

GIS for Business Intelligence: Getting Cloud Connected

Ed Farrell

Director of GIS Solutions, DVG

efarrell@dvginteractive.com

<http://dvginteractive.com>

October 19th, 2017

Lake Placid Convention Center

Lake Placid, NY



Intuitive Design. Intelligent Solutions.

Agenda



- Purpose – Solve Business Challenges with GIS and Cloud
- Intro to the Use Case & Problem Statement
- What is Business Intelligence?
- Approach
- Technical Implementation
- Takeaways



Who is this talk for?

- For managers
 - Technology Choices
- For developers
 - A lightweight for ArcGIS Online
 - Azure, Linux, Python, SQL Server Spatial, ETL, Microsoft Teams + Webhooks, Esri Python API (not arcpy), Anaconda
- For analysts
 - Geoprocessing with Python
 - Pandas, GeoPandas, Fiona, GDAL, Python + QGIS.



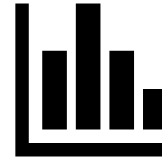
The Client – Cosmetics



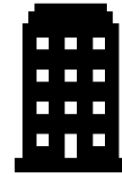
1,700+
Retailers



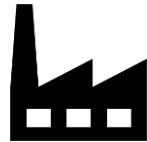
300+ Field
Sales Staff



Data



Headquarters



Manufacturing &
Warehousing



Problem Statement(s)

- “We have addresses, but we need a map of our retailers and field staff”
- “We want to map sales data for each retailer, and by sales territories”
- “We want to know how long it takes our staff to drive to a retail location, so we can assign the right person”
- “Staff and retailers change so often that we can’t re-allocate field staff resources fast enough”
- “It takes months to re-balance/draw sales territories”



The Solution  To “geo-enable”

“To geo-enable is to apply geospatial capabilities to a business process in order to establish the authoritative spatial location of business data, and enable contextual spatial analysis”

-US Dept. of Interior & FGDC, 2011



The Solution- Project Plan

- Move “on-premise” data to the cloud (i.e. ETL)
 - Low effort, cost.
- Geoenable the data (e.g. geocoding)
- Create maps & focused applications using ArcGIS Online (AGO) for Business Intelligence.
- Schedule...quick
- Cost...low



The Approach

- Agile, Phased
- Communications Plan
- Measure ROI
- **Fast, Cheap...and Great**



The Approach

- 3 Phases
 - GIS Baseline
 - Maps & Apps
 - Custom Apps & Integration
- Walk through each phase



Business Intelligence (BI)

“The applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance”

