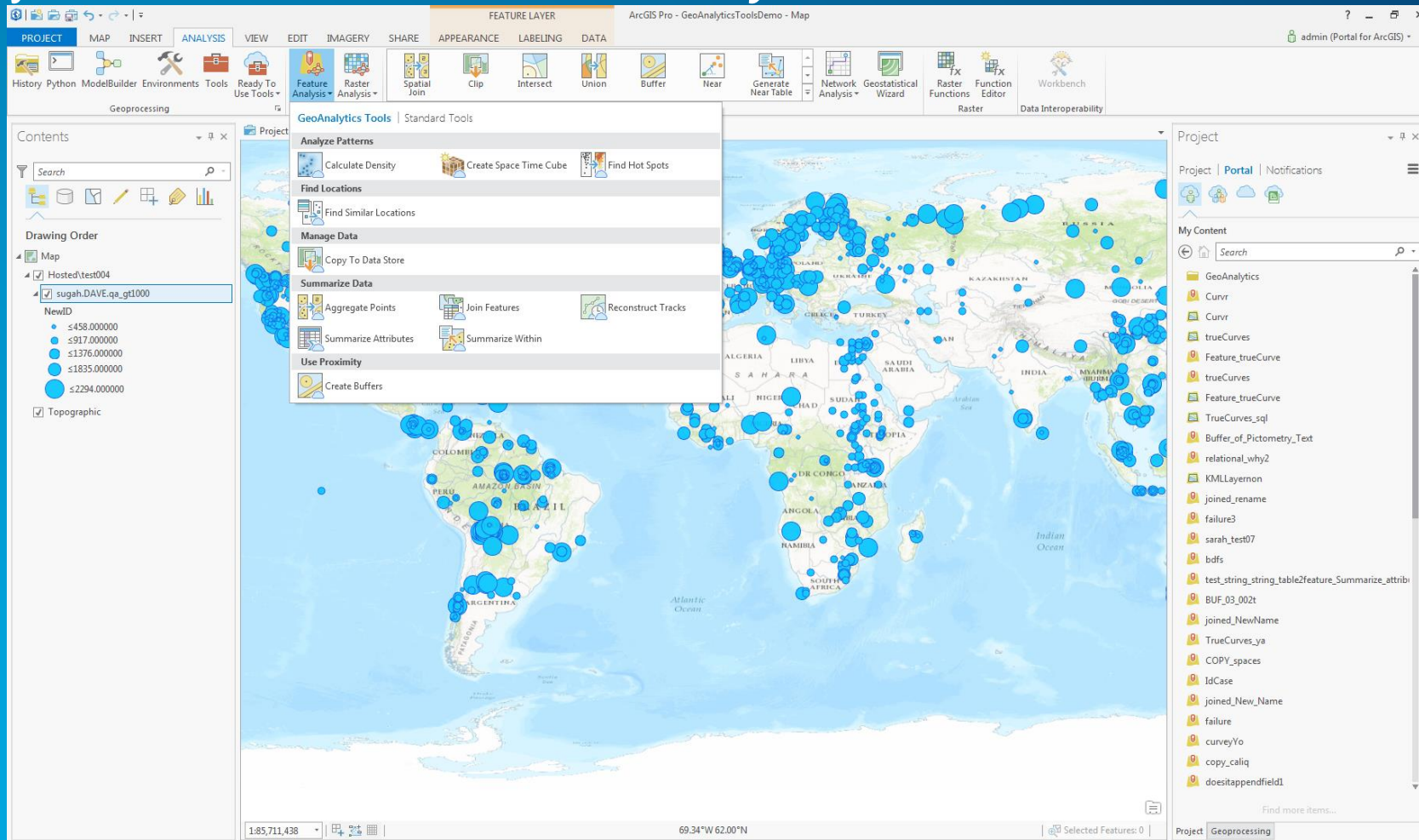
Web GIS Layers



Rich geoinformation model

GeoAnalytics Server | Why?

GeoAnalytics is *out of the box* and *ready to use* within ArcGIS Enterprise



GeoAnalytics Server | Why?

Run analysis against data that is too big for a single desktop



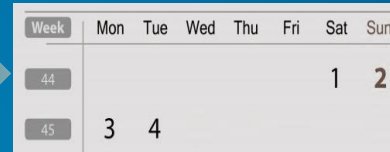
January	February	March	April
May	June	July	August
September	October	November	December

months



Week	Mon	Tue	Wed	Thu	Fri	Sat	Sun
44						1	2
45	3	4	5	6	7	8	9
46	10	11	12	13	14	15	16
47	17	18	19	20	21	22	23
48	24	25	26	27	28	29	30

