

Geospatial Analytics and Mapping in Tableau

A complete guide

2023 | v4 - present

About Me...

Grew up around aviation

My second car was a TUG

Worked the Concorde at Dulles

Pilot's license (CFI is a capt with SWA)

Tableau since 2014, lead an internal
Geospatial Champions team

Amazing wife and family!



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Why is Tableau Different?

Welcome to Mapping in Tableau.

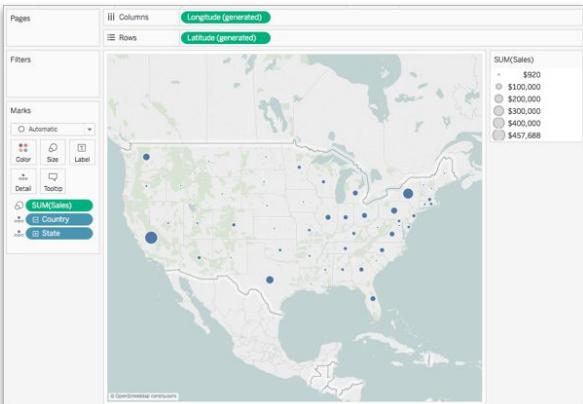
Tableau is different because there is no geospatial module for mapping. It has been organically constructed over the years to meet the needs of customers who love data and more specifically need to answer spatial questions.

It's everything you love about Tableau + the power to answer spatial questions.

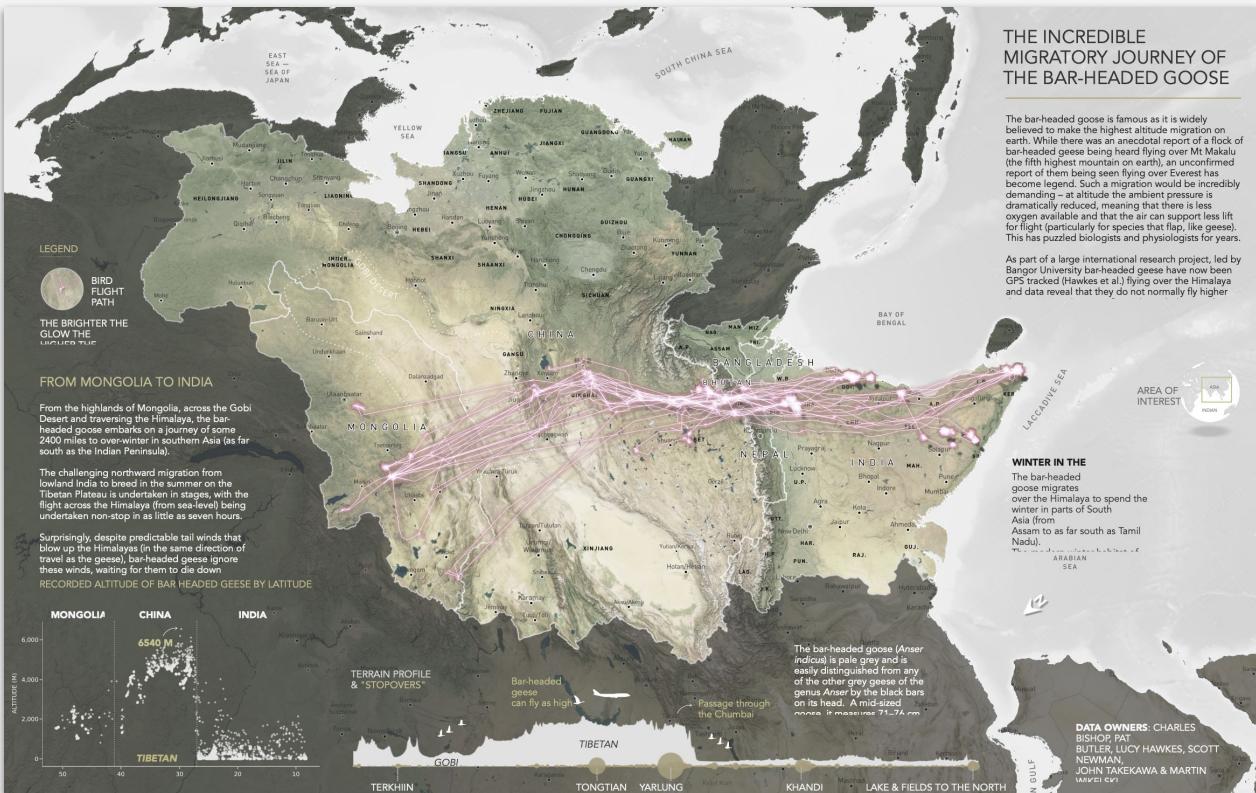


History of Mapping in Tableau

+29 releases since
version 4 | 2008



Today





What's new Spatially!

A history of mapping features in Tableau



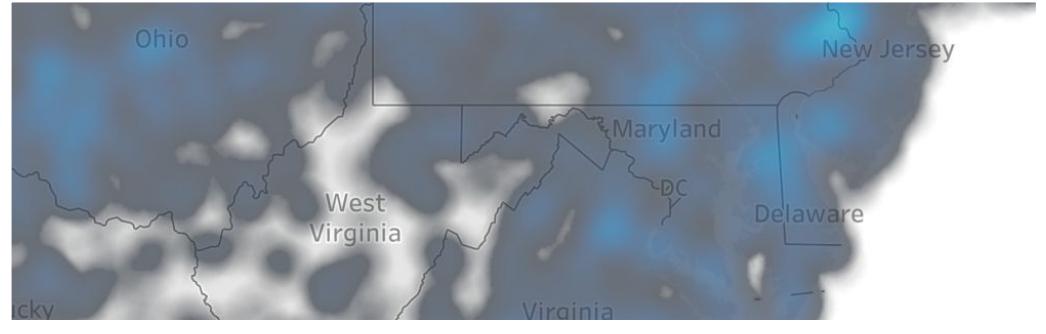
Join

Inner Left Right Full Outer

Data Source: usa-hospital-beds_dataset_usa...

Geometry: Intersects Geometry (usa-hospital...)

Add new join clause



Point maps based on location

Choropleth Maps

MapBox Integration

Spatial Joins

Spatial Formats

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

2018

2019

2020

2021

2022

2023

Origin

08_Fedex_flights

X

MakePoint([Latitude Origin],[Longitude Origin])

Lines - Route

08_Fedex_flights

X

MakeLine(
MakePoint([Latitude Origin],[Longitude Origin]),
MakePoint([Latitude Dest],[Longitude Dest]))

Distance

08_Fedex_flights

X

DISTANCE(
MakePoint([Latitude Origin],[Longitude Origin]),
MakePoint([Latitude Dest],[Longitude Dest]),'miles')

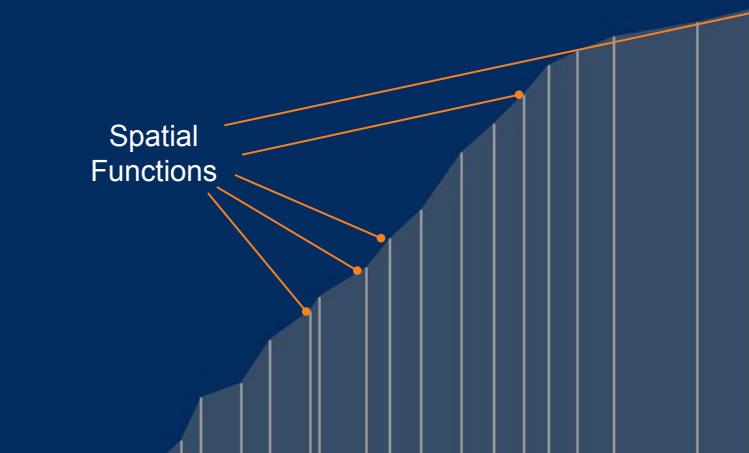
Buffer - Airport

08_Fedex_flights

X

Buffer(
MakePoint([Latitude Origin],[Longitude Origin]),
100,'miles')

Spatial
Functions



Outline

KIL_2018_LERZ_FlowChronologyPolys.shp

OUTLINE([Geometry])

Area - Lava Flow

X

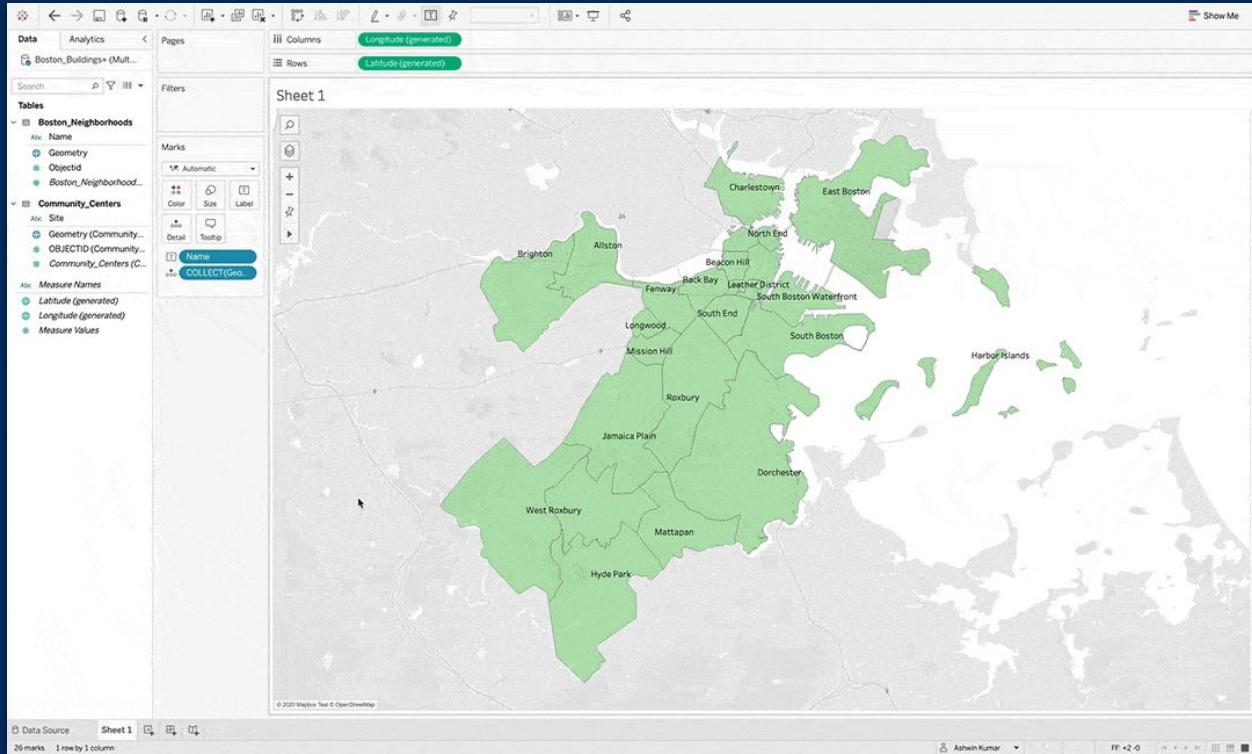
AREA([Geometry],'meters')

2016 2017 2018 2019 2020 2021 2022 2023

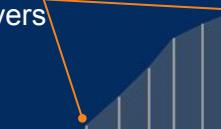


What's new Spatially!

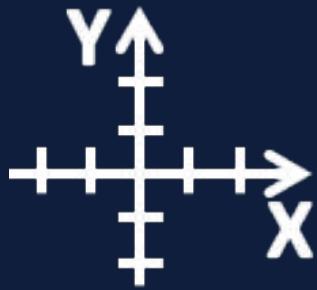
A history of mapping features in Tableau



Map
Layers



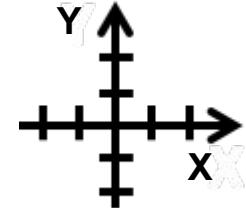
Types of Mapping in Tableau...