-Gartner

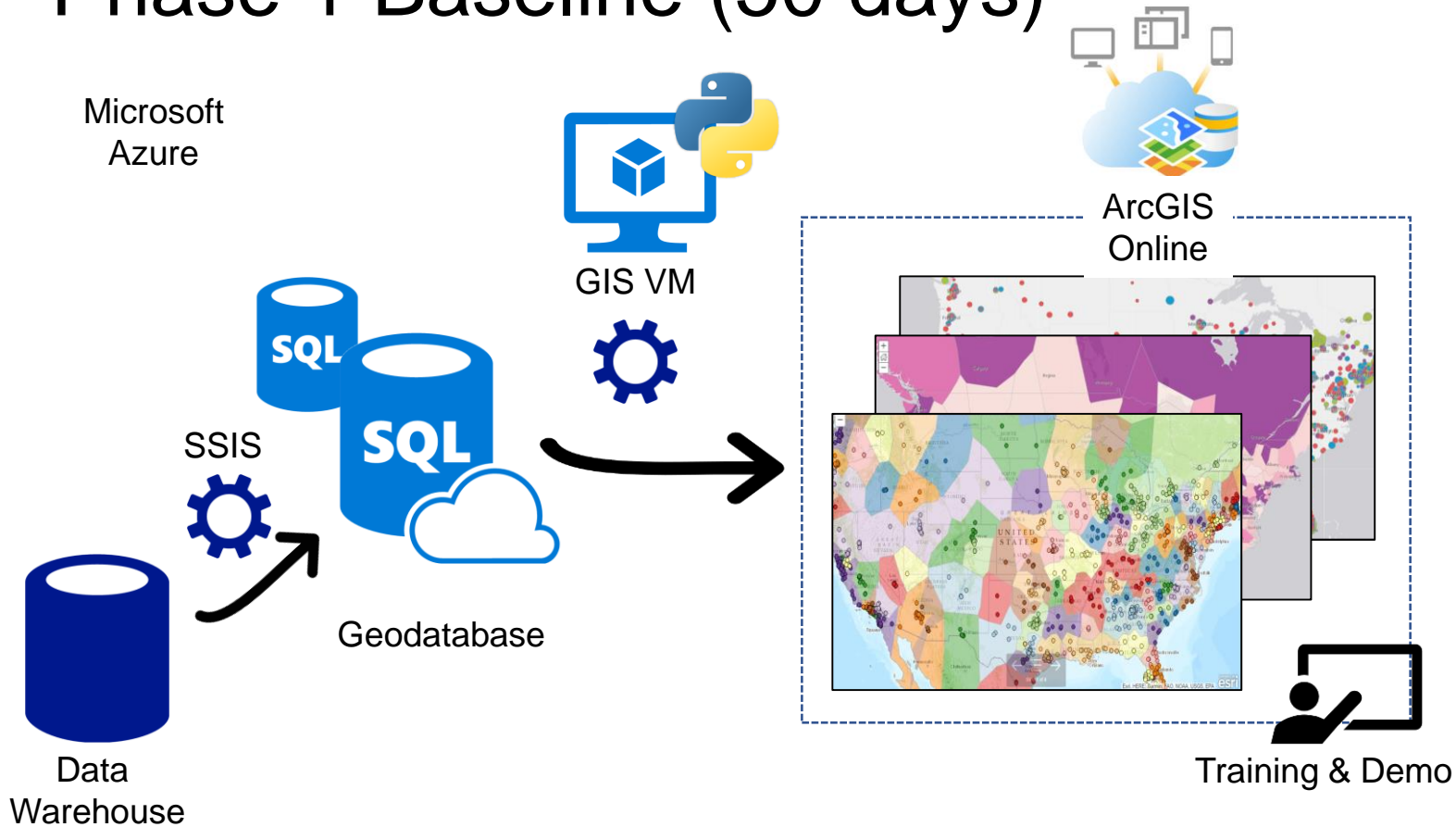


Phase 1 – “GIS Baseline”

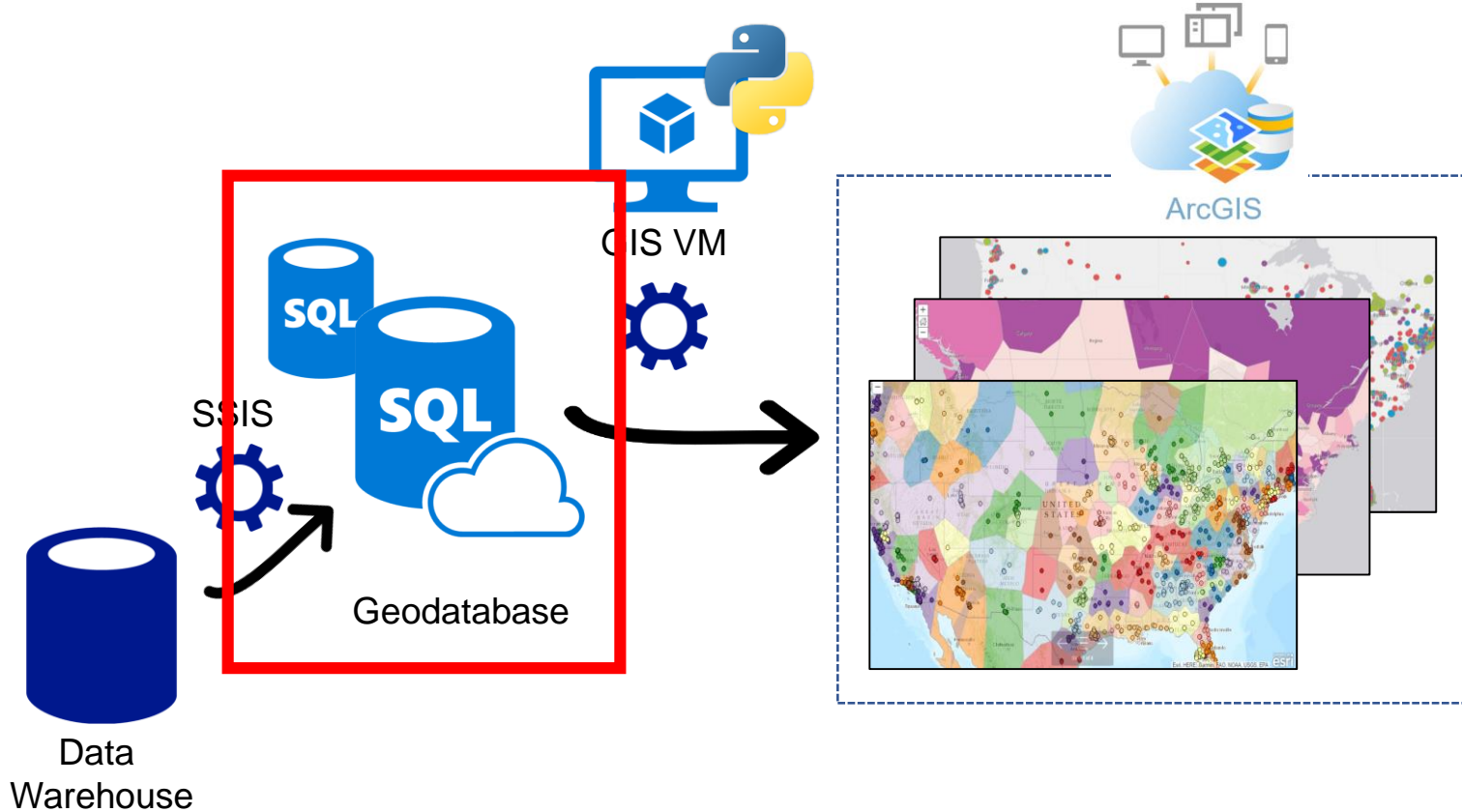
- Automatically Geocode addresses, generate failure reports
- Automatically geoprocess updated sales/operational boundaries
- Automatically sync with ArcGIS Online (AGO)
- Maps & Apps are automatically updated