weeks



Week	Mon	Tue	Wed	Thu	Fri	Sat	Sun
44						1	2
45	3	4					

days



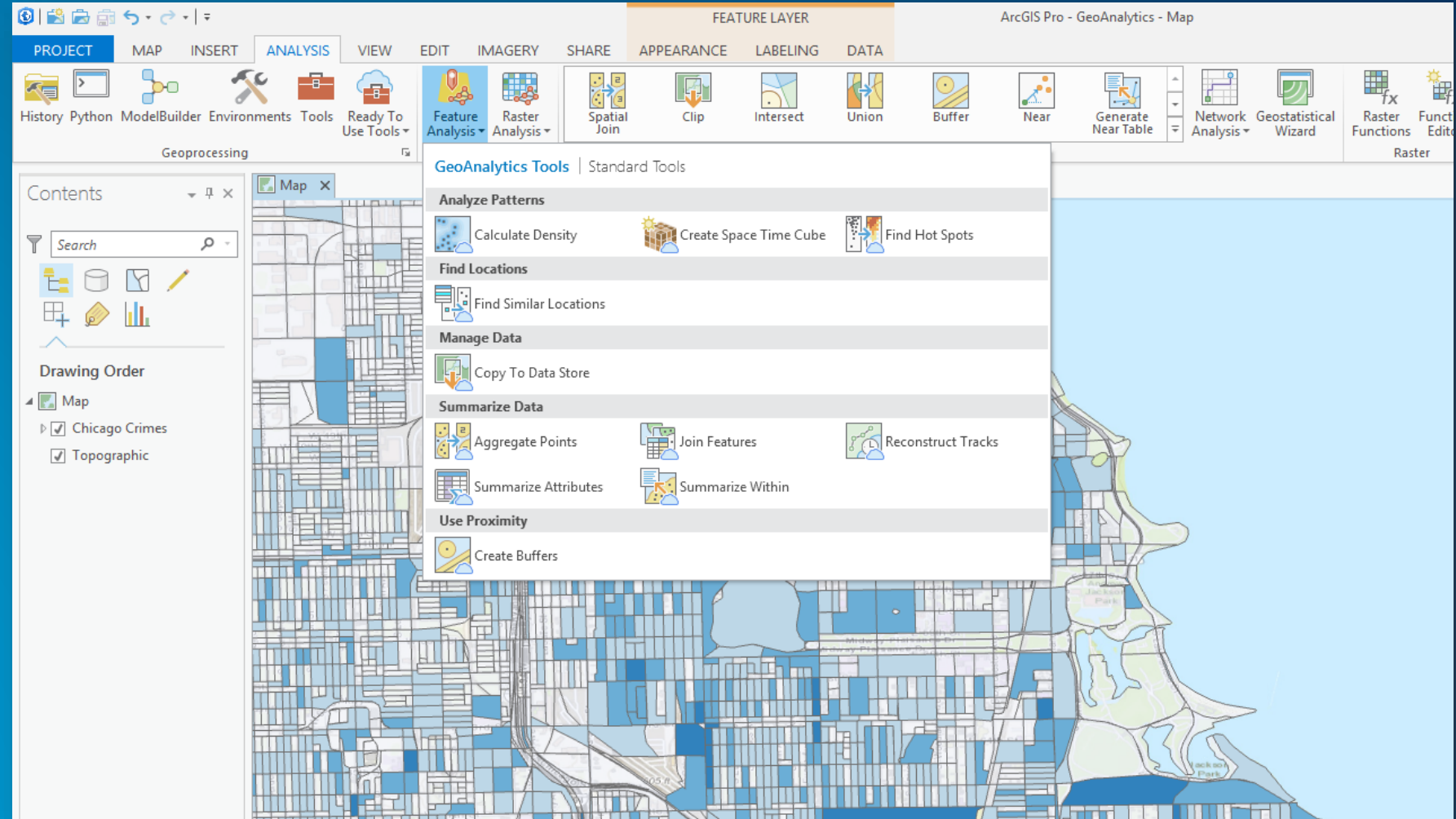
hours



minutes

GeoAnalytics Server | Familiar User Interfaces

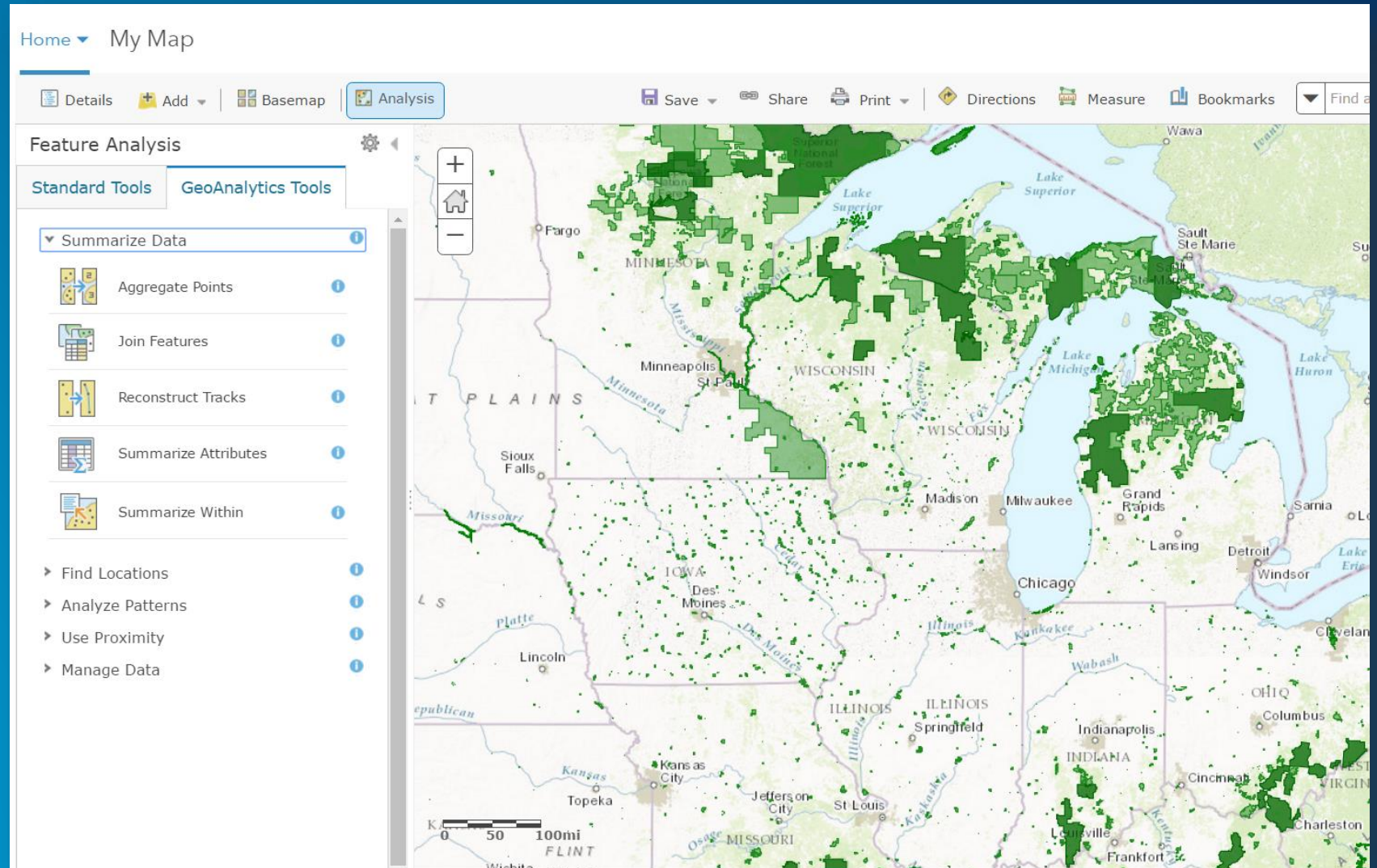
ArcGIS Pro Portal Map Viewer



GeoAnalytics Server | Familiar User Interfaces

ArcGIS Pro

Portal Map Viewer



GeoAnalytics Server | Developer Interfaces

REST API

ArcGIS API for Python

ArcGIS REST Services Directory

[Home](#) > [services](#) > [System](#) > [GeoAnalyticsTools \(GPServer\)](#)

[JSON](#) | [SOAP](#)

System/GeoAnalyticsTools (GPServer)

Service Description: The GeoAnalyticsTools service is provided for distributed analysis of large datasets.

Tasks:

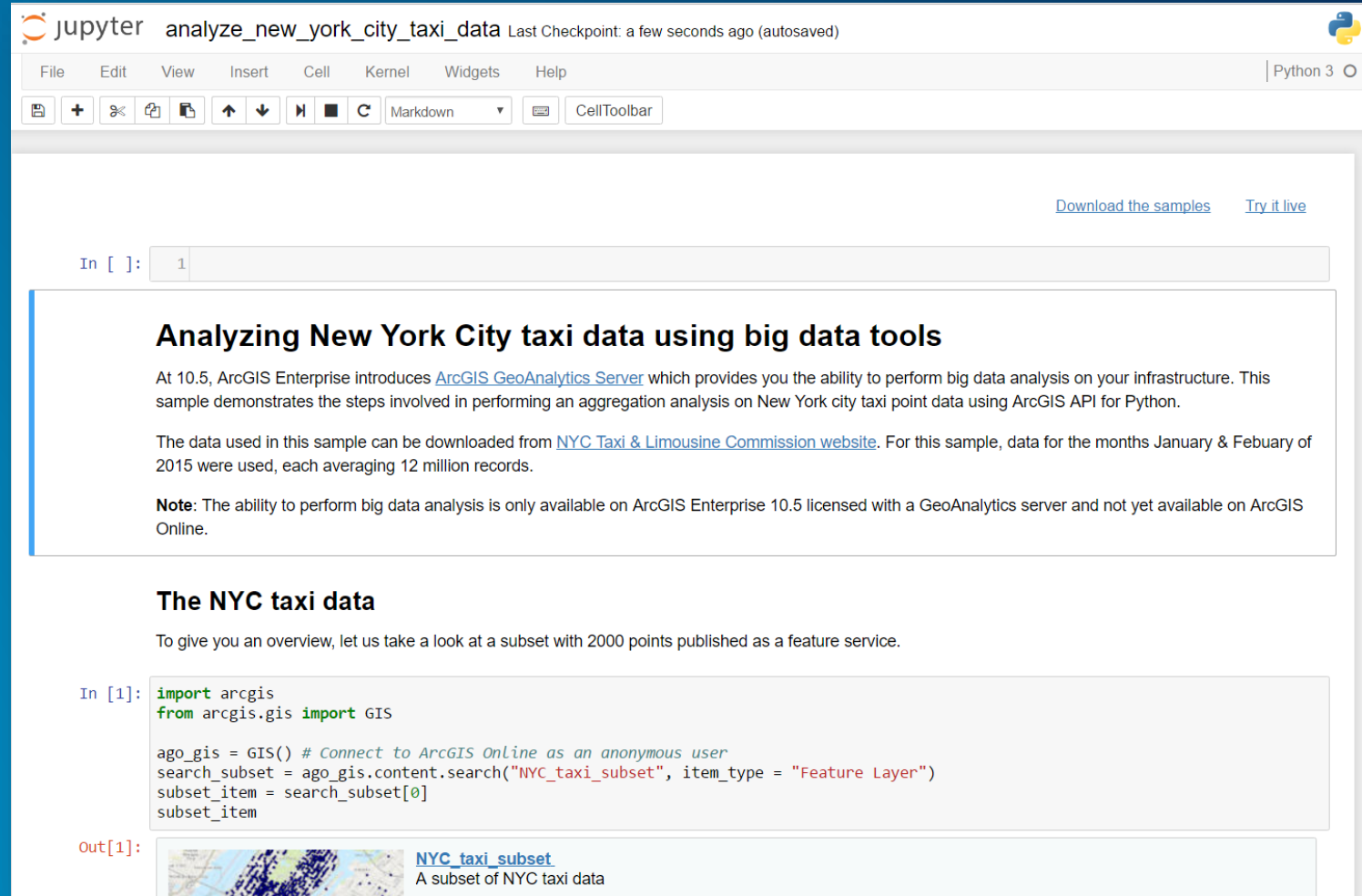
- [AggregatePoints](#)
- [DescribeDataset](#)
- [JoinFeatures](#)
- [CreateBuffers](#)
- [CalculateDensity](#)
- [ReconstructTracks](#)
- [CreateSpaceTimeCube](#)
- [CopyToDataStore](#)
- [SummarizeAttributes](#)
- [SummarizeWithin](#)
- [FindSimilarLocations](#)
- [FindHotSpots](#)

Execution Type: esriExecutionTypeAsynchronous

GeoAnalytics Server | Developer Interfaces

REST API

ArcGIS API for Python



The screenshot displays a Jupyter Notebook titled "analyze_new_york_city_taxi_data" with a status bar indicating "Last Checkpoint: a few seconds ago (autosaved)". The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for file operations, cell navigation, and execution. The notebook content is as follows:

Analyzing New York City taxi data using big data tools

At 10.5, ArcGIS Enterprise introduces [ArcGIS GeoAnalytics Server](#) which provides you the ability to perform big data analysis on your infrastructure. This sample demonstrates the steps involved in performing an aggregation analysis on New York city taxi point data using ArcGIS API for Python.

The data used in this sample can be downloaded from [NYC Taxi & Limousine Commission website](#). For this sample, data for the months January & February of 2015 were used, each averaging 12 million records.

Note: The ability to perform big data analysis is only available on ArcGIS Enterprise 10.5 licensed with a GeoAnalytics server and not yet available on ArcGIS Online.

The NYC taxi data

To give you an overview, let us take a look at a subset with 2000 points published as a feature service.

In [1]:

```
import arcgis
from arcgis.gis import GIS

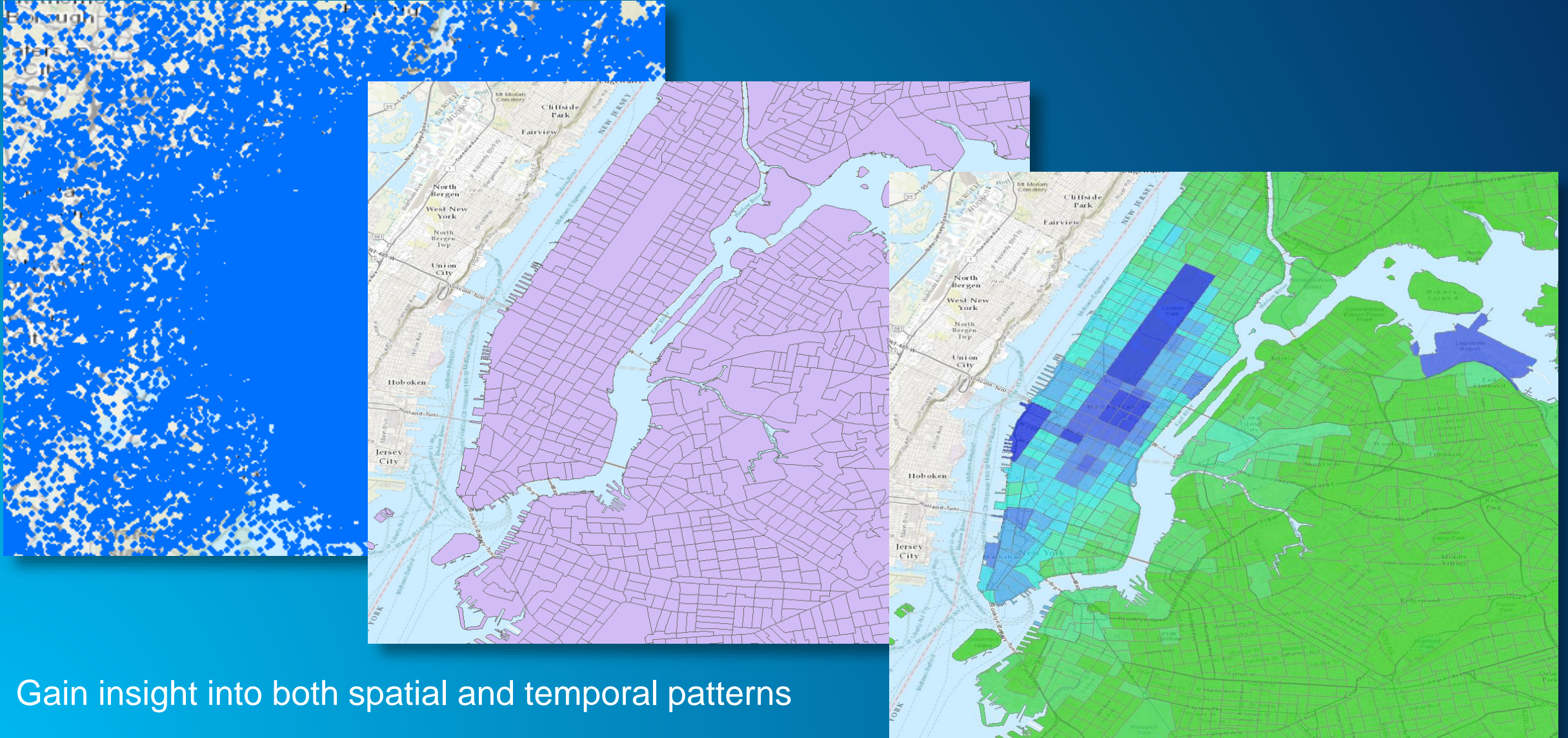
ago_gis = GIS() # Connect to ArcGIS Online as an anonymous user
search_subset = ago_gis.content.search("NYC_taxi_subset", item_type = "Feature Layer")
subset_item = search_subset[0]
subset_item
```

Out[1]:

[NYC_taxi_subset](#)
A subset of NYC taxi data

The output is a map visualization showing a dense cluster of blue points representing taxi data on a street map of New York City.