Cartesian

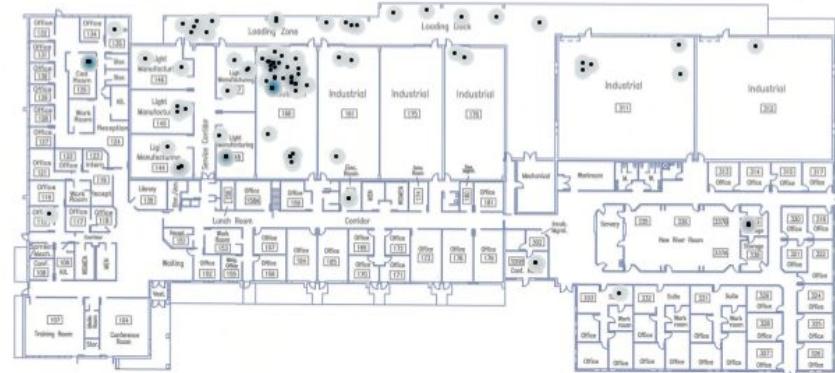
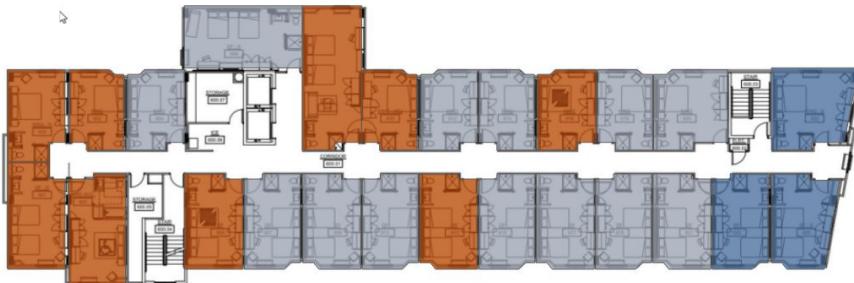
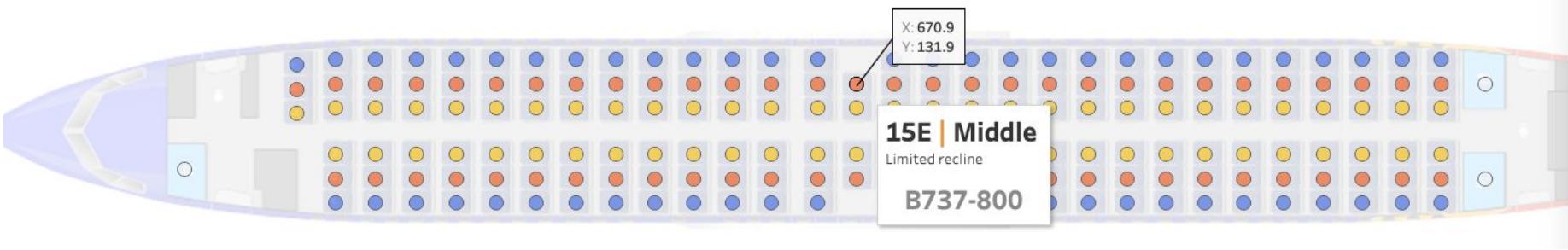


Geographic



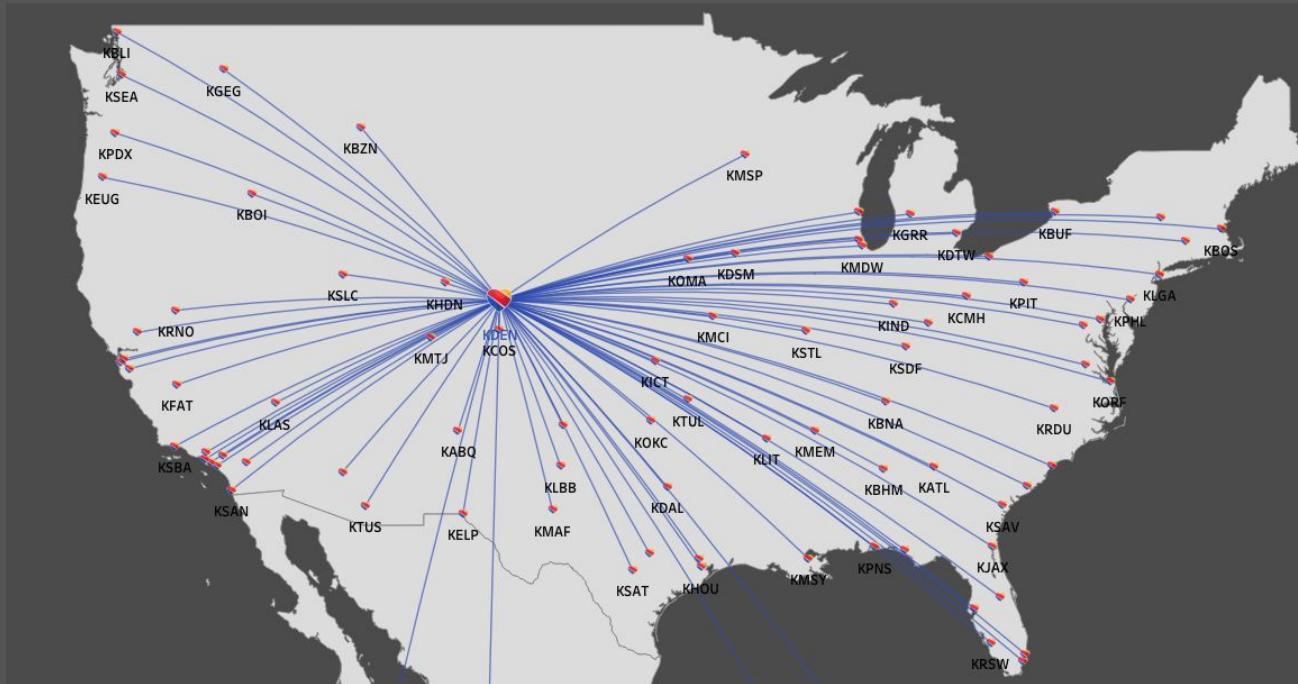
Cartesian:

Using X & Y system of plotting points

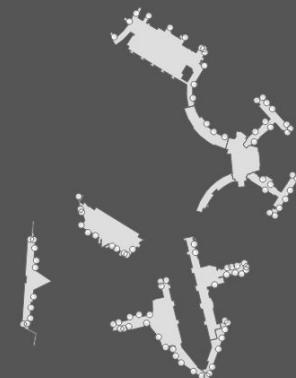


Geographic:

Plotting geometries on a globe (web Mercator projection)



Airport Terminal shapefiles



DEMO

Spatial Formats

Points, Lines and Polygons



Geometries that are unique and do not adhere to political boundaries

Point Geometry
Boston Gates (KML)

Line Geometry
SWA tracks to/from BOS

Polygon Geometry
Airspace boundaries

Spatial Connectivity

Flat files | SHP, KML....

ESRI ArcGIS Server & Online

Microsoft SQL Server

Oracle spatial

PostgreSQL + PostGIS

Redshift Spatial

Snowflake Spatial

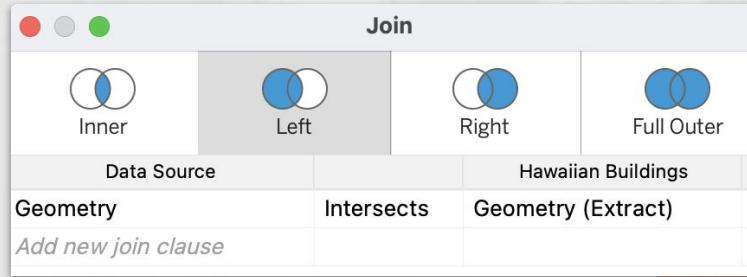
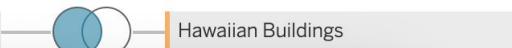
- ✓ Spatial Files (*.geojson *.json *.kml *.mif *.shp *.tab *.topojson gdb *.zip *.kmz)
 - Esri File Geodatabases (gdb *.zip)
 - Esri Shapefiles (*.shp)
 - GeoJSON Files (*.geojson)
 - KML Files (*.kml)
 - KMZ Files (*.kmz)
 - MapInfo Interchange Formats (*.mif)
 - MapInfo Tables (*.tab)
 - TopoJSON Files (*.json *.topojson)
 - Zip Files (*.zip)

Spatial Join

Connecting datasets together spatially

KIL_2018_LERZ_FlowChronologyPolys.shp is made of 2 tables. ⓘ

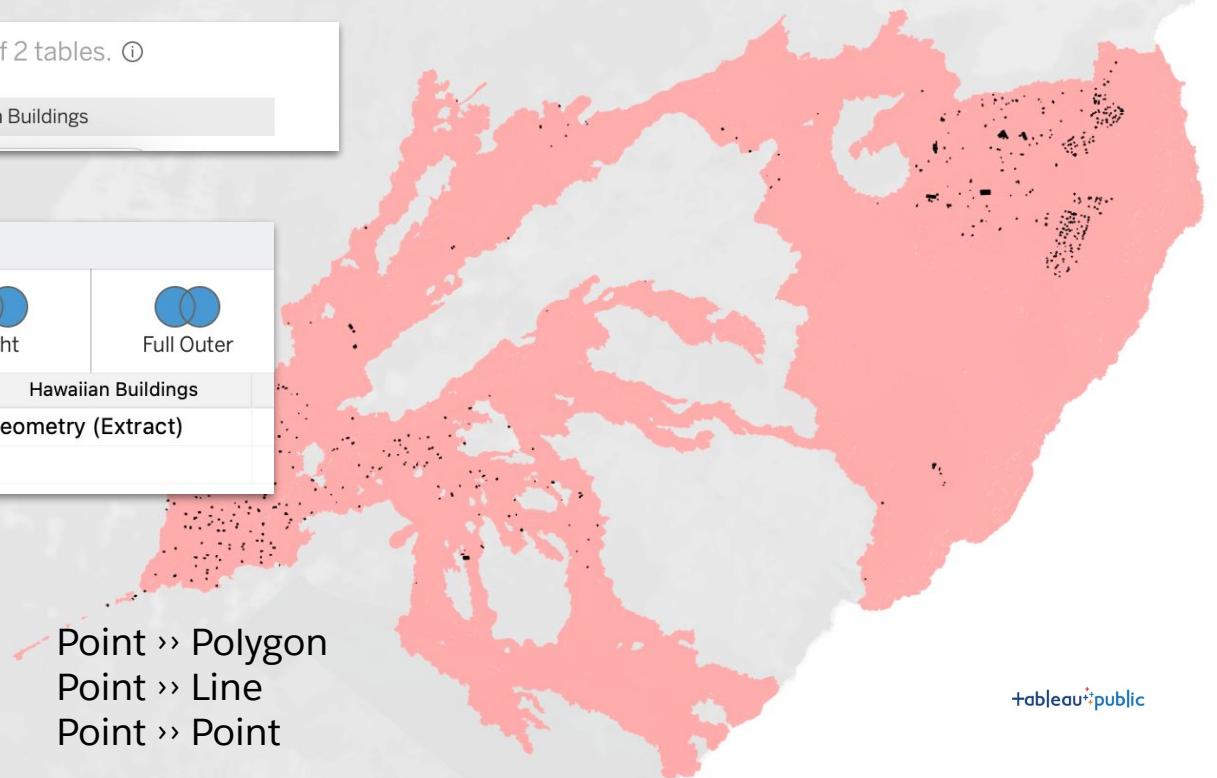
KIL_2018_LERZ_FlowChronology...