Phase 1 Baseline (50 days)



Architecture - Database



Geodatabase



- Azure SQL DBaaS, no server to maintain
- Geography/Geometry data type, OGC Compliant
- Automated backups, failover, etc.
- Use Python **pyodbc** module for transactions
- Cons
 - Partial pyodbc Geography/Geometry data type support! Solution? Computed columns
 - No “editor tracking” like Esri. Solution? Triggers



SQL Geography Point Data Type

```
CREATE TABLE [dbo].[pointtable](  
    [pointid] [nvarchar](300) NOT NULL,  
    [longitude] AS ([geog].[Long]),  
    [latitude] AS ([geog].[Lat]),  
    [geog] [geography] NULL
```

```
select geog.STAsText() from pointtable  
where pointid = '370'
```

```
POINT (-122.2685881899892 47.829202571096012)
```

```
select longitude, latitude from pointtable  
where pointid = '370'
```

```
(-122.2685881899892 47.829202571096012) # tuple or list
```

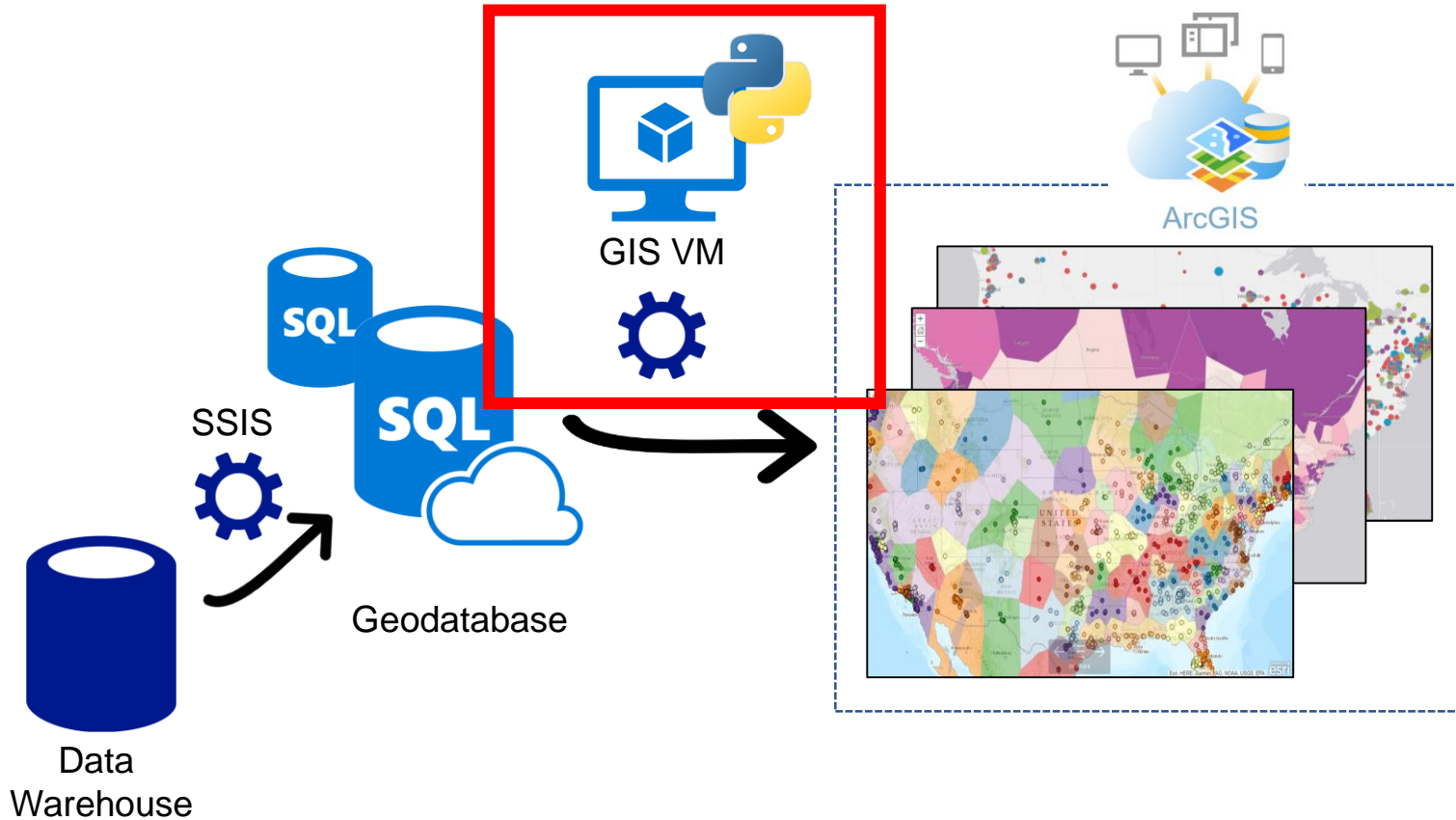


“Native” Geodatabase

- Works with ArcGIS Server, with or without installing Esri SDE
- Works with Geoserver (with some work)
- Did I mention OGC Methods: Area, buffer, contains, convex hull, difference, distance, intersects, etc.

