

Adding point data: Find patterns in mountains of data



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Lesson Overview

You begin to get a strong sense of what maps can do from this lesson. The image shows a total of 58,000 airline routes on one map. The Web Mercator projection transforms the straight flight paths into curves. You are going to use this map to solve a spatial problem while also learning how GIS software deals with point data. Locational information contained in point data adds the spatial component that the map needs to locate the information. Point data can get its locational information from latitude and longitude or from a street address.

The [International Federation of Air Traffic Controllers' Associations \(IFATCA\)](#) wants to investigate flights going in and out of three of the busiest airports in the world: London, New York, and Atlanta. The federation wants a visual representation of the flight routes to each of the airports within the three cities.

Builds skills in

- Opening and modifying an existing online map
- Filtering
- Adding x,y data
- Geocoding data
- Creating bookmarks

Software Requirements

- ArcGIS Online account (get a [free trial](#))

Estimated Time

- 30 - 60 minutes

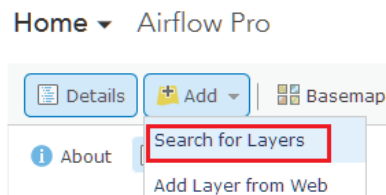
Exercise

Step 1: Open the map, add and filter data

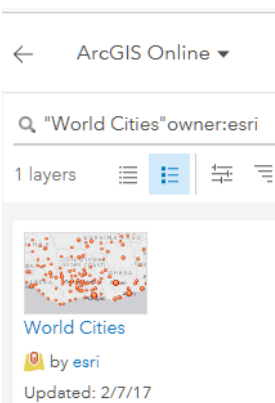
1. Open the [Airflow Pro map](#).
2. At the top of the page, Click **Sign In** and sign into your ArcGIS account.
3. On the ribbon, click **Save** and **Save As**.
4. Add the appropriate documentation and click **Save Map**.
5. On the side panel, click **Content**. You should see two layers in the **Content** Pane: **World Dark Gray Base** and **flight routes**.

You have been asked to map three individual cities that have the largest air traffic: London, New York, and Atlanta. You need to add a layer to obtain that information.

6. Click **Add** and choose **Search for Layers**.



7. Click **My Content** and change it to **ArcGIS Online**.
8. In the search bar, type *World Cities* and press Enter.
9. Add the **World Cities** layer owned by Esri.

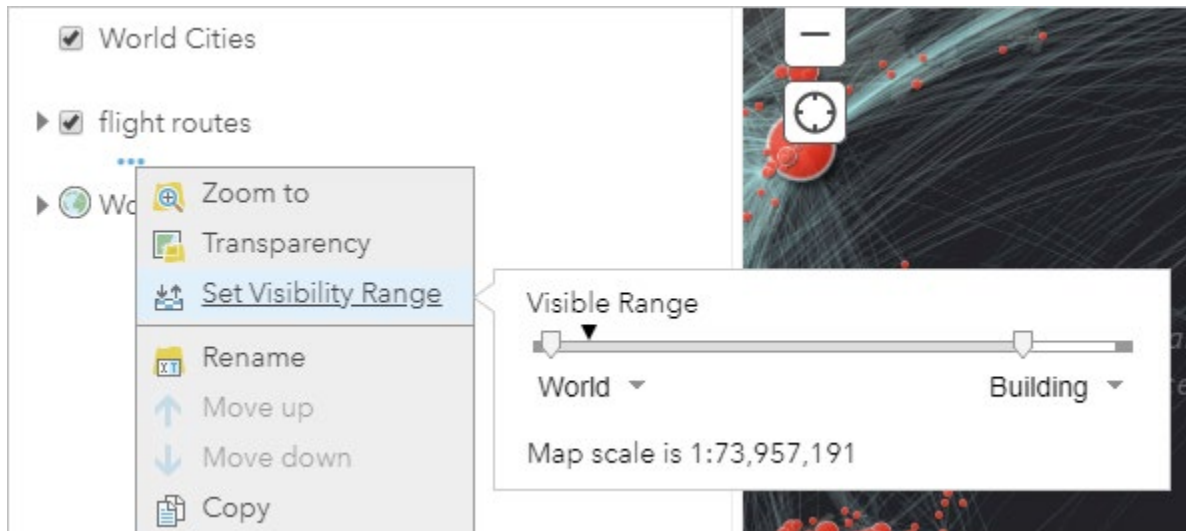


10. Click the back arrow to go back to the **Contents** pane.
11. Zoom in and out on the map.

As you zoom out, the flight routes and the cities disappear. This is because a visibility range has been set. Visibility ranges are used with multiscale maps and allows you to view geographic data across a range of scales or zoom layers. Next, you'll set the visibility range to be open at all scales.

12. Point to the flight routes layer and click the **More Options** (three dots) button. **Choose Set Visibility Range.**

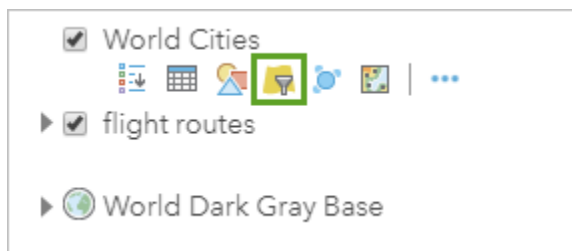
13. Set the slider so it ranges from **World** to **Building**.