GeoAnalytics Server | From Noise to Intelligence

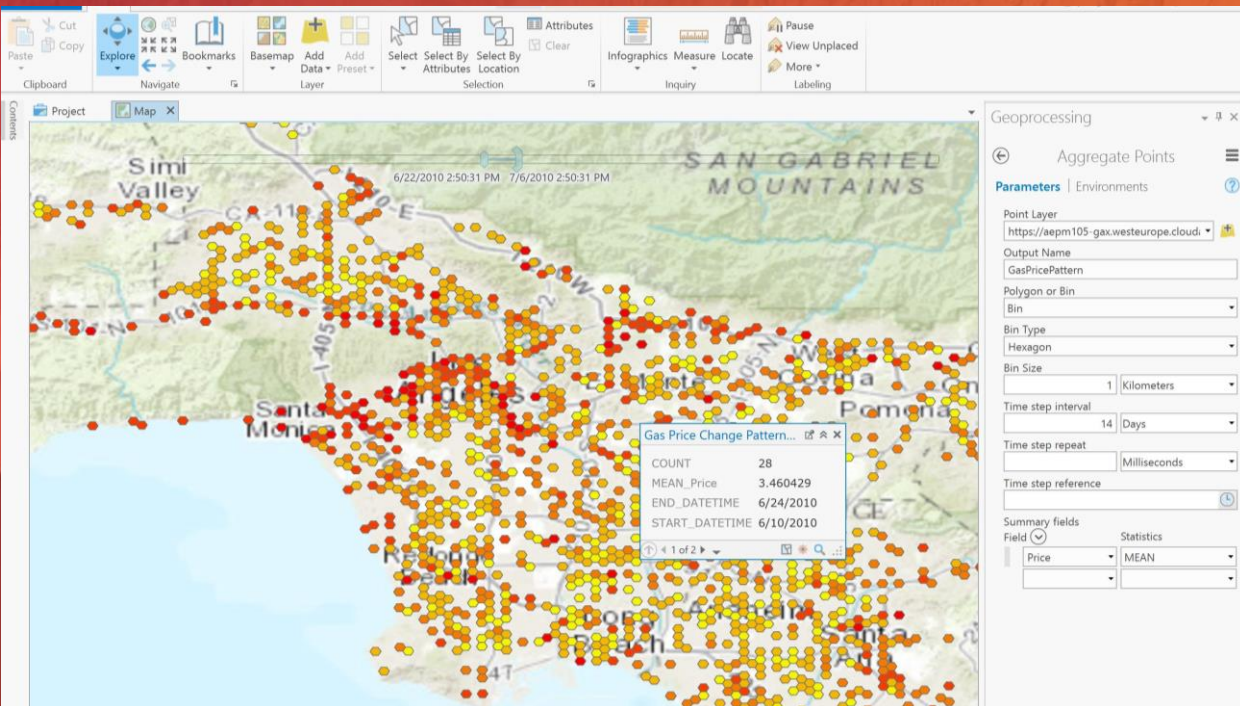


Gain insight into both spatial and temporal patterns

GeoAnalytics Server

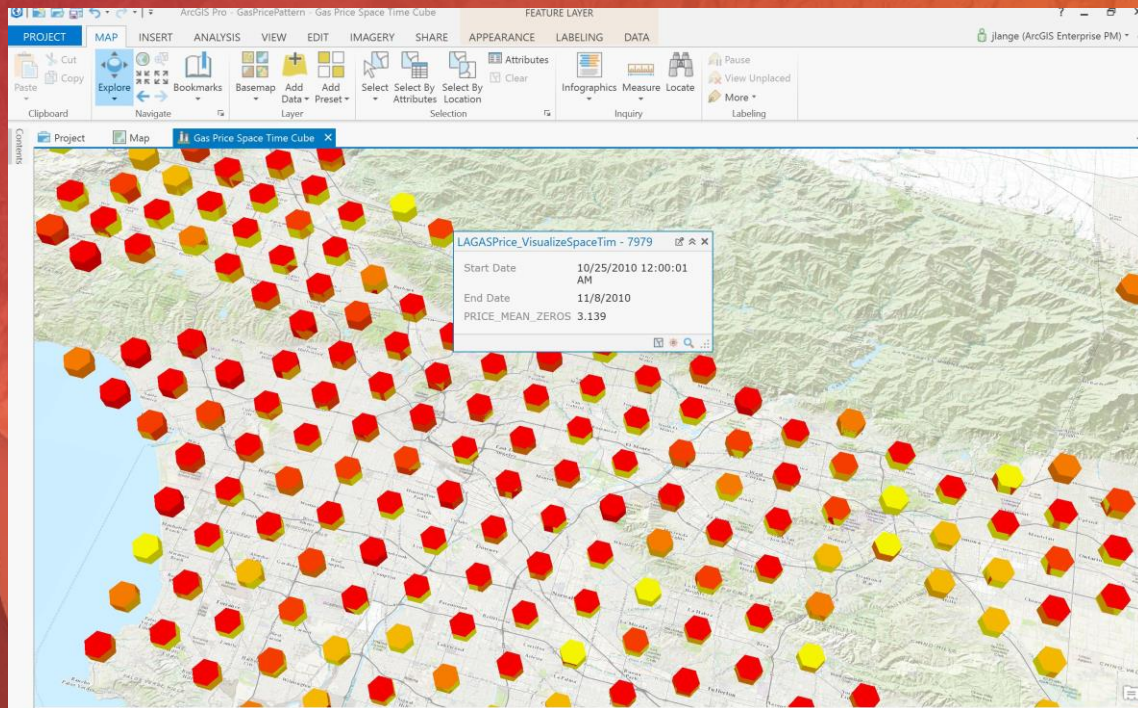


Run analysis against massive collections in a scalable manner



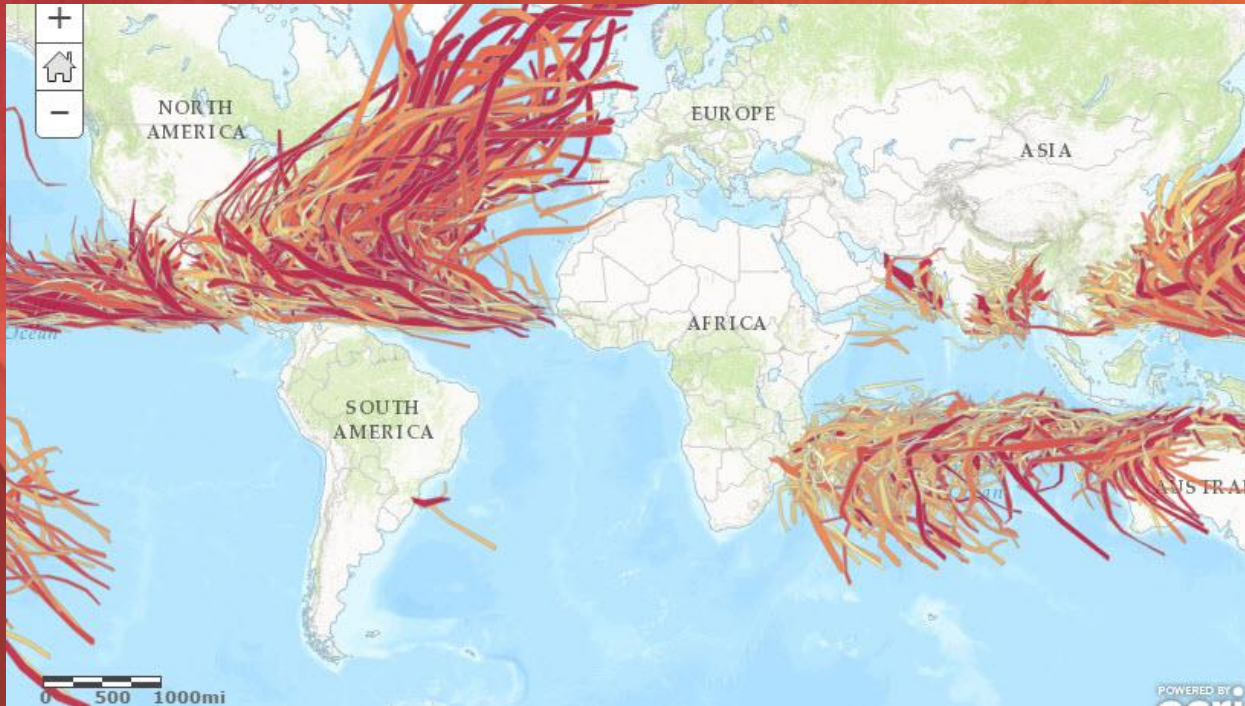
Aggregate Points

Pro UI



Create Space Time Cube

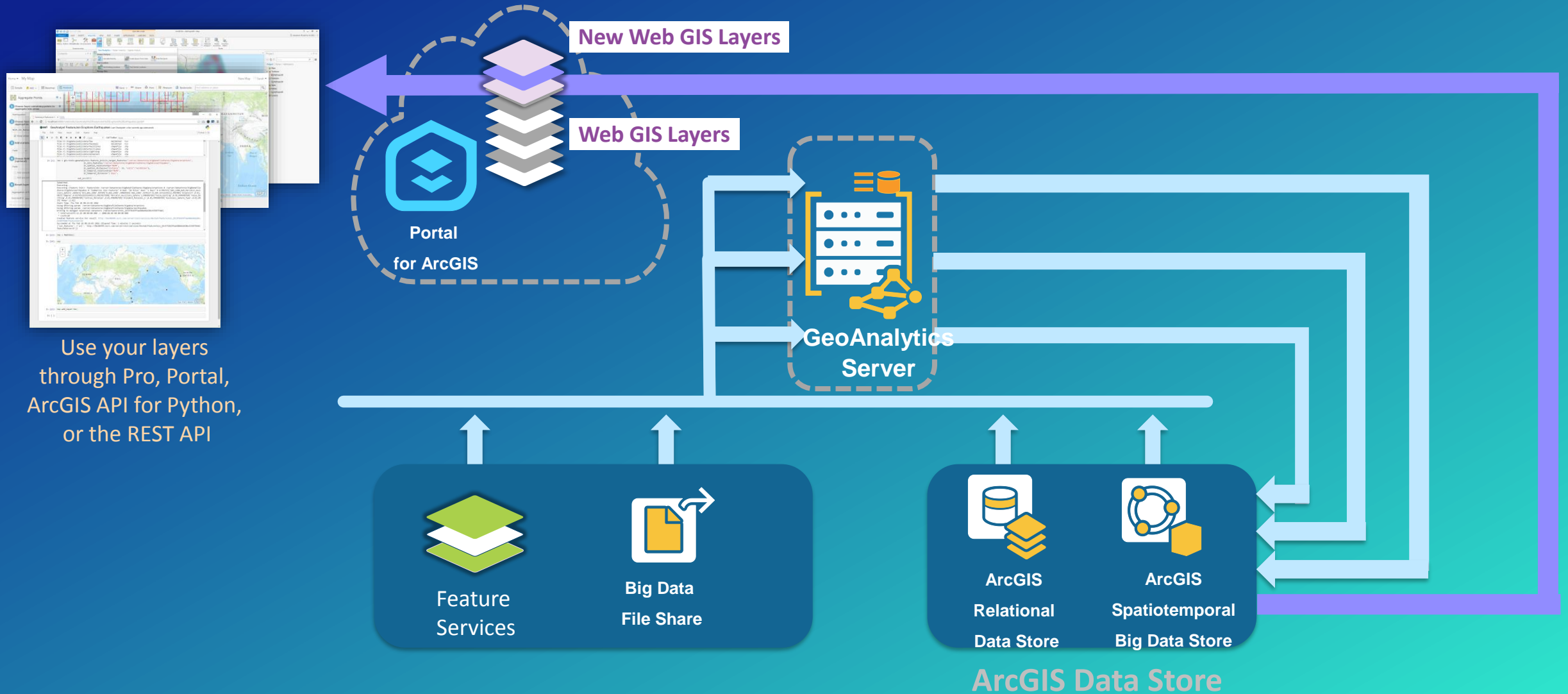
Pro UI



Reconstruct Tracks

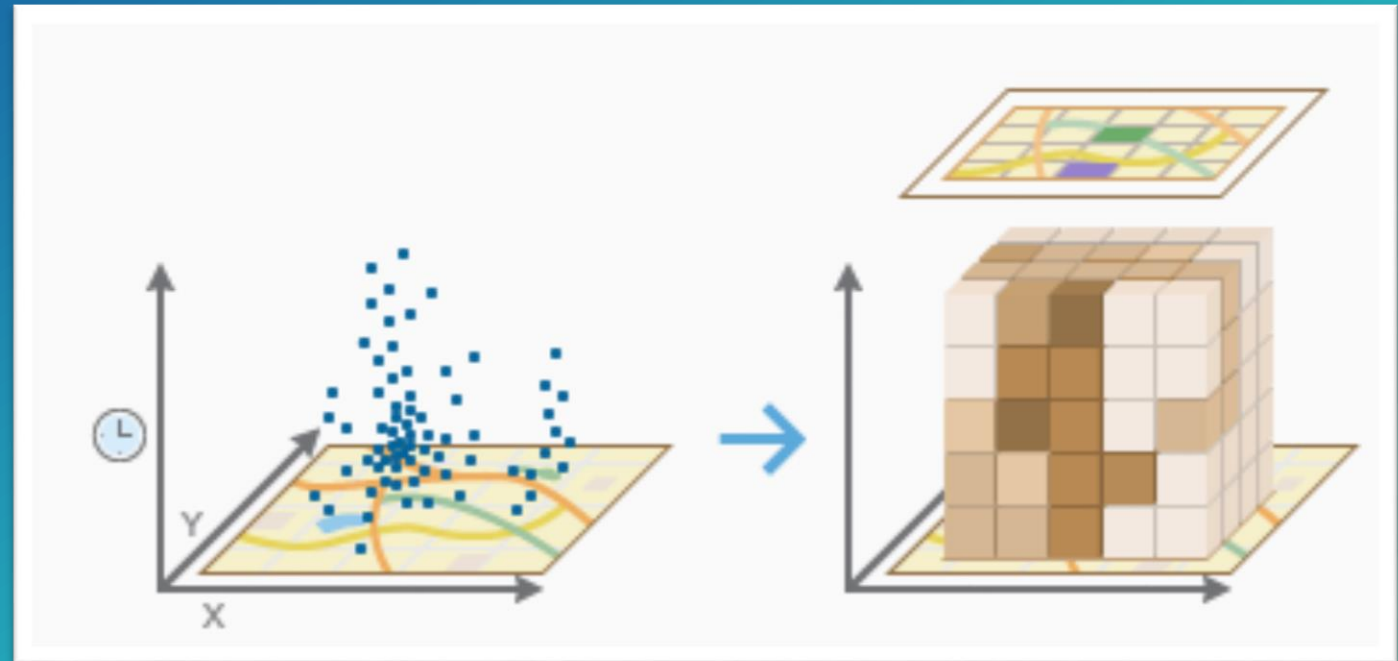
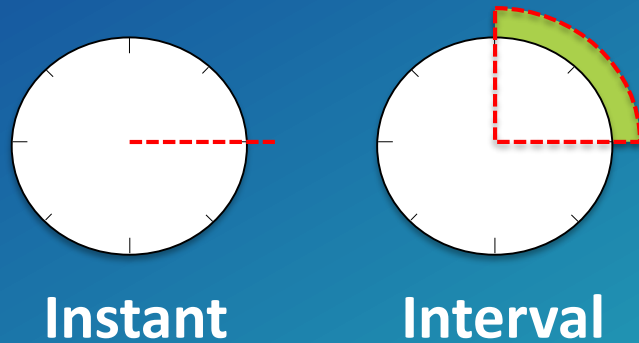
Portal UI

GeoAnalytics Architecture | Inputs and Results