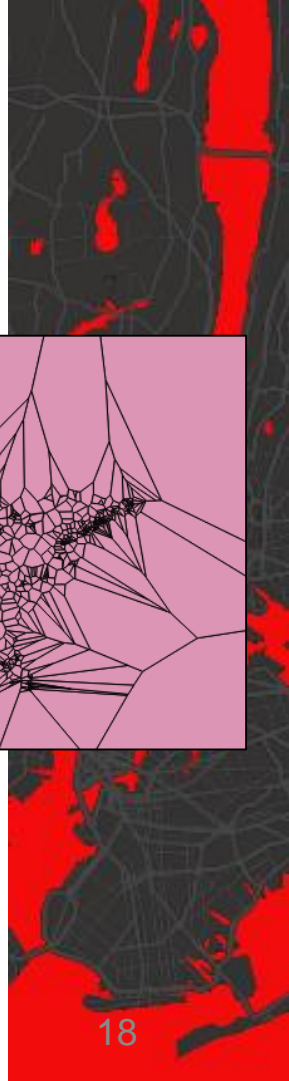
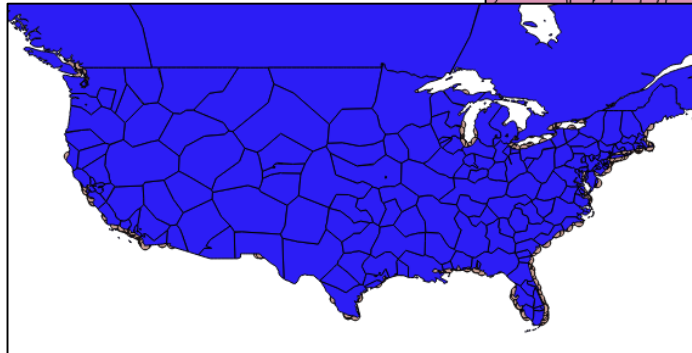
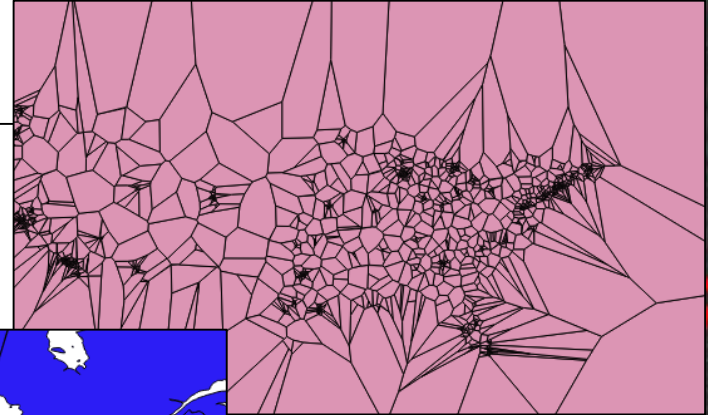
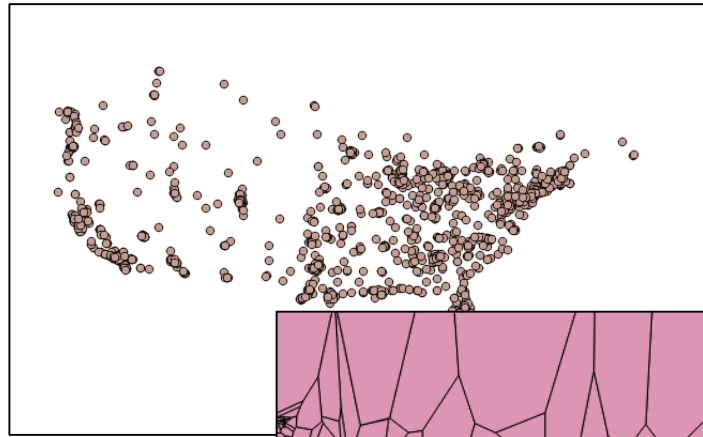


Architecture - Processing



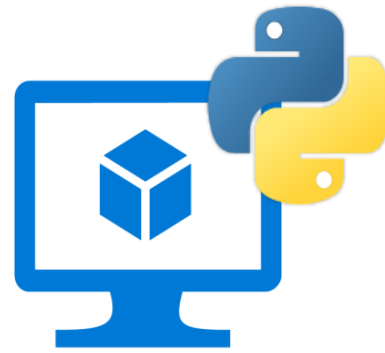
Geoprocessing

- Points, with categorical fields
- Voronoi polygons
- Dissolve by category
- Spatial join/union to countries