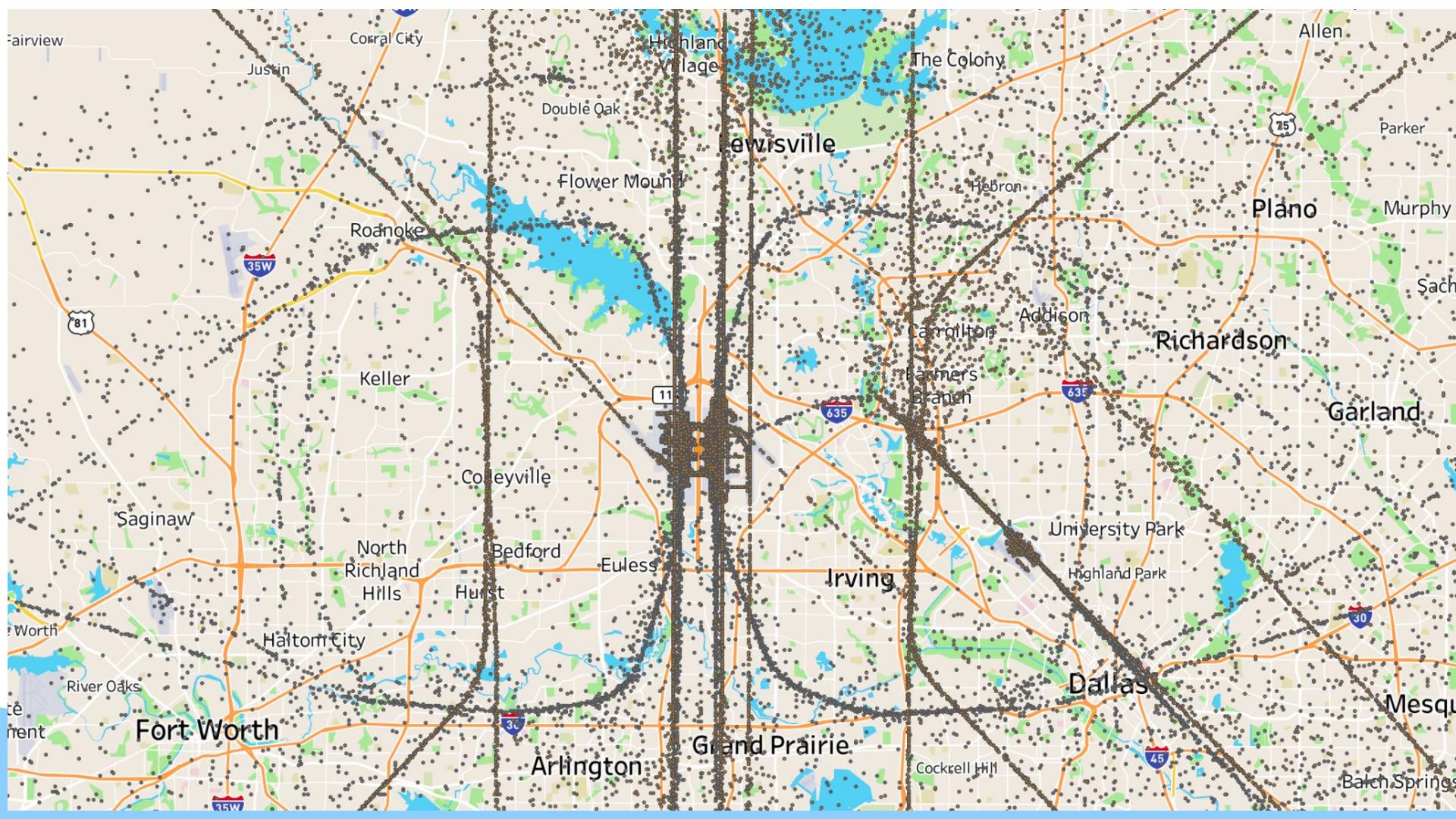


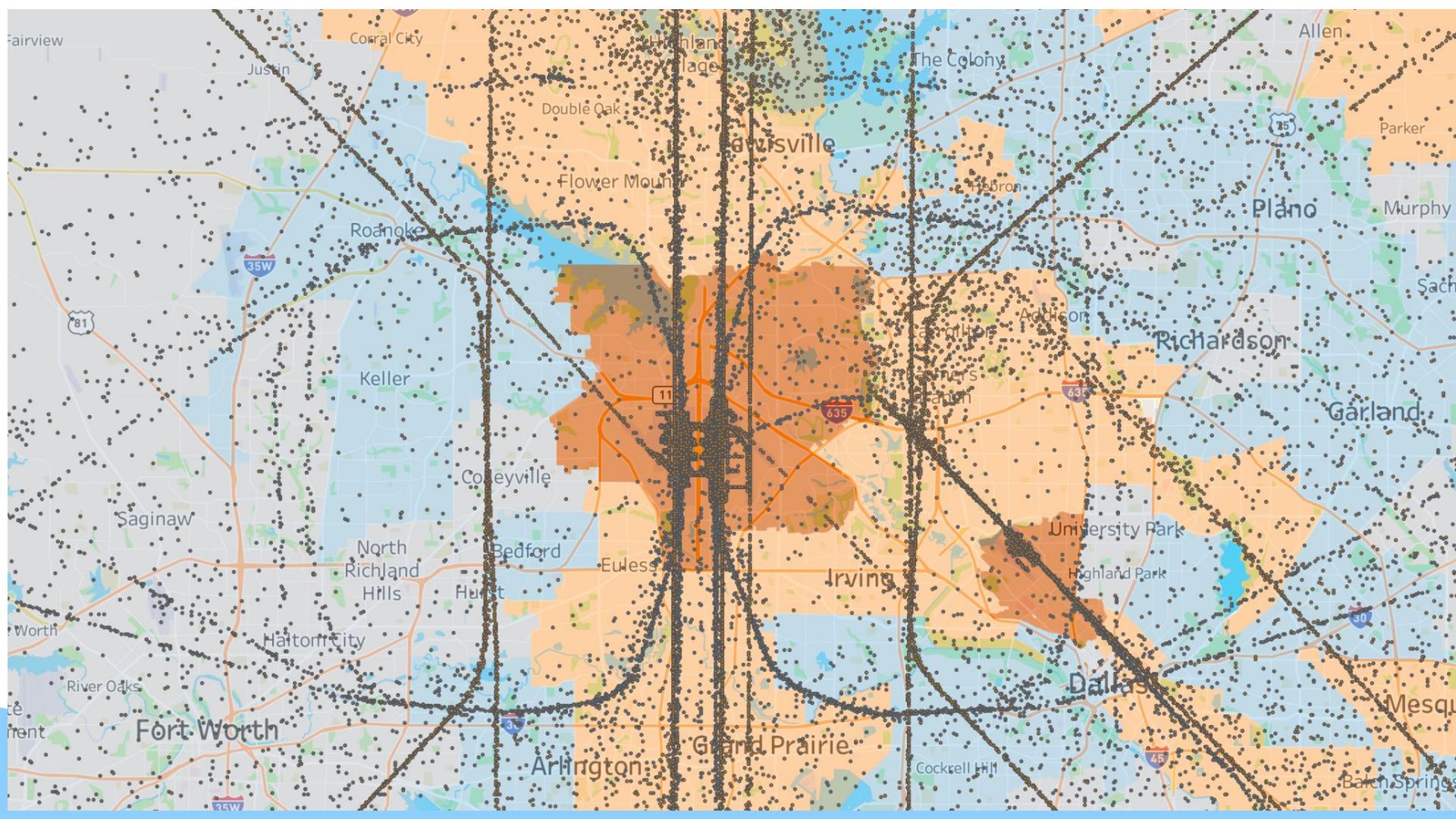
Works with:

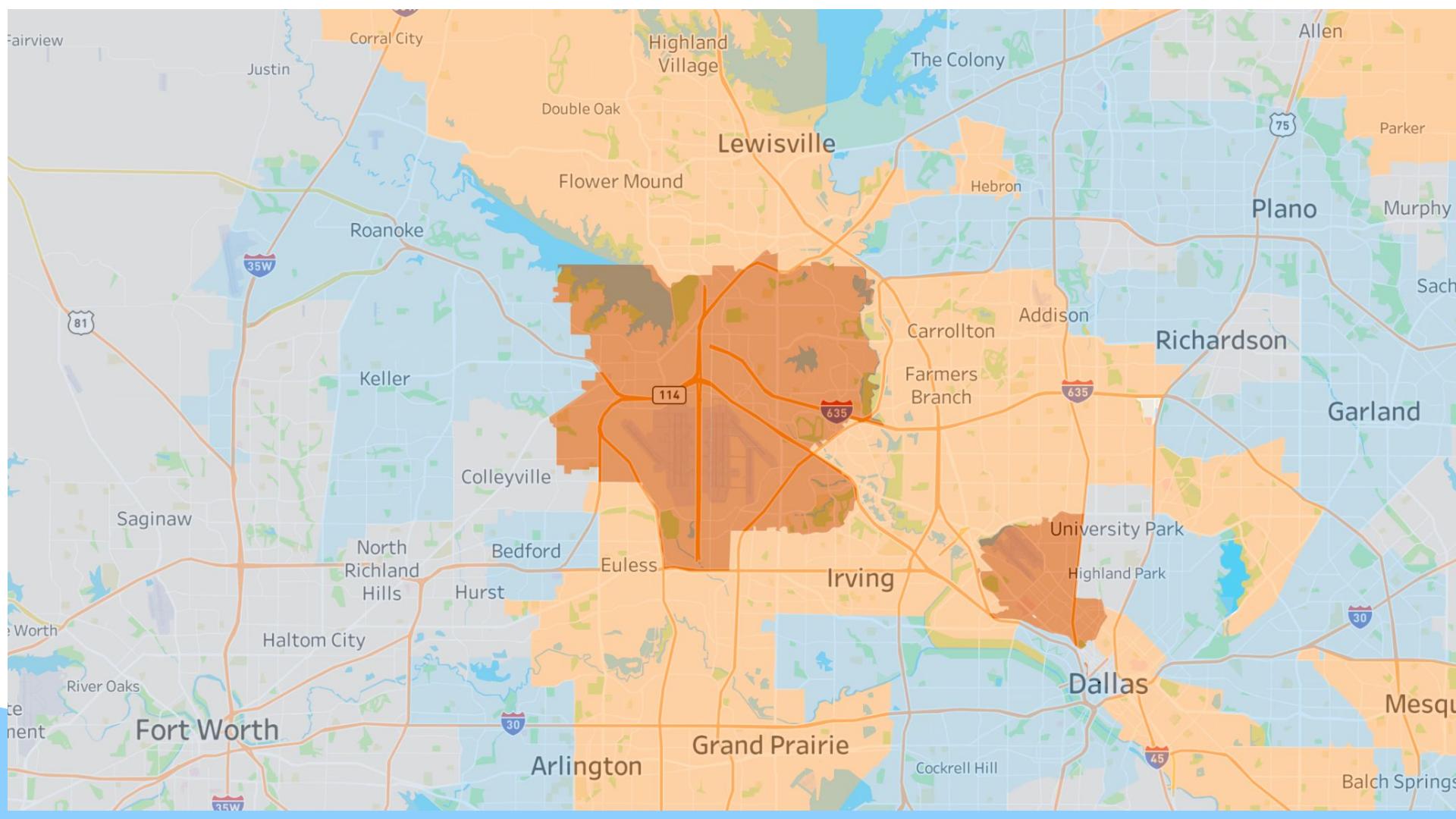
Polygon » Polygon Line » Polygon
Polygon » Line Line » Line
Polygon » Point Line » Point