Analysis Overview

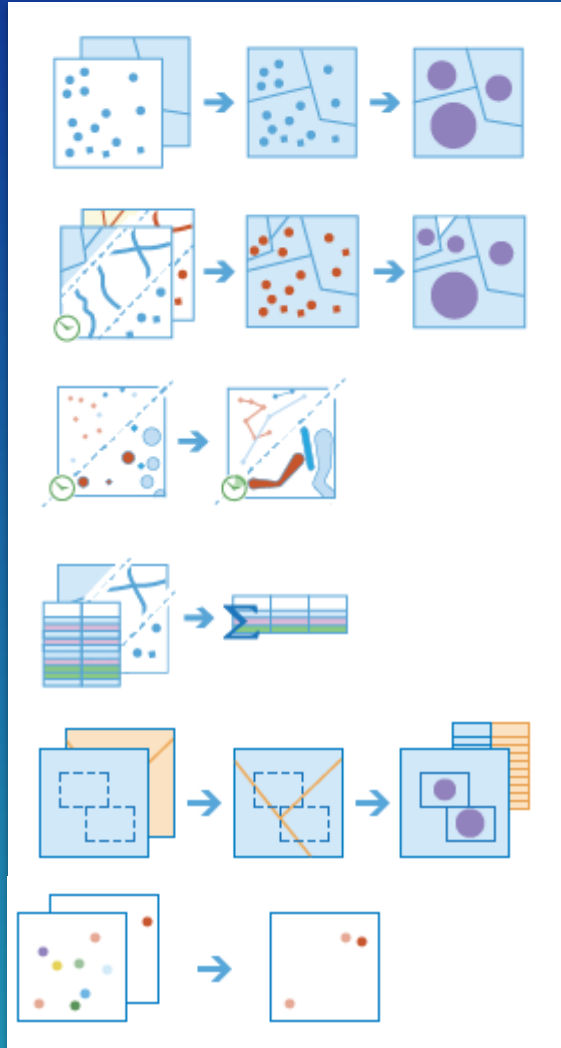
- Analysis capabilities patterned from ArcGIS Online Spatial Analysis
- Tools useful for big data with an emphasis on:
 - Spatiotemporal analysis
 - Summarization and aggregation



GeoAnalytics Server | Rich Collection of Analysis Tools

Summarize Data

- Aggregate Points
- Join Features
- Reconstruct Tracks
- Summarize Attributes
- Summarize Within



Find Locations

- Find Similar Locations

Analyze Patterns

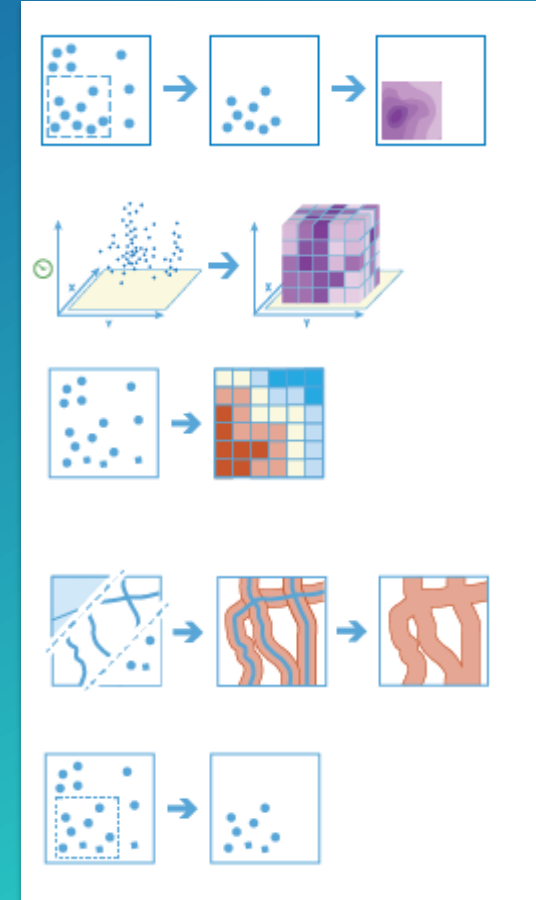
- Calculate Density
- Create Space Time Cube
- Find Hot Spots