GIS Processing – Open Source

- Azure Linux Ubuntu Server 16.04
- QGIS Python
- Python Anaconda 3.6.x, Conda, virtualenv
- Key Packages
 - ArcGIS Python API
 - Fiona/Shapely
 - GDAL
 - Pyodbc
 - Geopandas & Pandas



GIS Geoprocessing Choices



- ArcGIS Python API – Open Source toolset for geoprocessing, administration in ArcGIS Online
- Pandas/Geopandas – Slicing data, queries geoprocessing, visualization
- Shapely, Fiona, GDAL – I/O, some geoprocessing
- QGIS – python hooks for core functions (difficult since python version is tied to QGIS)
- Pyodbc – SQL queries/views



ArcGIS Python API

- Auto geocoding of addresses
- Automated Syncing of geodatabase (1-5x/day)
- Why not just use ArcGIS Server?
- How? Without changing “item id”


```
8 class Pyapi:
9     def __init__(self, url, user, password):
10         self.url = url
11         self.user = user
12         self.password = password
13         self.gis = GIS(self.url, self.user, self.password)
14         self.geocoder = get_geocoders(self.gis)[0]
15
16 +     def update_fields(self, field_list, newfields):...
64
65 +     def field_difference(self, originalfields, newfields):...
72
73 +     def field_difference_delete(self, originalfields, newfields):...
80
81 +     def get_field_list(self, featurelayercollection, fieldtype="name"):...
```





Create & Publish Item

Add the zipped shapefile to AGO

```
shpfile = self.gis.content.add(item_properties, filepath, folder=ago_folder)
```


 Edit Thumbnail




Add a brief summary about the item.  Edit


by [dvg_admin](#)


Last Modified: October 18, 2017


 Shapefile

 Add to Favorites

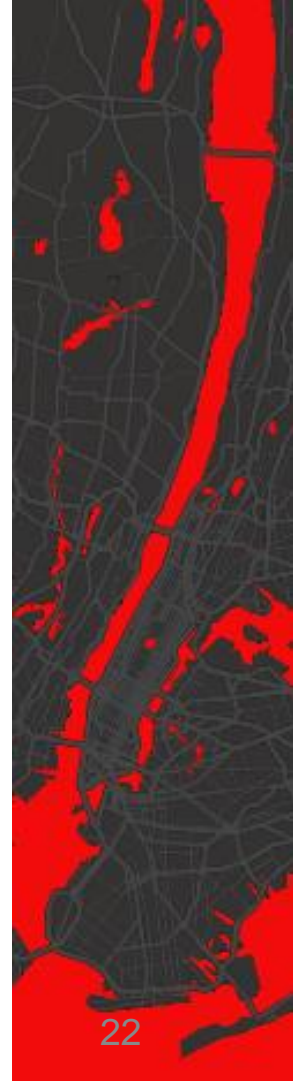
Details

 Download

☆☆☆☆☆ (0)  views: 48

 Update

Published on:



Create & Publish Item

Publish the item, this creates a hosted feature layer. **overwrite = True**

```
published_item = item.publish(overwrite=True)
```

The screenshot shows the ArcGIS Item Details page for a 'Feature Layer (hosted)'. The page includes a title bar with a yellow location pin icon and the text 'Feature Layer (hosted)'. Below the title bar, there is a 'rites' tab. The main content area displays a list of actions: 'Open in Map Viewer' (with a dropdown arrow), 'Open in Scene Viewer', 'Open in ArcGIS Desktop', 'Publish' (with a dropdown arrow), 'Create View', 'Export Data' (with a dropdown arrow), 'Overwrite' (highlighted with a red box), and 'Share'. On the left side, there is a 'views: 32' indicator, a 'service' link, and a 'SalesQuarter,' link. At the bottom left, there is a 'Change Owner' link.



Update Item With New Data

Get the “feature item”

```
feature_item = Pyapi.gis.content.get(feature_info[0][0])
```