Point » Polygon
Point » Line
Point » Point



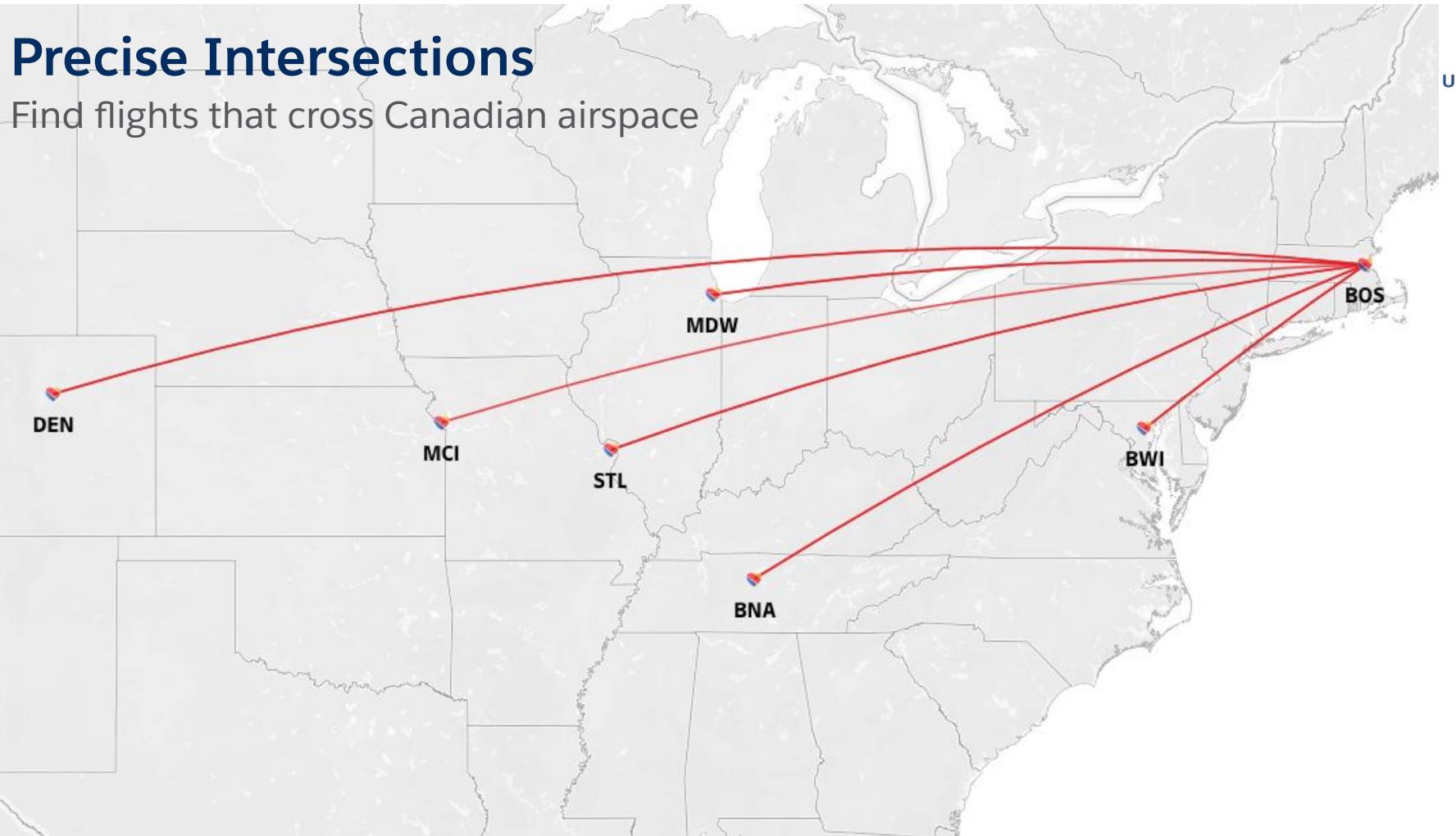






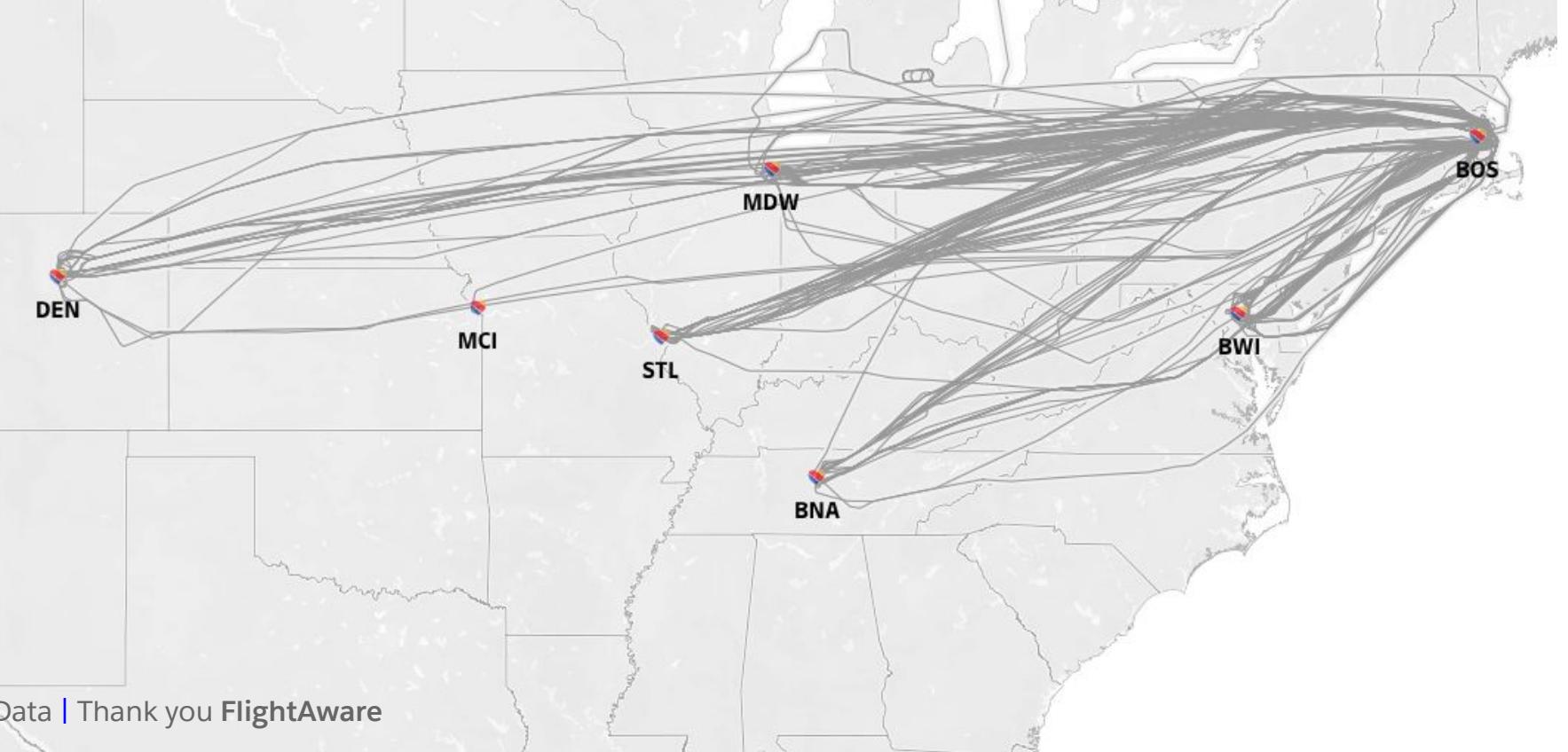
Precise Intersections

Find flights that cross Canadian airspace



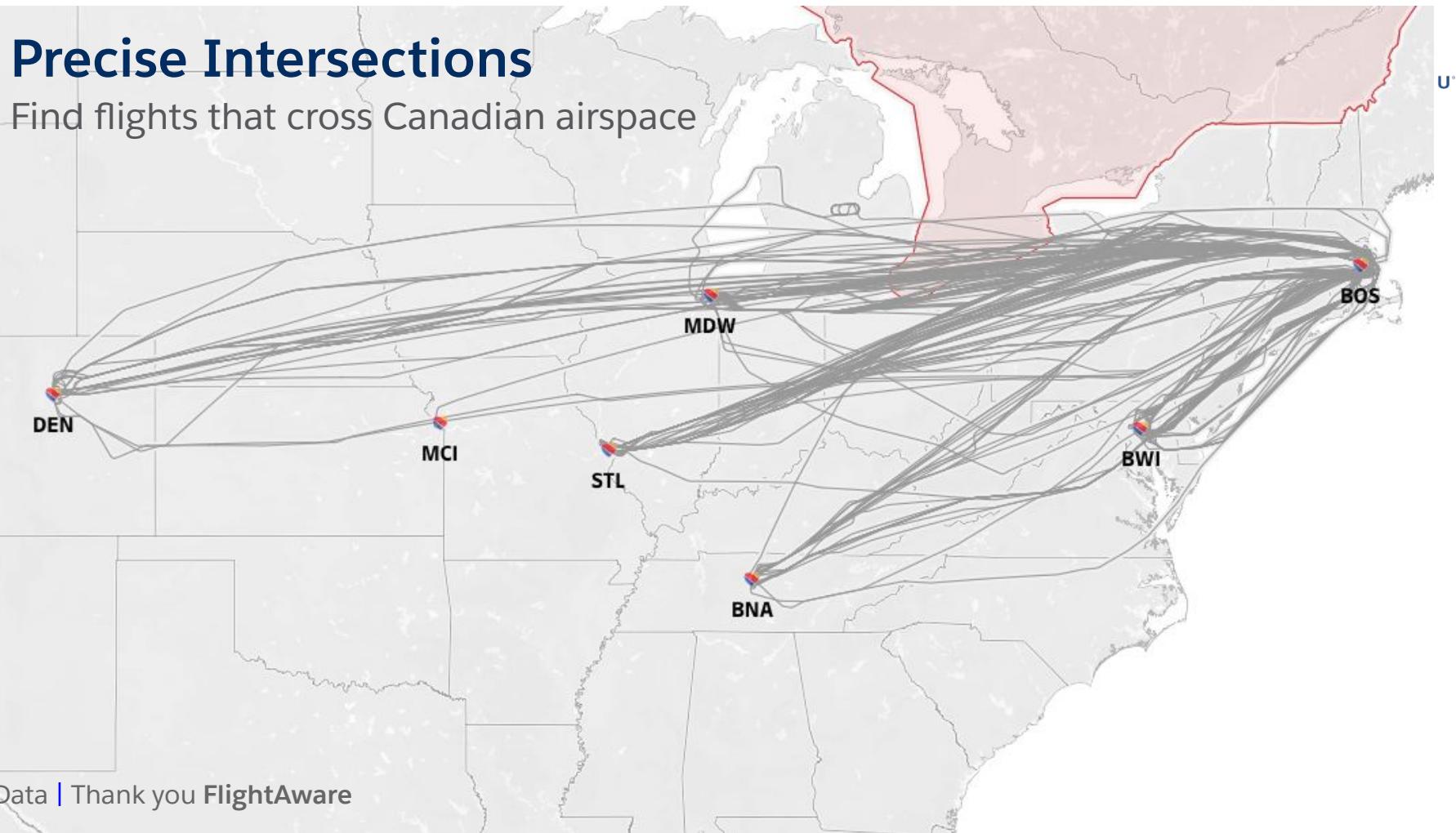
Precise Intersections

Find flights that cross Canadian airspace



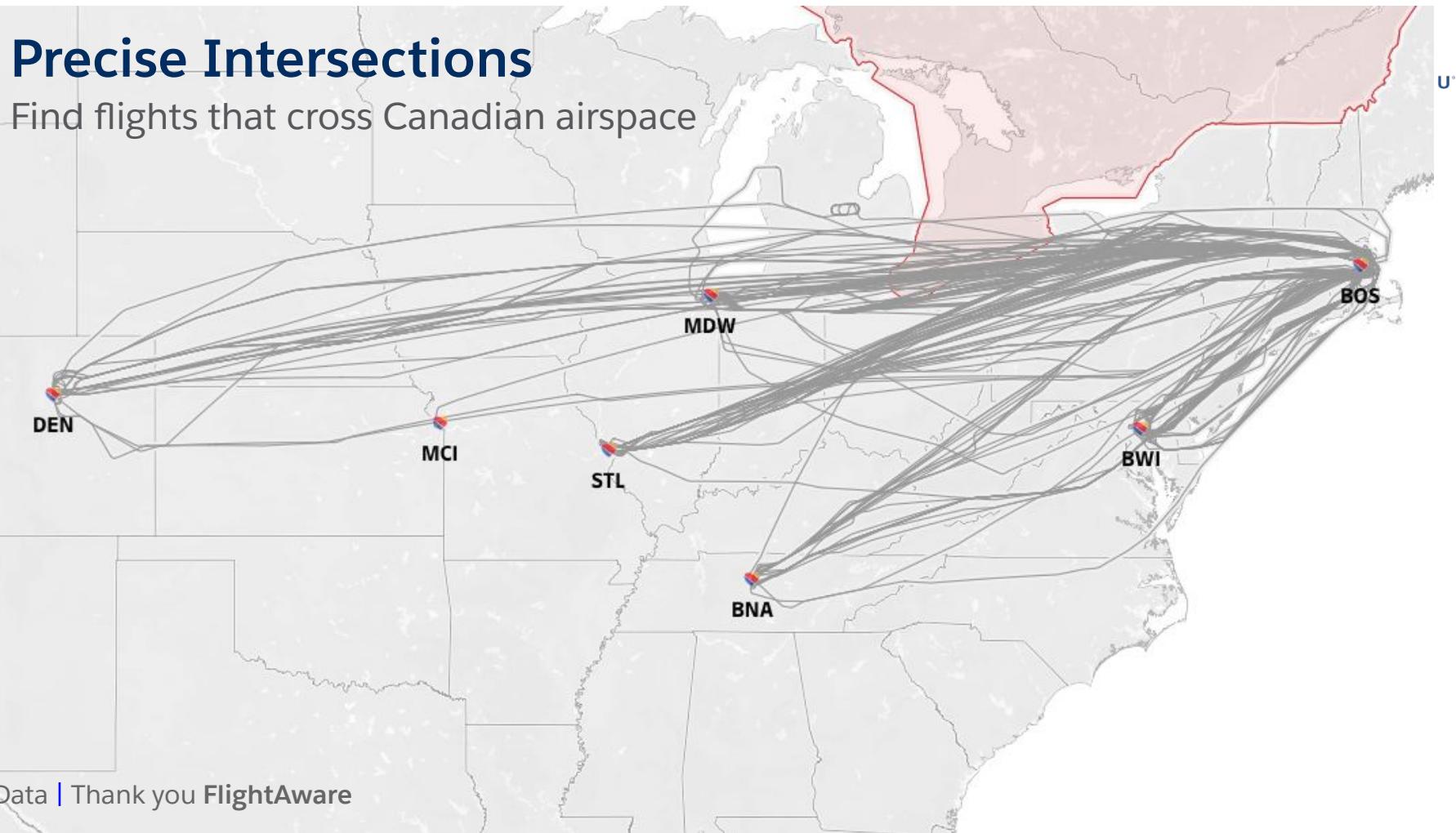
Precise Intersections

Find flights that cross Canadian airspace



Precise Intersections

Find flights that cross Canadian airspace



Precise Intersections

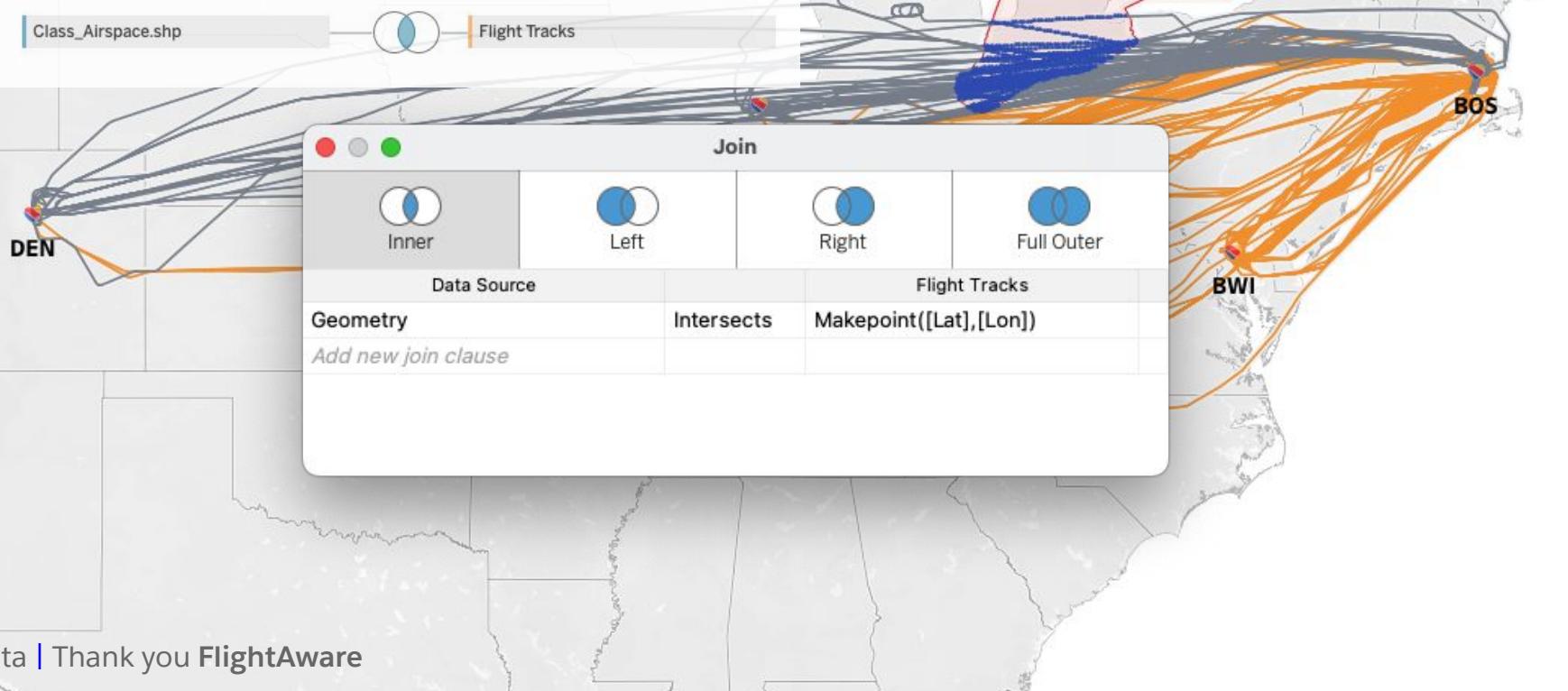
Find flights that cross Canadian airspace

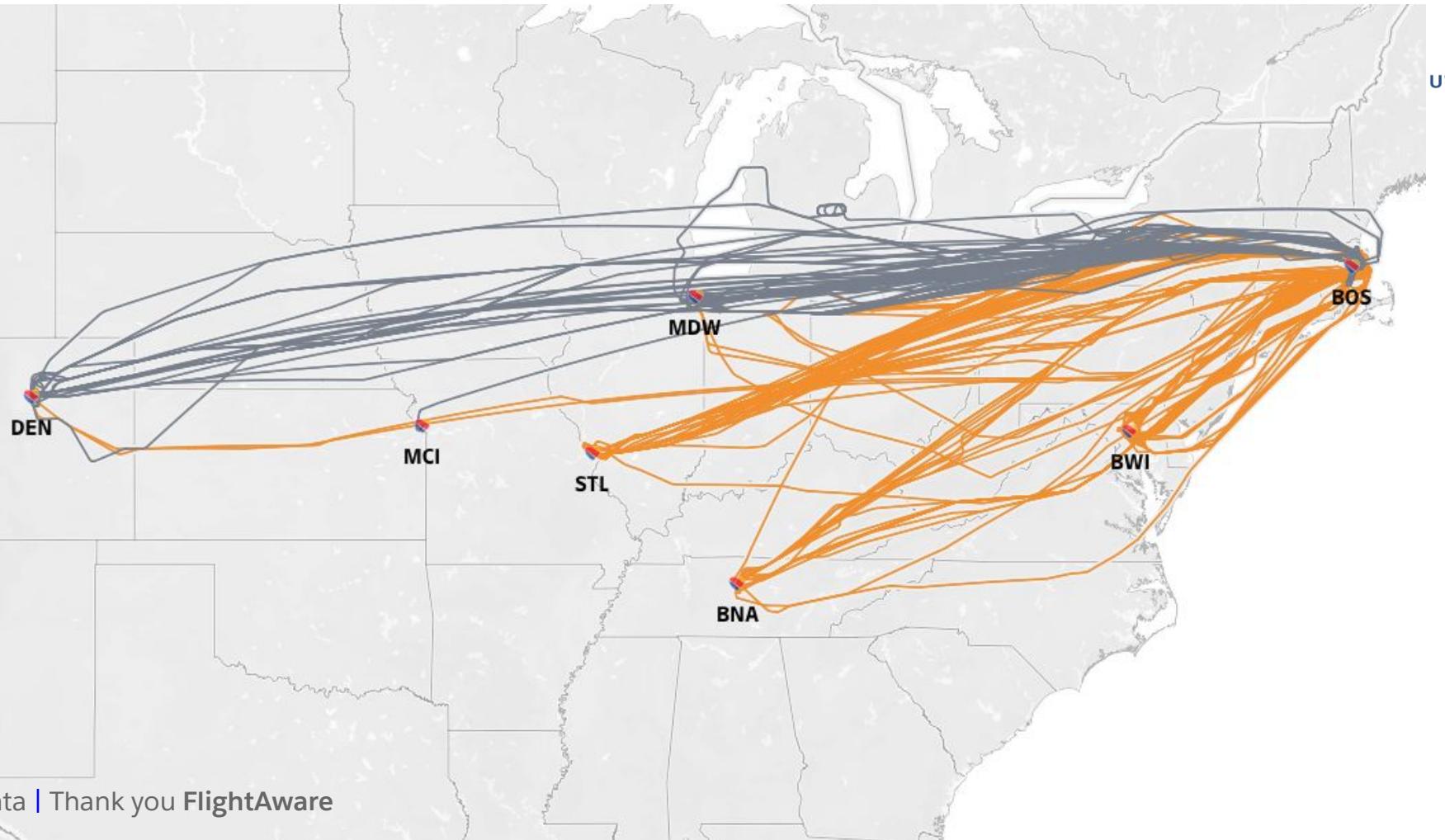
Class_Airspace.shp is made of 2 tables. ⓘ

Class_Airspace.shp



Flight Tracks





Makepoint()

What is it and why is it important?



Spatial data - has 'Geometry' built in

Useful for doing spatial joins

Spatial Join



V4.0



Since V4, - Spreadsheets, txt files, and non-spatial databases mapped with Latitude and Longitude fields

Spatial join
2018.2

Spatial files
10.2 & 10.4

Spatial functions
2019.2 - 2021.2

Using Makepoint() Tableau converts Lat/Lon fields to **spatial geometries** for use with **spatial joins** and other **spatial calculations** such as Distance(), buffer() and others.

MakeLine()

What is it and why is it important?