Use Proximity

- Create Buffers

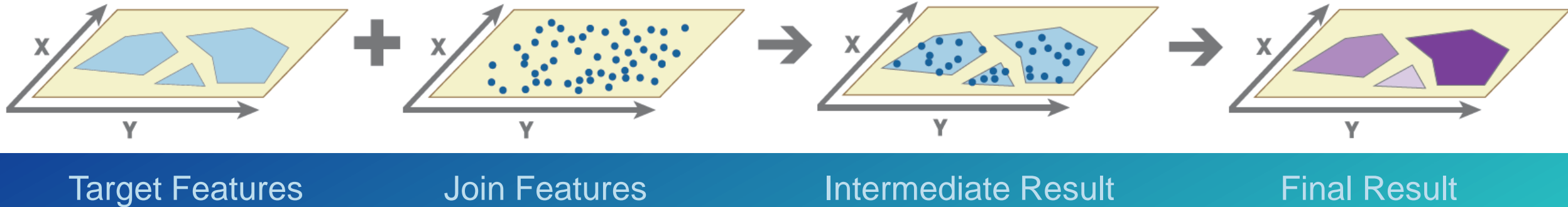
Manage Data

- Copy to Data Store

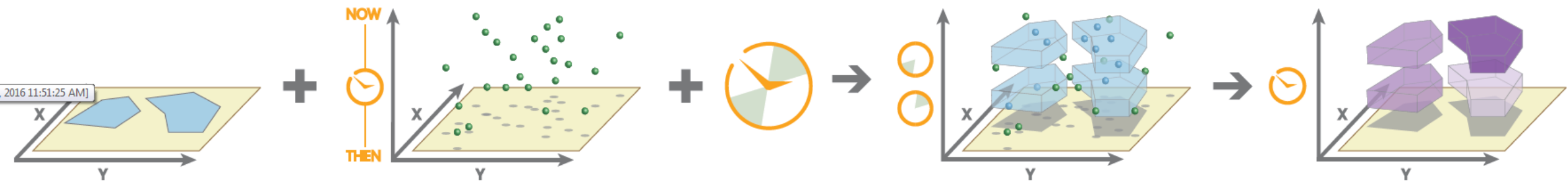


Aggregation

- Aggregate into polygons

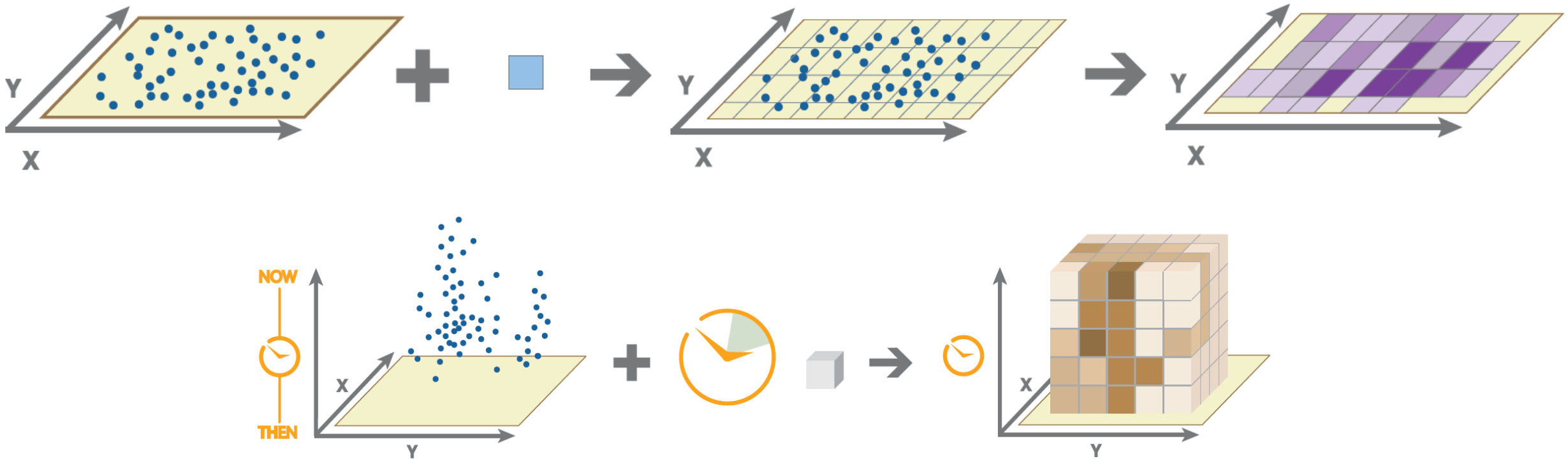


- Aggregate into time steps

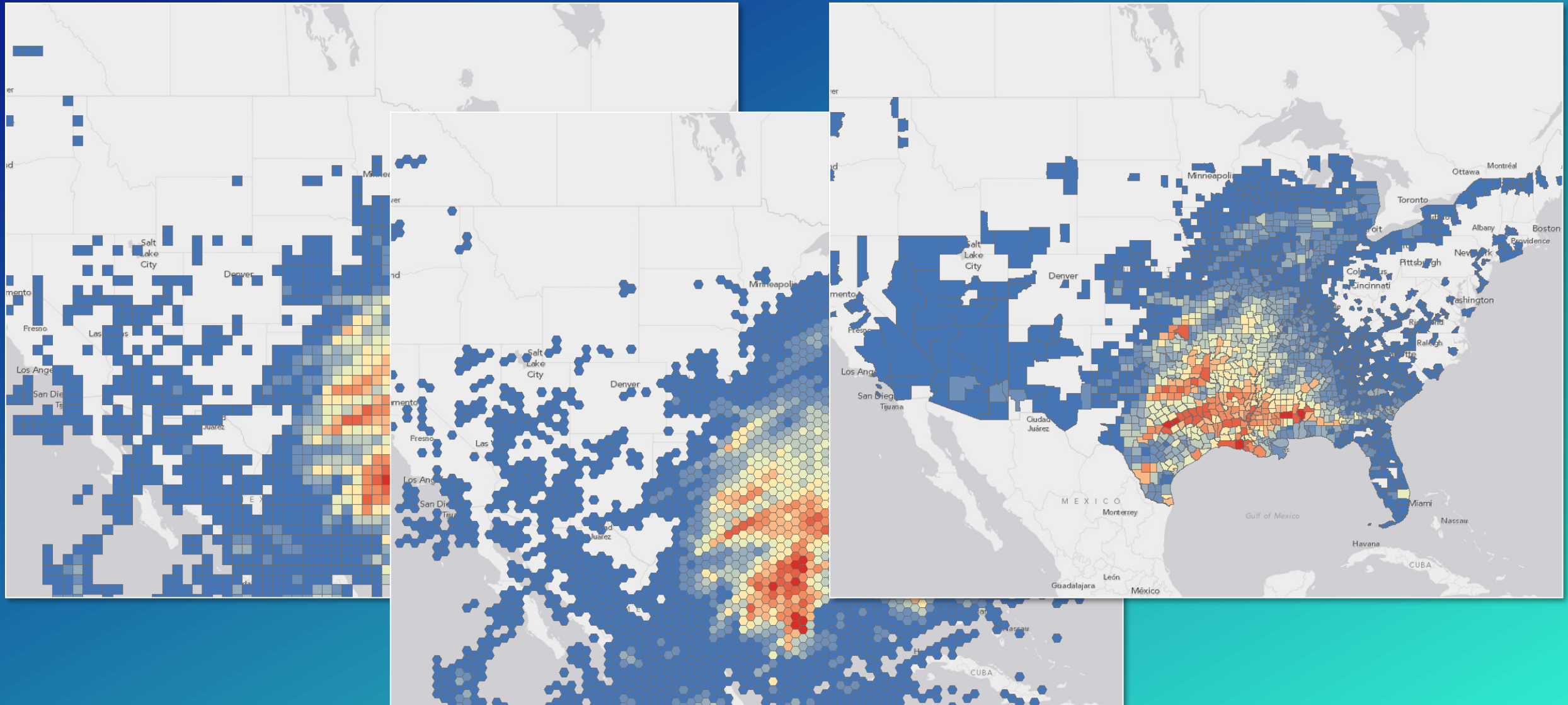


Aggregation into Space and Time

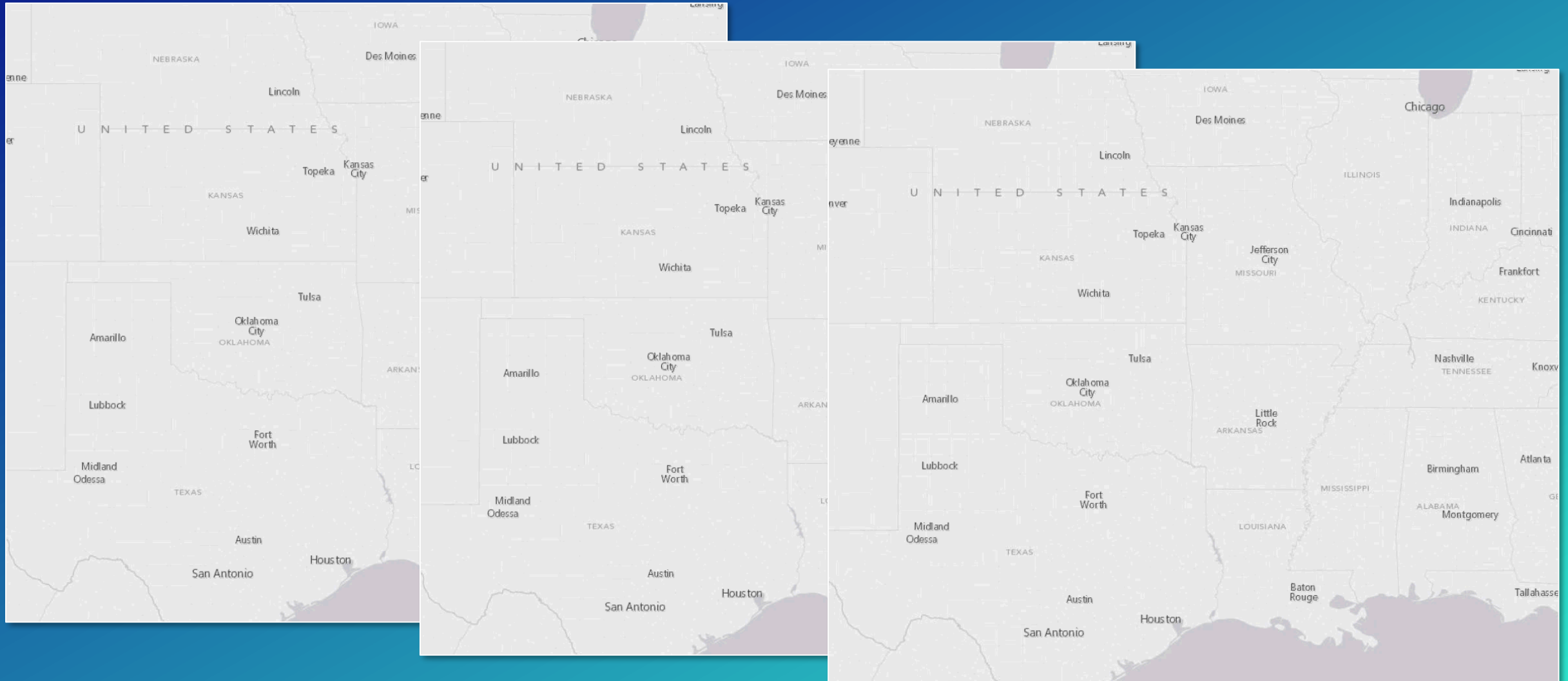
- Points into bins (square or hexagon)