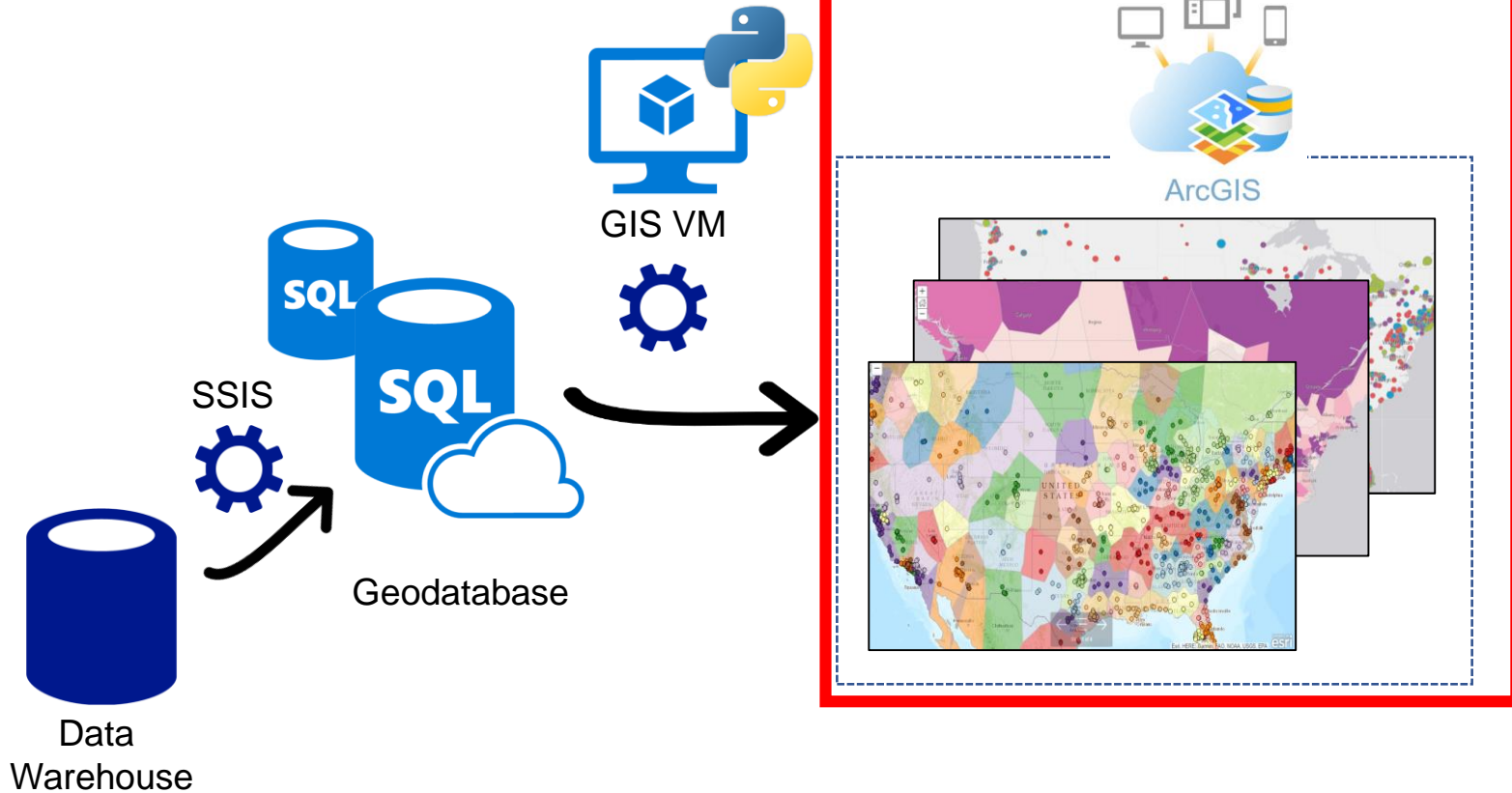
Get the “featurelayercollection”

```
flc = Pyapi.featurelayercollection(feature_item)
```