Route lines

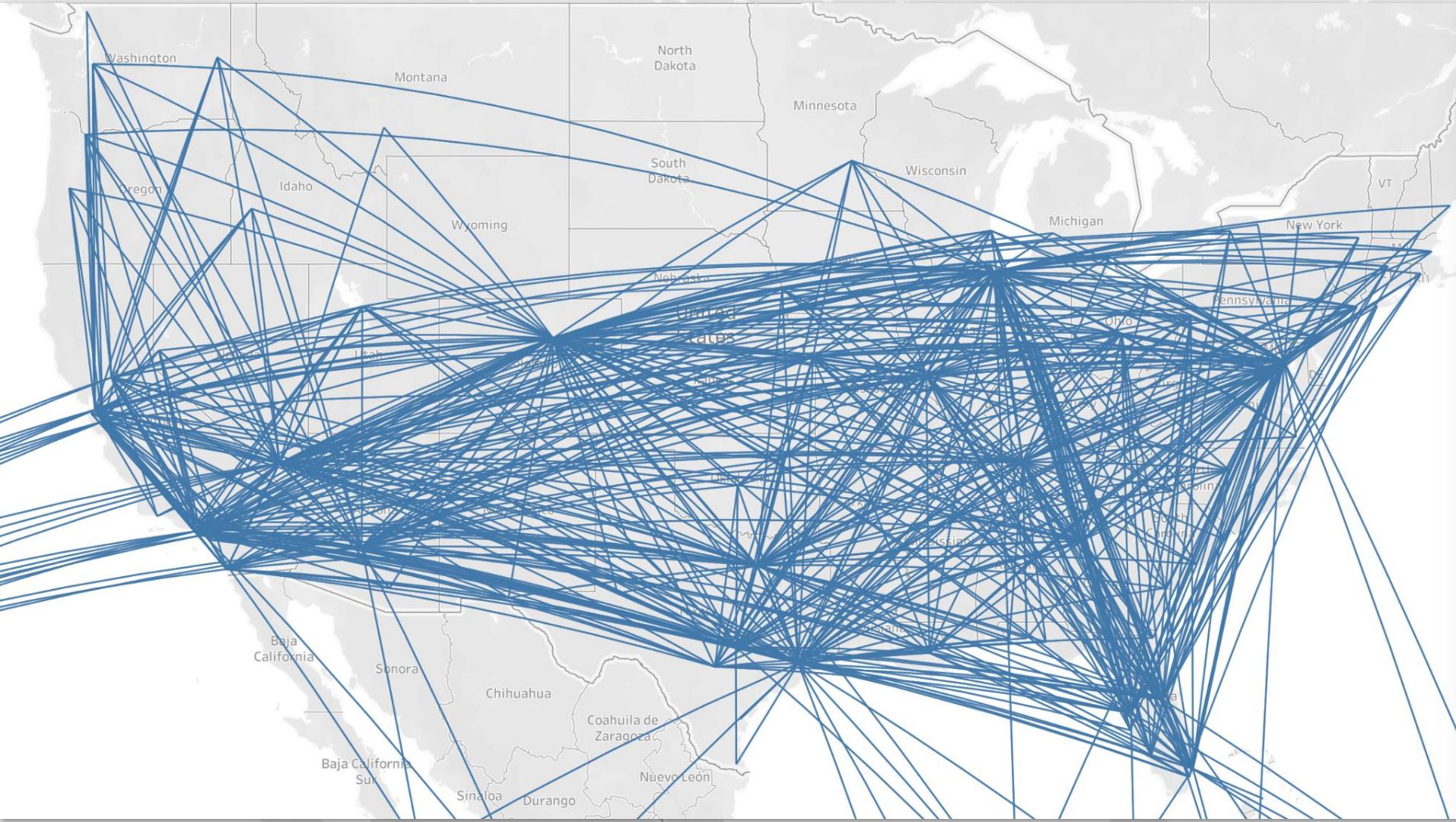


SWA_Flights_week Extract

`MakeLine([Origin_Airport], [Dest_Airport])`

SFO

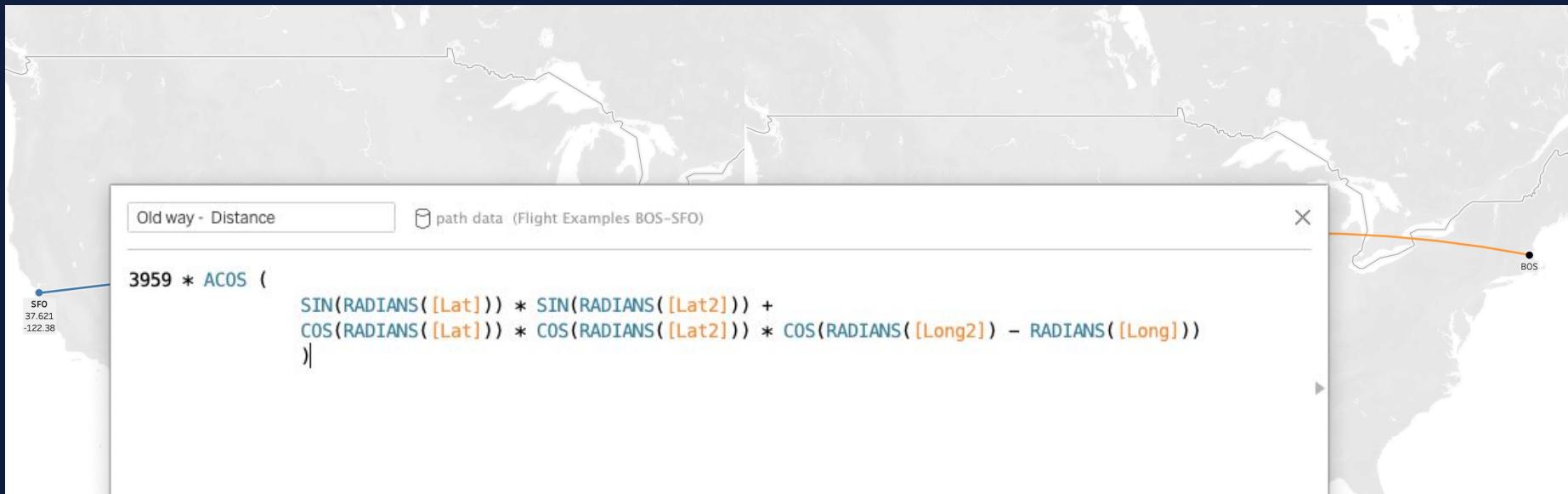
BOS



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Distance()

Using spatial data makes it a lot easier!



The screenshot shows a spatial data interface with a map of North America in the background. A flight path is drawn from San Francisco (SFO) to Boston (BOS) in orange. The SFO location is marked with a blue dot and labeled with coordinates: 37.621, -122.38. The BOS location is marked with a black dot and labeled BOS. In the foreground, a modal dialog box is open with the title "Old way - Distance". It contains a text input field with the placeholder "path data (Flight Examples BOS-SFO)". Below the input field is a code editor containing the following formula:

```
3959 * ACOS ( SIN(RADIANS([Lat])) * SIN(RADIANS([Lat2])) + COS(RADIANS([Lat])) * COS(RADIANS([Lat2])) * COS(RADIANS([Long2]) - RADIANS([Long])) )
```

At the bottom left of the dialog, the text "The calculation is valid." is displayed. At the bottom right, there are buttons for "Dependencies" (with a count of 5), "Apply", and a large green "OK" button.

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Distance()

Using spatial data makes it a lot easier!

The screenshot shows a spatial data editor interface with a map of North America in the background. A flight path is drawn from San Francisco (SFO) to Boston (BOS).

Old way - Distance:

```
3959 * ACOS ( SIN( [Lat] ) * SIN( 34.0522 ) + COS( [Lat] ) * COS( 34.0522 ) * COS( 122.38 - 71.0589 ) )
```

New way - Distance:

```
Distance([Origin], [Destination], 'miles')
```

path data (Flight Examples BOS-SFO)

RADIANS([Long]))

Apply OK

The calculation is valid.

The calculation is valid. 4 Dependencies **Apply OK**

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Buffer calculation

Two reasons to use buffer... 1



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Buffer calculation

Two reasons to use buffer... 2

Connections Add

- Airports_Large Text file
- Airports Microsoft Excel

Files

- Use Data Interpreter
Data Interpreter might be able to clean your Text file workbook.
- Airports_Large.csv
- New Union

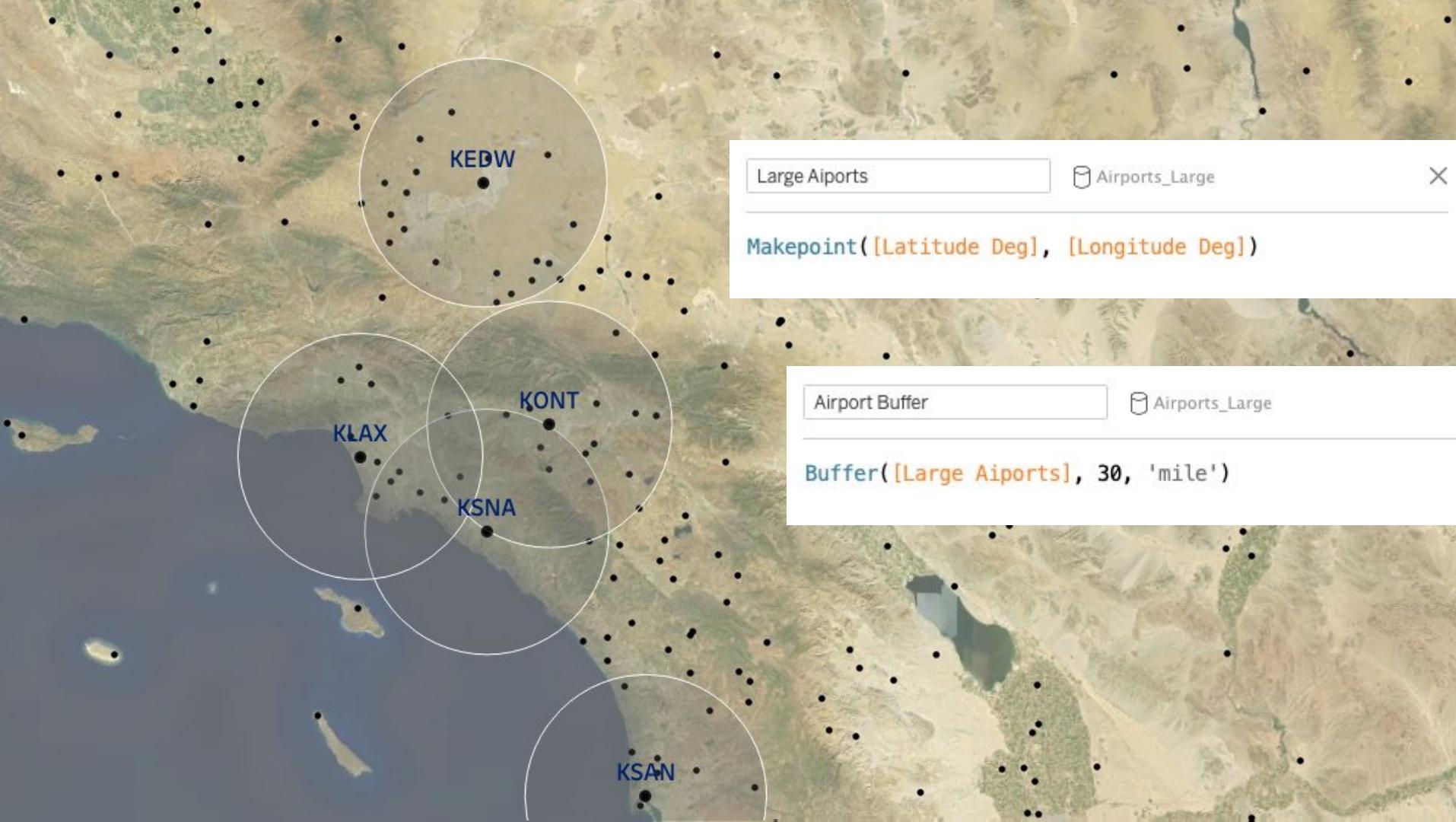
Airports_Large.csv is made of 2 tables. ①

Airports_Large.csv Join Airports

Data Source		Airports	
Inner	Left	Right	Full Outer
Buffer(...)	Intersects	Makepoint([Latitude Deg1],...	
Add new join clause			

Join calculation Airports_Large

```
Buffer(makepoint([Latitude Deg], [Longitude Deg]), 30, 'mile')
```



Large Aiports

Airports_Large

Makepoint([Latitude Deg], [Longitude Deg])

Airport Buffer

Airports_Large

Buffer([Large Aiports], 30, 'mile')

Connections Add

Airports_Large
Text file

Airports
Microsoft Excel

Files

Use Data Interpreter
Data Interpreter might be able to clean your Text file workbook.