Aggregation of Lightning Strikes



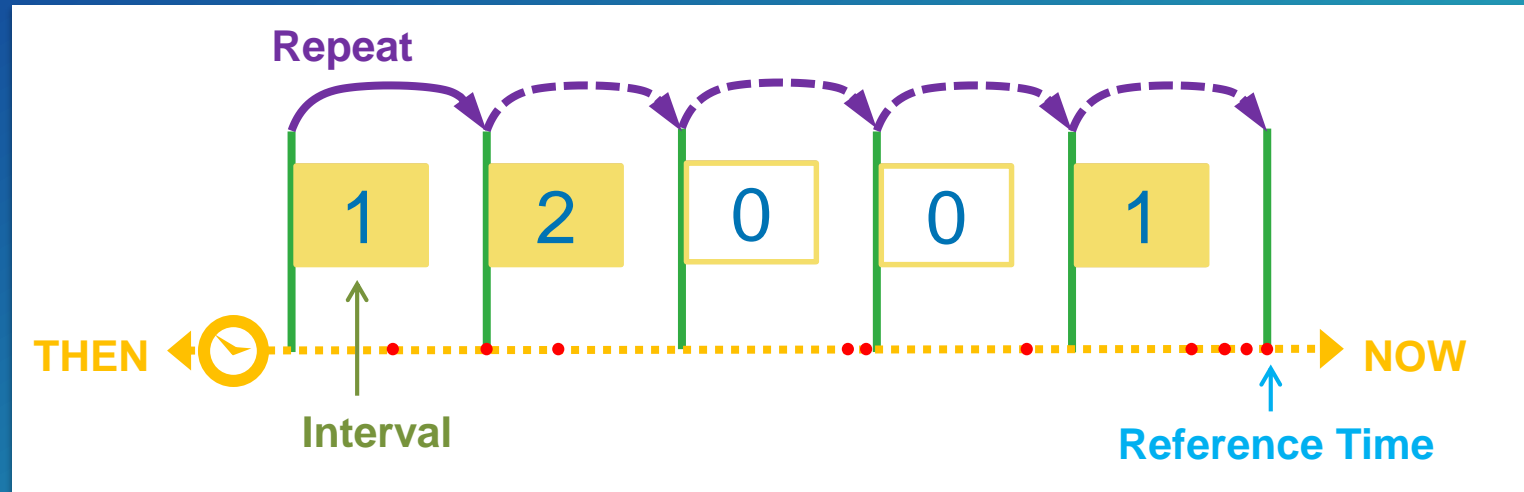
Aggregation of Lightning Strikes | 6 Hour Intervals



Time Stepping

- Three parameters to define a time step:

- **Interval** (duration of time in a step)
- **Repeat** (frequency of a step)
- Reference time (alignment)



- Examples:

- Hourly steps
- Every 12th hour
- Every Monday

Interval: 1 hour

Interval: 1 hour

Interval: 1 day

Repeat: 12 hours

Repeat: 1 week

Reference: Some Monday

Joining Features in Space and Time

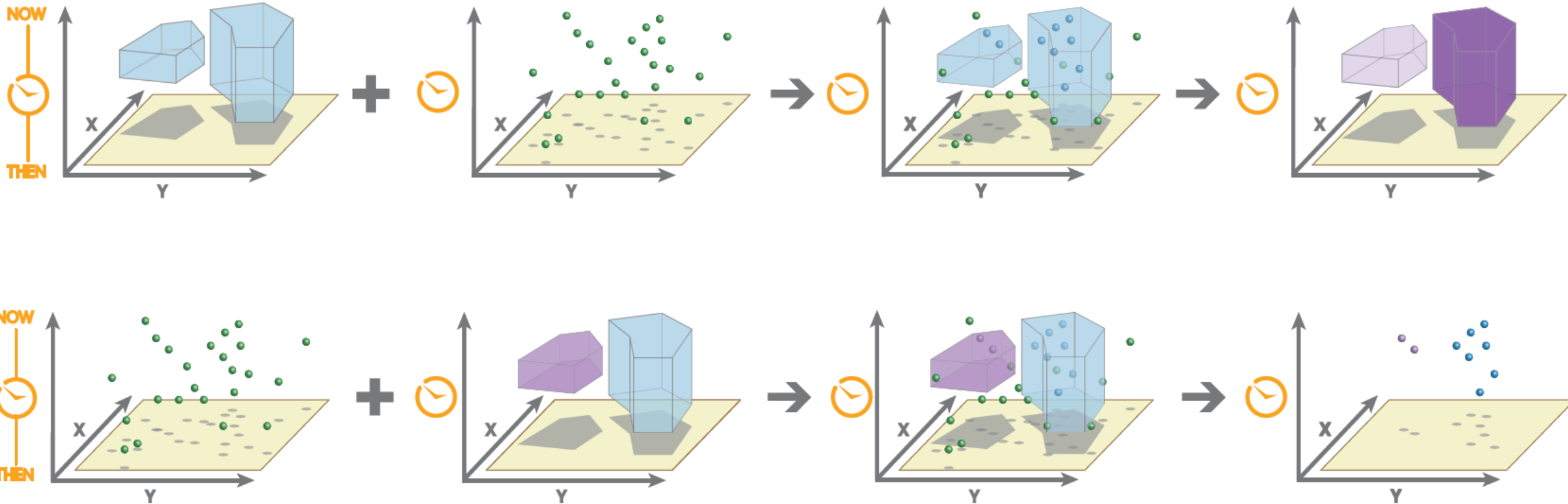
- Spatiotemporal joins

Target Features

Join Features

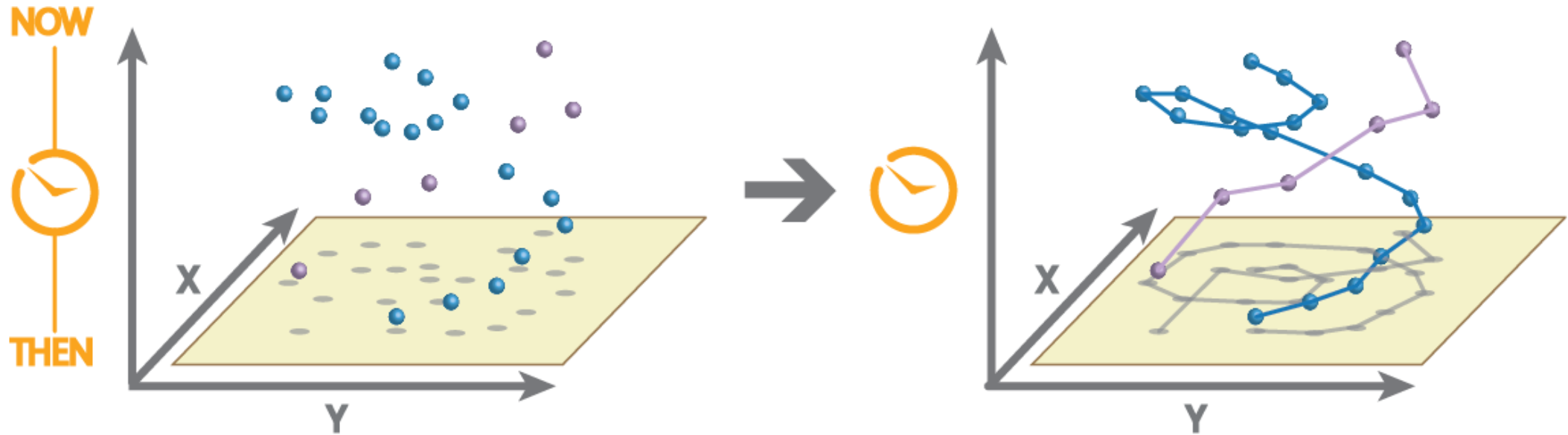
Intermediate Result

Final Result



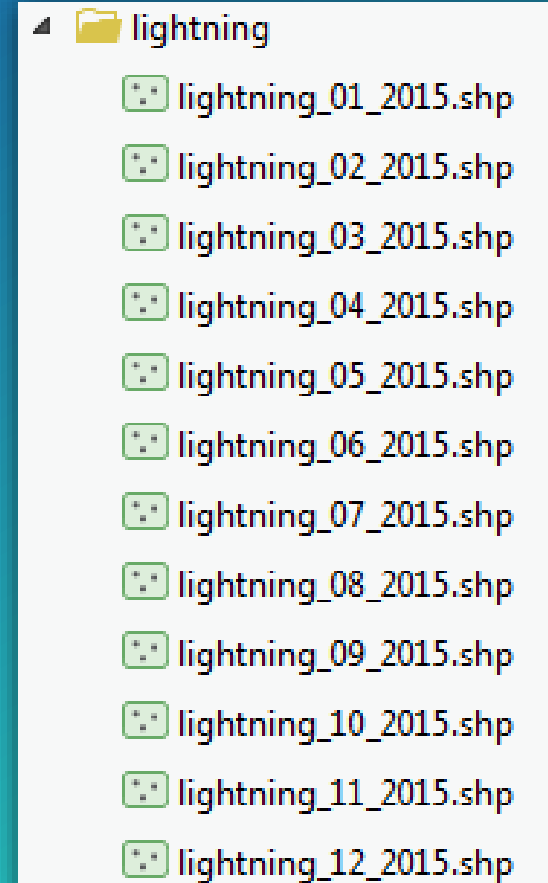
Aggregate Points into Tracks

- Reconstruct Tracks
 - Summarize time-enabled points into tracks



GeoAnalytics Server and your Data

- Use your GIS data
 - Works with layers already in your Web GIS
- Use your own big data sources: big data file shares
 - Easily attach folders located locally on a disk or file share
 - Data stored in HDFS or Hive
- Output:
 - Hosted feature service
 - By default, results are stored in the spatiotemporal data store
 - Local NetCDF file (Create Space Time Cube)