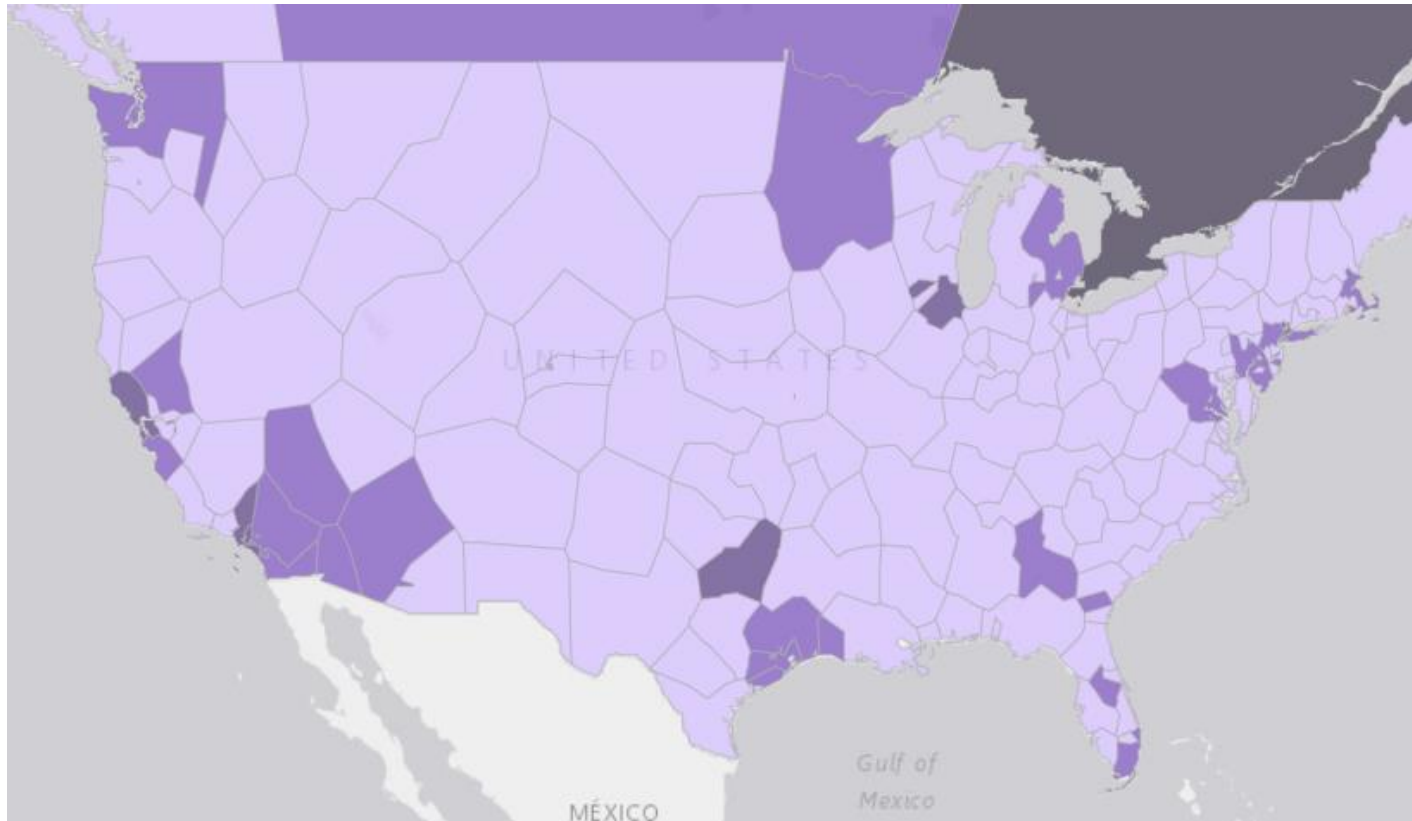
Overwrite the service with a zipped shapefile, update the properties (if fields changed), update sharing

```
flc.manager.overwrite(zippath)  
feature_item.update(item_properties)  
feature_item.share(**sharing)
```

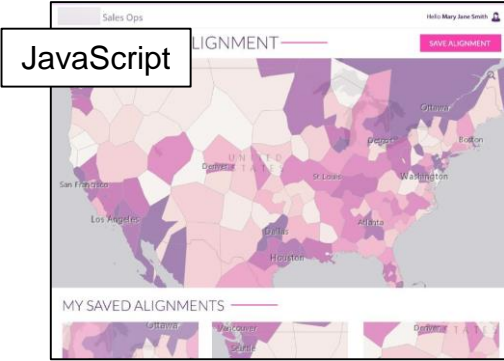
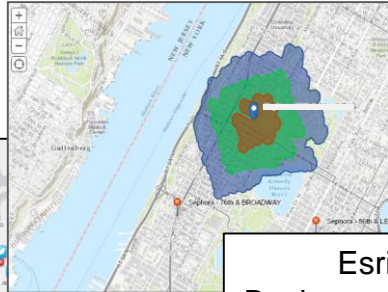
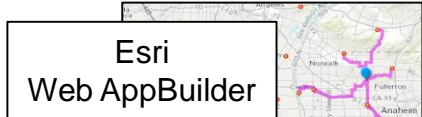

ArcGIS Online



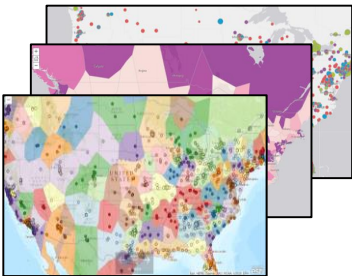
ArcGIS Online – Sales/Area/Period



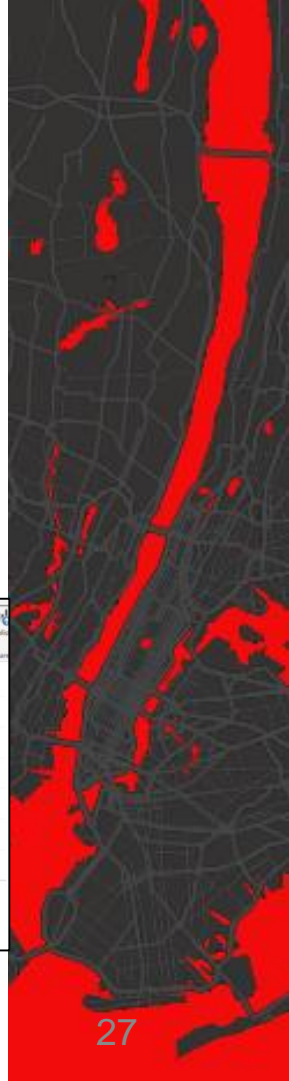
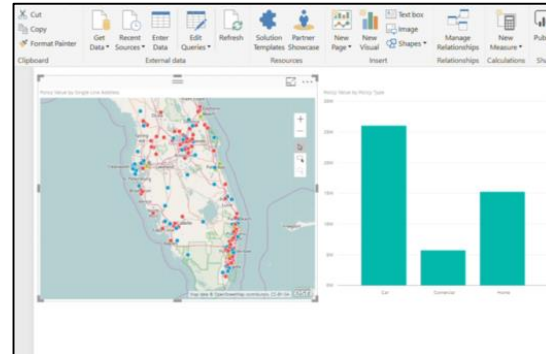
Phase 2 & 3, and Beyond