Airports_Large.csv

New Union

Airports_Large.csv is made of 2 tables. ⓘ

Airports_Large.csv Airports

Join

Inner Left Right Full Outer

Data Source Airports

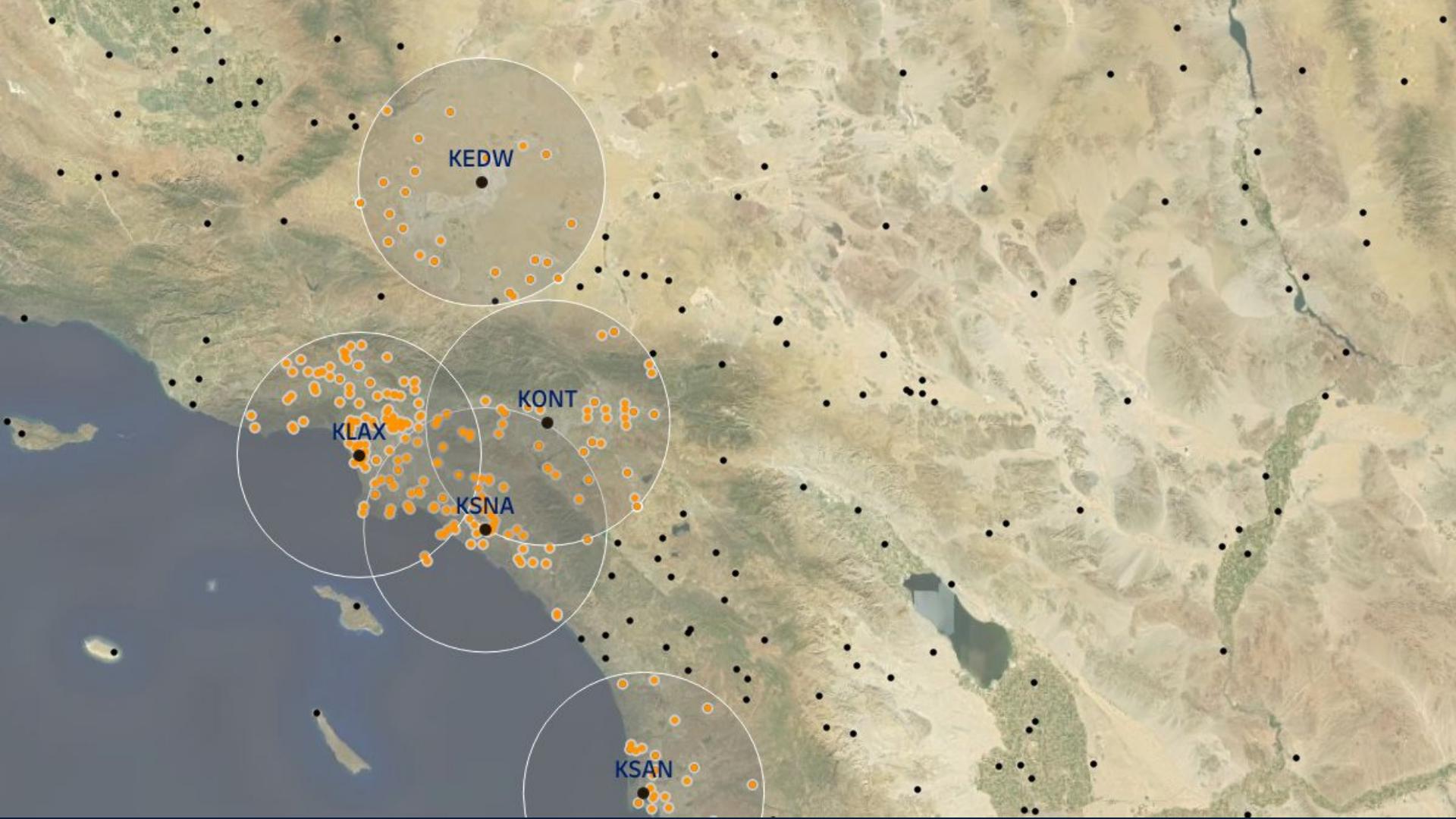
Buffer(...) Intersects Makepoint([Latitude Deg1],...)

Add new join clause

Join calculation Airports_Large

Buffer(makepoint([Latitude Deg], [Longitude Deg]), 30, 'mile')

The screenshot shows a geospatial data analysis interface. At the top, a map displays numerous airport locations marked with black dots. One specific airport, KEDW, is highlighted with a white circle and labeled with its code. Below the map is a sidebar with 'Connections' and 'Files' sections. Under 'Connections', 'Airports_Large' (Text file) and 'Airports' (Microsoft Excel) are listed. Under 'Files', 'Airports_Large.csv' is selected, with a note about using a Data Interpreter to clean it. A 'New Union' item is also present. The main workspace shows that 'Airports_Large.csv' contains two tables. A 'Join' dialog is open, showing four join types: Inner, Left, Right, and Full Outer. The 'Left' join is selected. The 'Data Source' dropdown is set to 'Airports'. The 'Buffer(...)' and 'Intersects' fields are visible, along with a placeholder for a calculation involving latitude and longitude. A tooltip for the 'Join calculation' field shows the formula 'Buffer(makepoint([Latitude Deg], [Longitude Deg]), 30, 'mile')'. The bottom part of the interface shows a partial URL 'KEDW'.



Intersects() calculation

Roxbury

Intersects

311 Extract

INTERSECTS([Bos boundaries], [Loc])

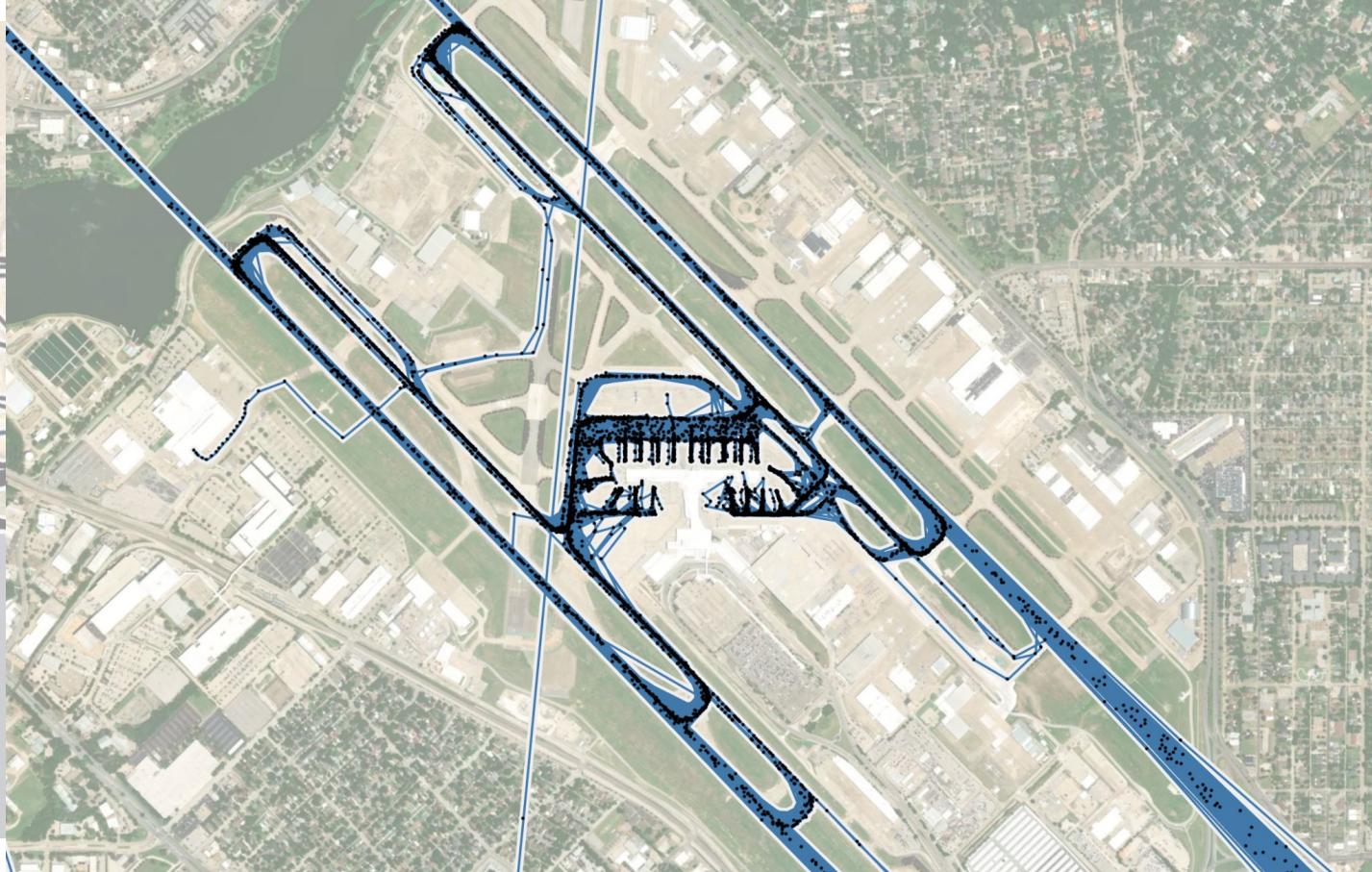
Results in a boolean TRUE or FALSE result

Extract

Boston_Neighborhoods.geojson

Join			
Inner	Left	Right	Full Outer
Data Source		Boston_Neighborhood...	
Neighborhood	=	Name	
Add new join clause			

Hexbin maps



Hexbin maps

80k data points



HexbinY

SWA_Flights_week Extract

`HEXBINY([Longitude]*[Adjuster] , [Latitude]*[Adjuster])/[Adjuster]`



HexbinX

SWA_Flights_week Extract

`HEXBINX([Longitude]*[Adjuster] , [Latitude]*[Adjuster])/[Adjuster]`

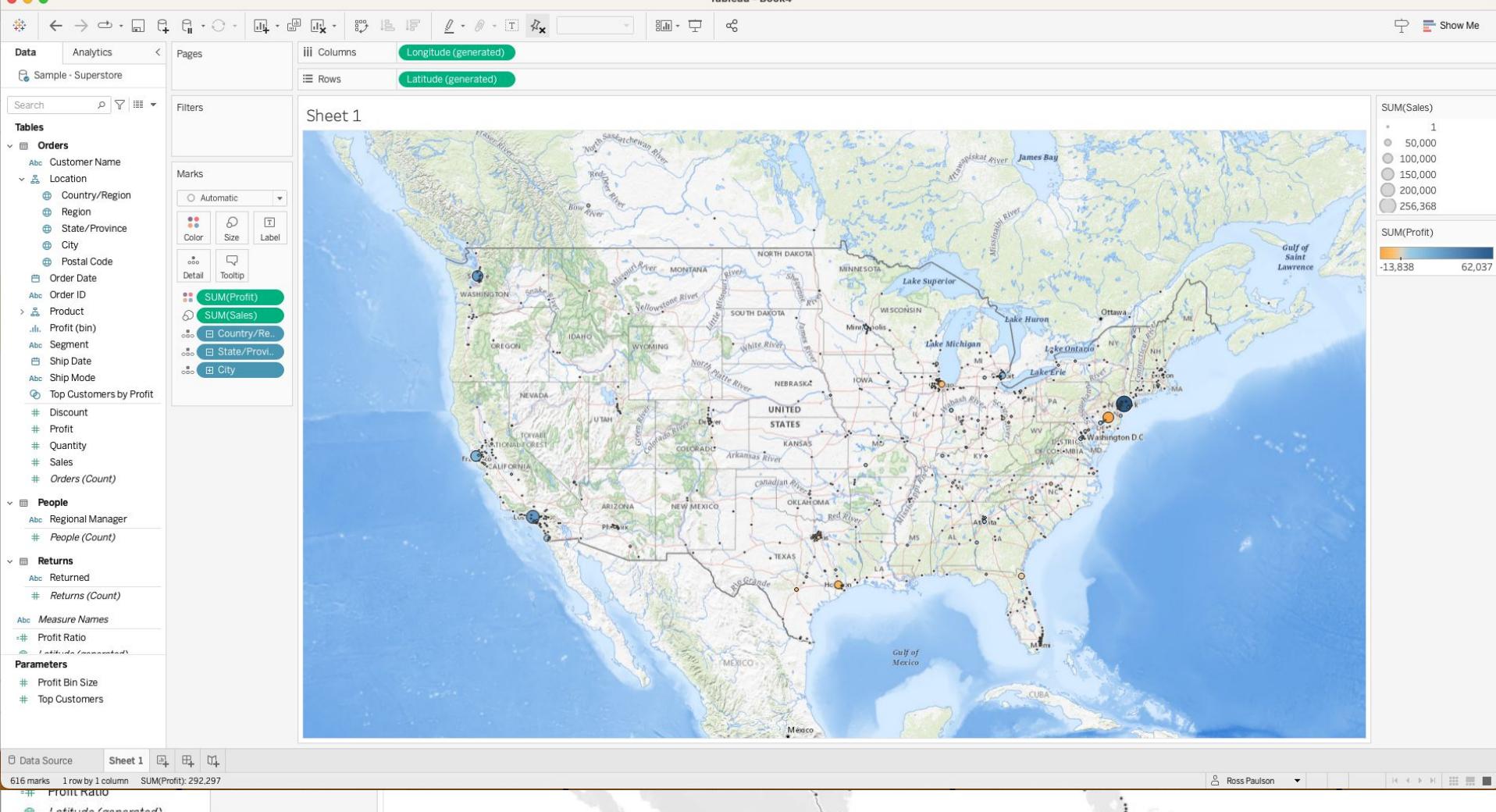


“Adjuster” is a Parameter

WMS and using MapBox

Custom backgrounds

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Web Mapping Service | WMS

Custom backgrounds

The OpenGIS® Web Map Service Interface Standard (WMS) provides a simple HTTP interface for requesting geo-registered map images from one or more distributed geospatial databases.