Registering a Big Data File Share

The screenshot displays the ArcGIS Server Manager web interface. The top navigation bar includes 'Services', 'Site', 'Security', and 'Logs'. Below this, a secondary bar shows 'GIS Server', 'Web Adaptor', 'Software Authorization', and 'Settings'. The left sidebar lists 'Directories', 'Configuration Store', 'Clusters', 'Machines', 'Data Stores' (selected), and 'Extensions'. The main content area is titled 'Data Stores' and includes a 'Help' link. A modal dialog box titled 'Register Big Data File Share' is open, featuring a 'Name:' text input, a 'Type:' dropdown menu with 'File Share' selected, and 'Create' and 'Cancel' buttons. The background interface shows a 'Register:' dropdown set to 'Database' and a table with columns for Name, Add, Edit, and Delete. The table contains five rows, with the first three labeled 'Share' and the last two 'd Store'. At the bottom, a 'Show:' dropdown is set to 'All'.

ArcGIS Server Manager

Services | **Site** | Security | Logs

GIS Server | Web Adaptor | Software Authorization | Settings

Directories
Configuration Store
Clusters
Machines
Data Stores
Extensions

Data Stores [Help](#)

Registering data stores provides the server with a list of data source locations for your services. You can register a data store by clicking the Add icon in the table or by using the Register drop down.

Determine if they are available. To

Register: Database ▼

Name	Add	Edit	Delete
Share			
Share			
Share			
d Store			
d Store			

Register a big data file share on your ArcGIS Server

[Help](#)

Name:

Type:

File Share
File Share
HDFS
Hive
Cloud Store

Create Cancel

Show: All ▼

GeoAnalytics Server Setup and Administration

- GeoAnalytics Server Setup
- Deployment Patterns

Components Required for GeoAnalytics Server

Portal for ArcGIS



ArcGIS Web Adaptor



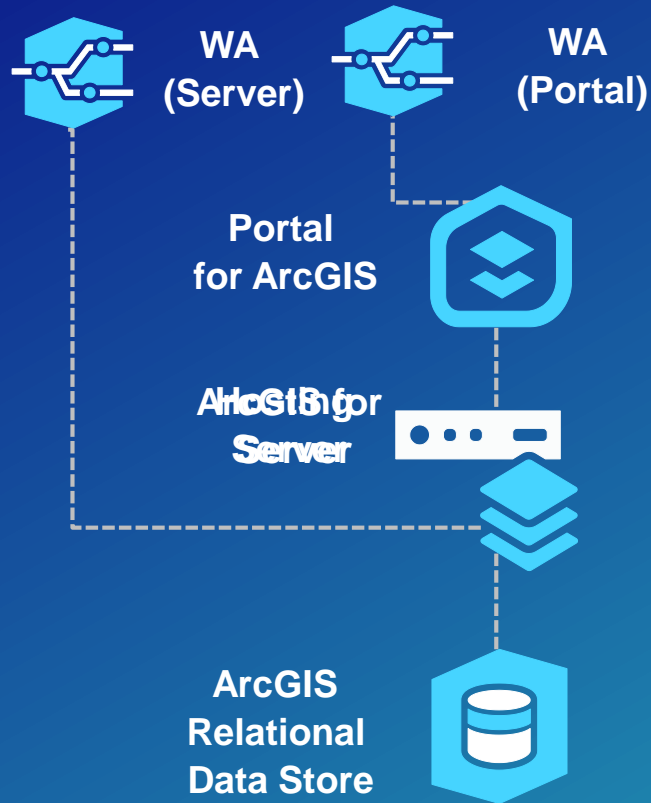
ArcGIS for Server



ArcGIS Data Store
(relational and spatiotemporal)



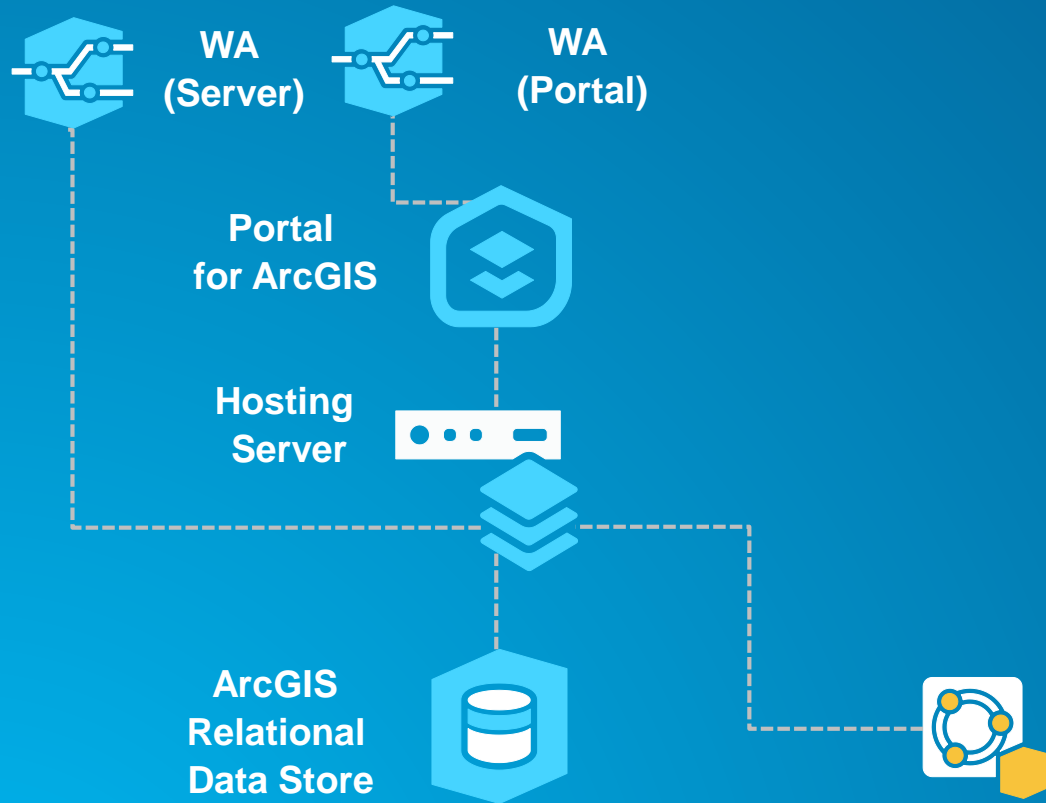
Step 1: Set up a Base Enterprise Deployment



Base Deployment
(Machine 1)

1. Install Portal for ArcGIS
2. Install ArcGIS Server
(license as standard or advanced GIS server)
3. Install ArcGIS Data Store and register relational data store with Server
4. Install and configure Web Adaptors (WA) for Server and Portal
5. Federate Server with Portal and configure as the Hosting Server

Step 2: Install and Configure Spatiotemporal Data Store



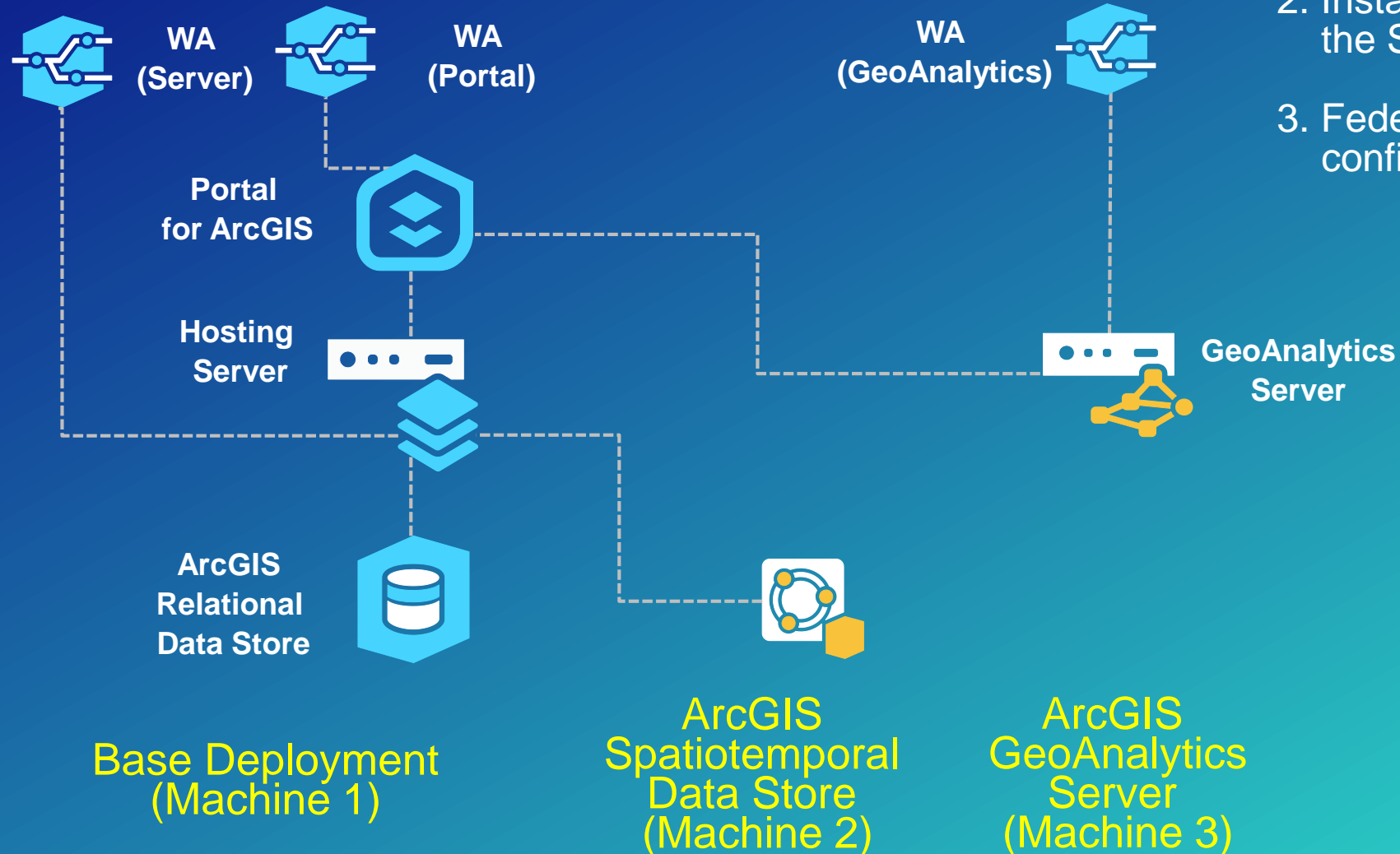
1. Install ArcGIS Data Store

2. Configure a spatiotemporal data store with the hosting server

Base Deployment
(Machine 1)