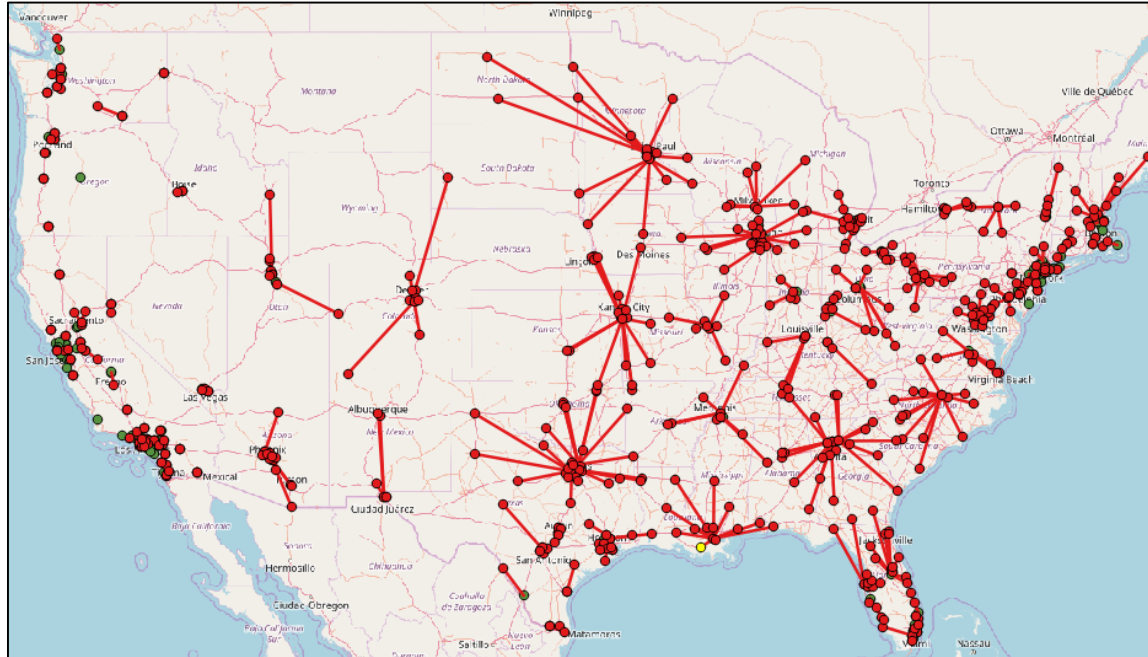
Focused Apps



Maps with BI Data



Ad-Hoc Analysis



Comparative
Retailer Analysis

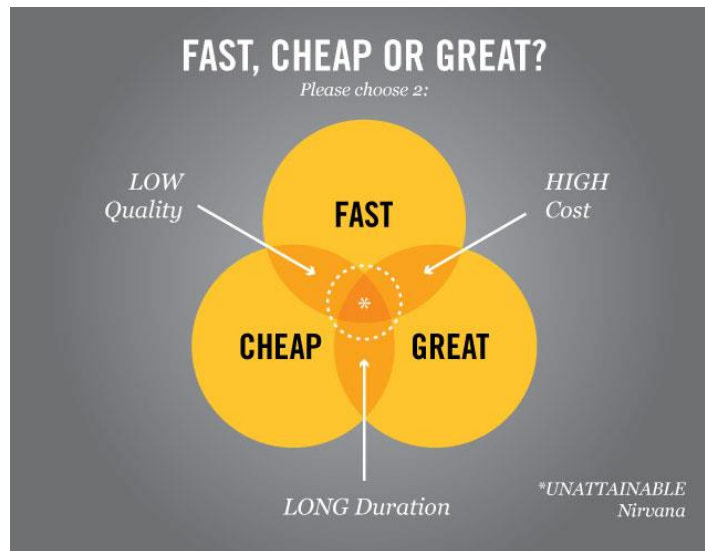
Summary...So Far

- Business data has been mapped
 - Point locations of assets
 - Sales boundaries
 - Sales data by area
- Focused Apps
 - In progress
- Custom Apps/Integrations
 - Future



And You Can Too!

- Fast (80 days)
- Cheap
- Great...
- Flexible
- Extendable
- If...
 - Low volume/velocity of data
 - GIS/Dev skills...you need this anyway.



Thank You!, Questions

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