- Useful in offline environments
- Specific & Unique map needs

The screenshot shows a map application interface with a sidebar titled "Map Layers". The sidebar includes sections for "Background" and "Map Layers". Under "Background", there is a dropdown for "Style" set to "Chartbundle Chart Proxy" and a slider for "Washout" at 48%, with a checked checkbox for "Repeat Background". Under "Map Layers", a long list of checkboxes is shown, with the last one, "Chartbundle (enrh)", checked. At the bottom of the sidebar, there is a section for "Data Layer" with a dropdown set to "No Data Layer".

Map Layers

OSM
 Chartbundle
 Chartbundle (secdebug)
 Chartbundle (sec_3857)
 Chartbundle (secgrids)
 Chartbundle (sececlipse)
 Chartbundle 4326
 Chartbundle (wac)
 Chartbundle (wac_3857)
 Chartbundle (wacgrids)
 Chartbundle 4326 (wac_4326)
 Chartbundle (tac)
 Chartbundle (tac_3857)
 Chartbundle (tagrids)
 Chartbundle (taceclipse)
 Chartbundle 4326 (tac_4326)
 Chartbundle (hel)
 Chartbundle (hel_3857)
 Chartbundle (helgrids)
 Chartbundle (heleclipse)
 Chartbundle 4326 (hel_4326)
 Chartbundle (enrl)
 Chartbundle (enrl_3857)
 Chartbundle 4326 (enrl_4326)
 Chartbundle (enrh)
 Chartbundle (enrh_3857)
 Chartbundle 4326 (enrh_4326)

Data Layer

Layer: No Data Layer

Styles > Blank-copy : Edited less than a minute ago

Components Layers

Share & develop 

Draft Production

The Production URL is cached for performance and scale, so new changes may take a few minutes to appear.

Published 1 minute ago

Learn more about using an iframe to embed your style in a website.

Developer resources

Web iOS Android Unity Third party

Tableau 

Integration URL: <https://api.mapbox.com/styles/v1/r...> 

In Tableau, click Map > Background Maps > Map Services > Add > Mapbox Maps. Then paste in the share URL above. This feature is available in Tableau 9.3 and above.

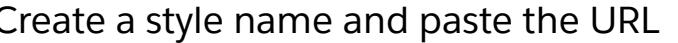
Download: [Blank-copy.zip](#)

Stylesheet (JSON), icons (SVG), and fonts (TTF or OTF)

Background Maps

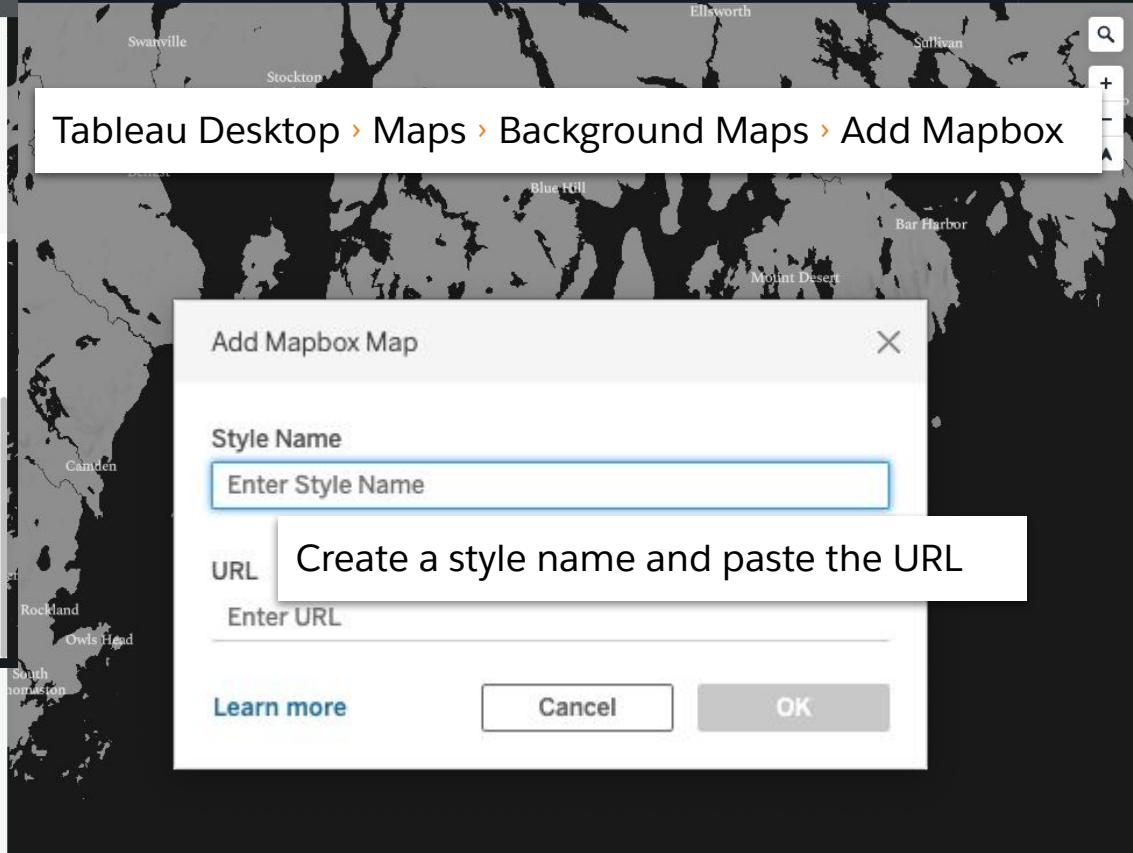
Add Mapbox Map

Style Name

URL 

Enter URL

Learn more Cancel OK



Facilities Mapping

+++ + a b | e a u

New Orleans Ernest Morial Convention Center | COVID-19 Hospitalization

| Hover over Orange room for details or, click to go to room dashboard

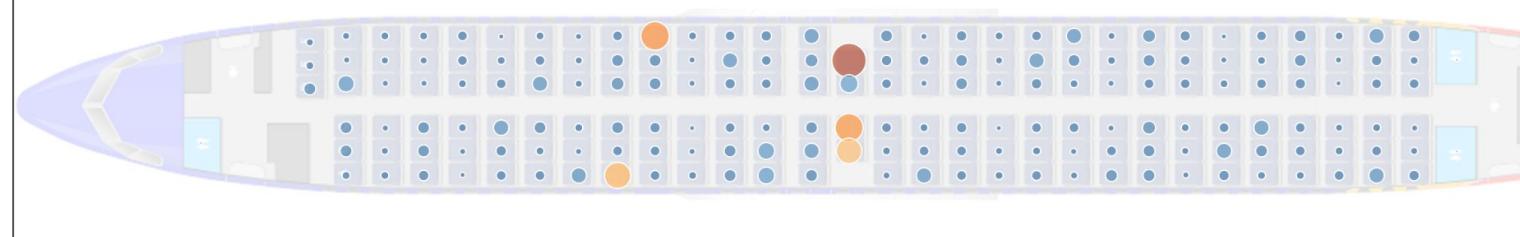
| Orange rooms have beds | gray rooms are currently empty

FIRST FLOOR

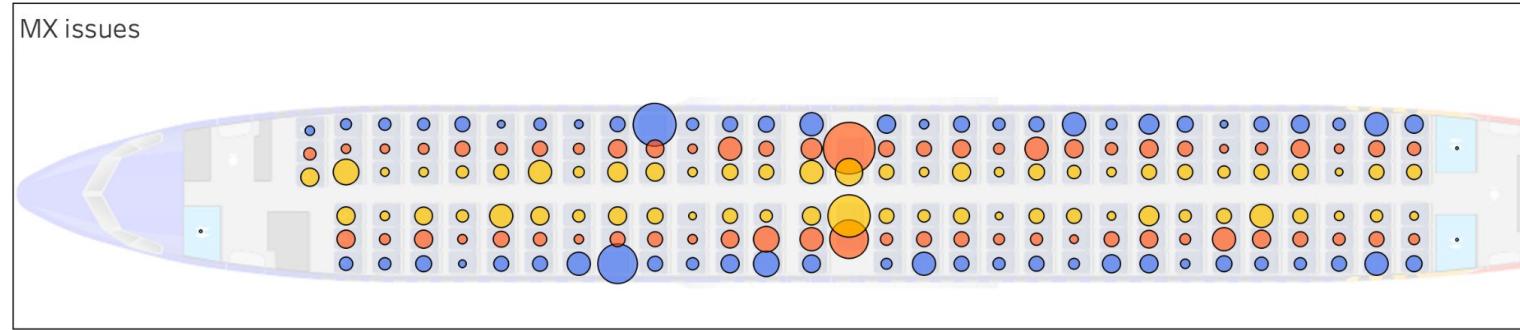


See all Bed Locations

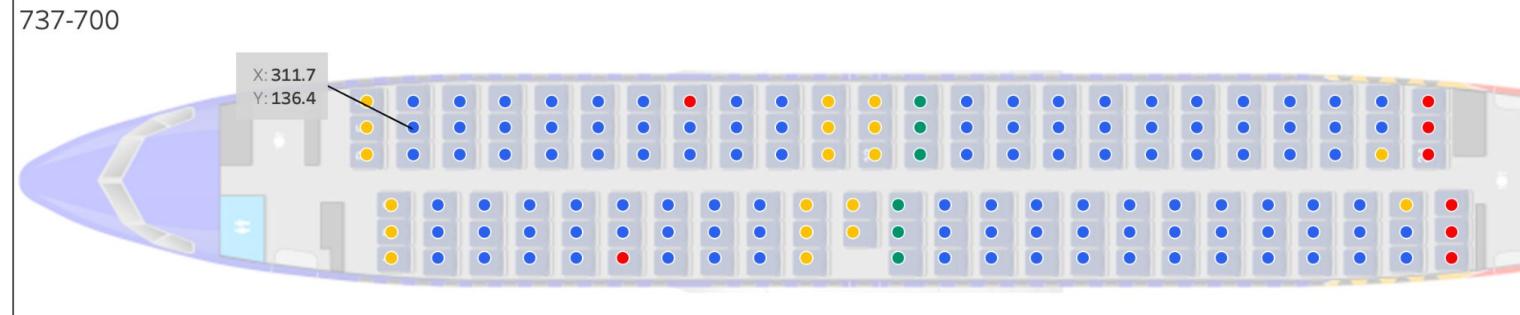
737-800/MAX 8



MX issues



737-700



Learn about Mapping on Tableau

Ross Paulson:

<https://public.tableau.com/app/profile/rpaulson>

Tableau Tim:

YouTuber: Map layers Multiple data sources 2021.4

https://www.youtube.com/watch?v=O_LvTD2UyYg

Alan Walker:

<https://public.tableau.com/app/profile/allan.walker>

<https://blog.mapbox.com/my-favorite-tableau-visualizations-d85e869200b4>

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tab|eau⁺₊public

public.tableau.com/app/profile/rpaulson