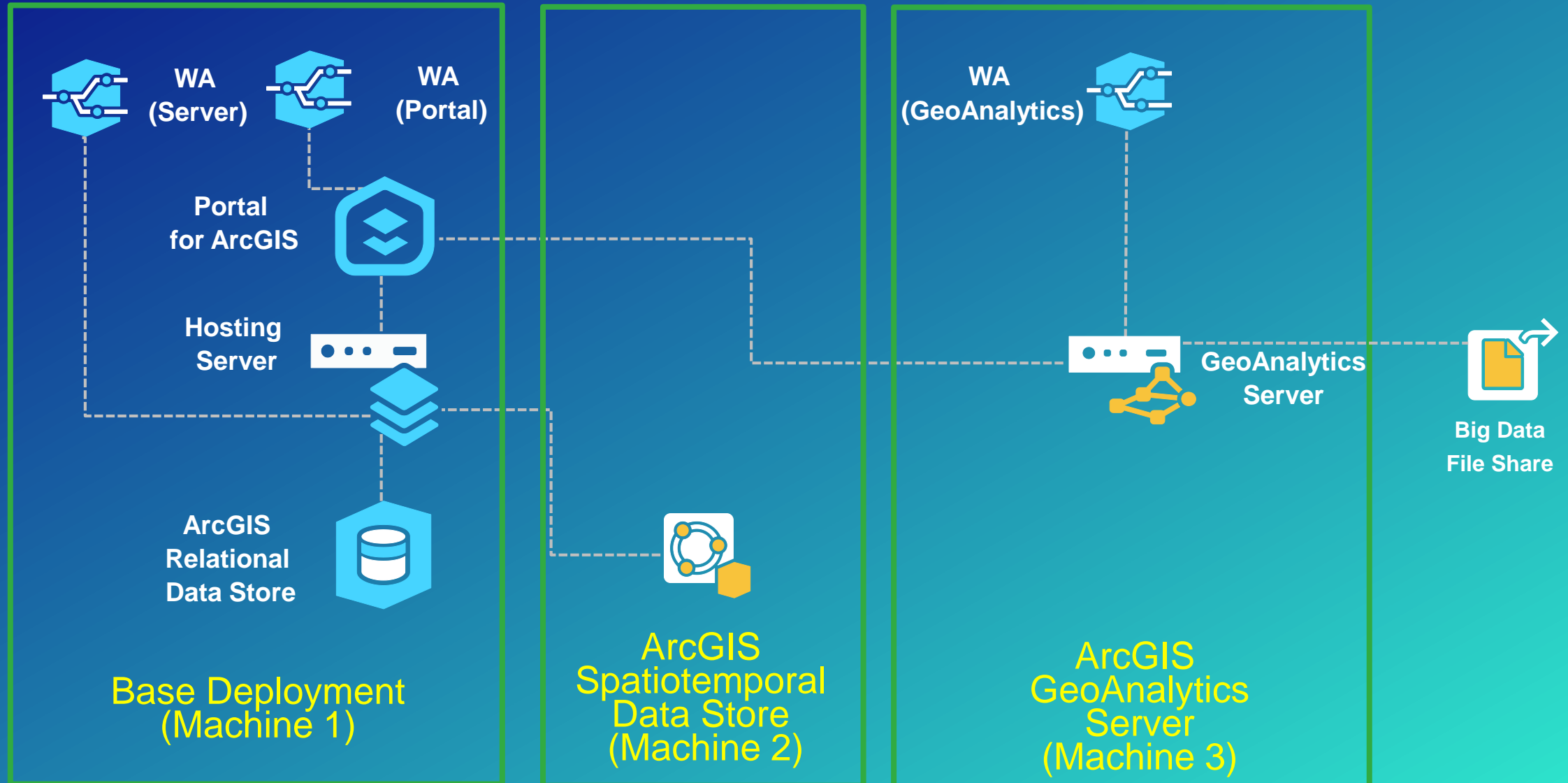
ArcGIS Spatiotemporal
Data Store
(Machine 2)

Step 3: Set up a GeoAnalytics Server

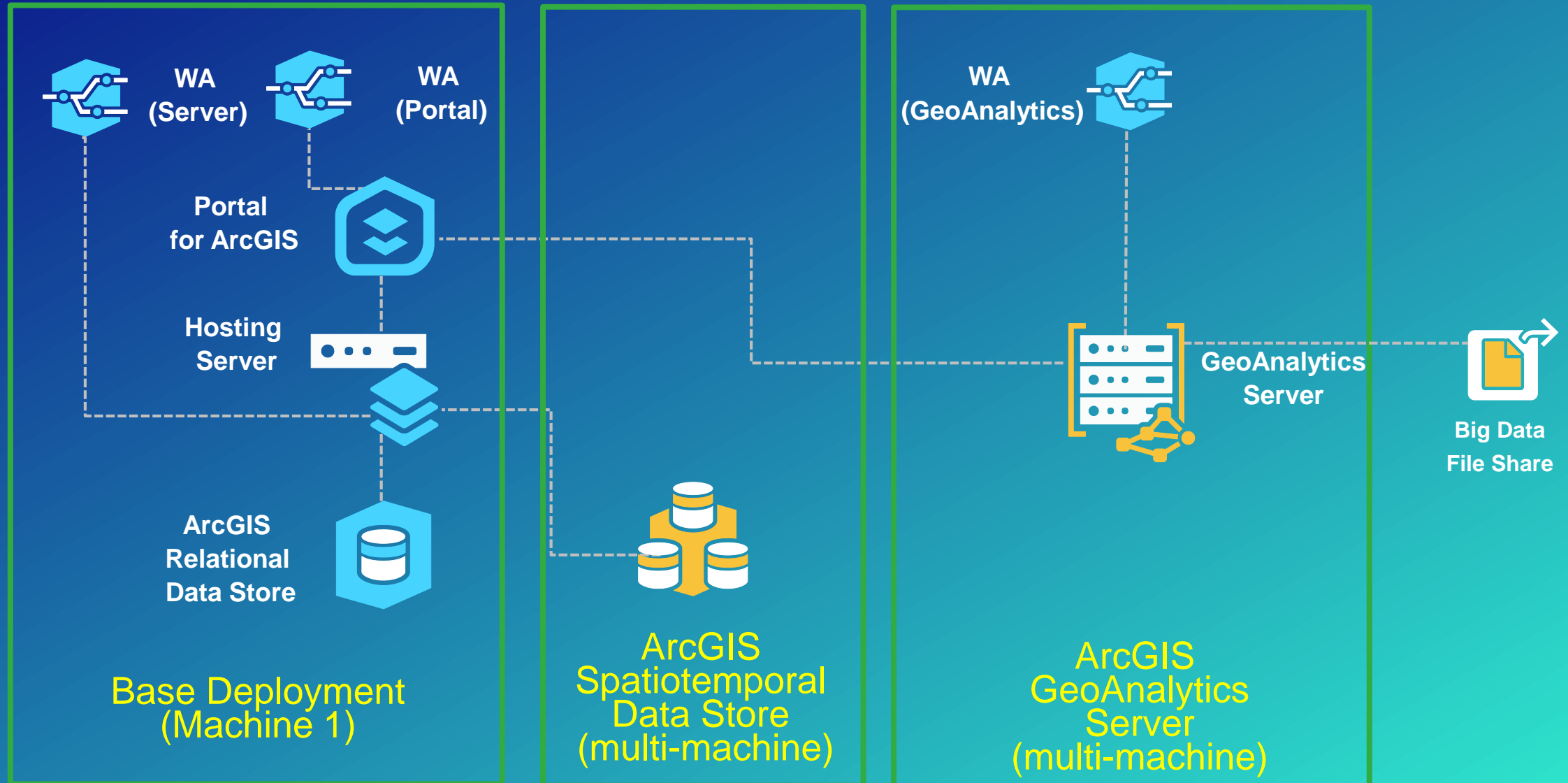


1. Install ArcGIS Server (licensed as a GeoAnalytics Server)
2. Install and configure a Web Adaptor for the Server
3. Federate the server with the Portal and configure as the GeoAnalytics server

Deployment patterns | Simple deployment



Deployment patterns | Multi-machine deployment



What can I run GeoAnalytics on?

- Supported on Windows and Linux platforms
 - On-premises
 - Amazon (easy to configure with Amazon Cloud formation templates)
 - Azure (easy to configure with Azure Cloud Builder)

Minimum System Requirements

- Base ArcGIS Enterprise deployment
 - Minimum 4 cores and 16 GB RAM
- ArcGIS Spatiotemporal Data Store
 - Minimum 16 GB RAM for each machine
 - Fast disk/sufficient disk space for data
- ArcGIS GeoAnalytics Server
 - Minimum 4 cores and 16 GB RAM for each machine
 - Sufficient temp space for compute



Recommended System Requirements

- Base ArcGIS Enterprise deployment
 - Minimum 4 cores and 32 GB RAM
 - Or install the base deployment across multiple machines



- ArcGIS Spatiotemporal Data Store
 - 32 GB RAM for each machine



- ArcGIS GeoAnalytics Server
 - 32 GB RAM for each machine



- Recommend an equal number of GeoAnalytics to spatiotemporal data store machines

Summary

- ArcGIS GeoAnalytics “out of the box” and “ready to use” within ArcGIS Enterprise
- Distributed Analytics - helps you get “big jobs” done faster
- Makes big data easier to use and easier to share
- Focuses on space and time analysis for massive dataset processing
- Lets you see the big data picture in a clearer and more meaningful way