14. Repeat the process to set the same visibility range for the **World Cities** layer.

You now want to narrow down the cities to London, New York, and Atlanta. You can do this by applying a filter, which presents a focused view of the layer.

15. Point to the **World Cities** layer and click the **Filter** button.



16. Change **ADMIN_NAME** to **CITY_NAME**. In the third box, type *London*. The expression now reads **ADMIN_NAME is London**.

17. Click **Add another expression**. Create the expression **CITY_NAME is New York**.

18. Add another expression for **CITY_NAME is Atlanta**.

19. Above the expression, change the **Display option** to **display features in the layer that match any of the following expressions**.

View Edit

+ Add another expression Add a set

Display features in the layer that match any of the following expressions ▾

CITY_NAME ▾	is ▾	London	✘
<input type="checkbox"/> Ask for values ▾		<input checked="" type="radio"/> Value <input type="radio"/> Field <input type="radio"/> Unique	

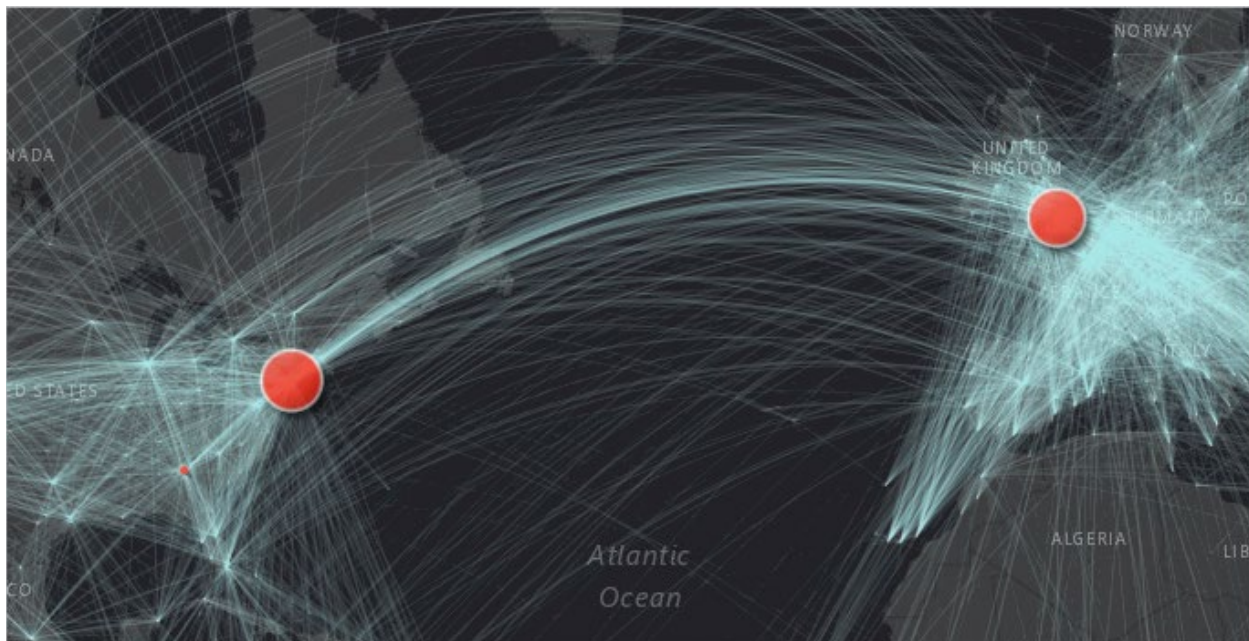
CITY_NAME ▾	is ▾	New York	✘
<input type="checkbox"/> Ask for values ▾		<input checked="" type="radio"/> Value <input type="radio"/> Field <input type="radio"/> Unique	

CITY_NAME ▾	is ▾	Atlanta	✘
<input type="checkbox"/> Ask for values ▾		<input checked="" type="radio"/> Value <input type="radio"/> Field <input type="radio"/> Unique	

APPLY FILTER APPLY FILTER AND ZOOM TO CLOSE

20. Click **Apply Filter**.

21. Save the map.



Step 2: Locate and map airports

Now that the three cities are isolated, it is time to locate and map the individual airports. To add the location of the individual airports you will deal with two types of point data:

Type 1: latitude and longitude (x,y) values.

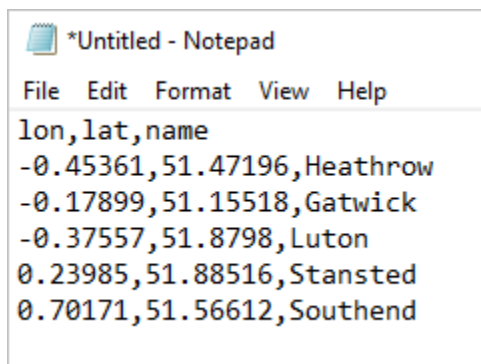
Type 2: Address information.

You'll add airports for the city of London using latitude and longitude values stored in a file. This can be a delimited text (.txt) or comma-separated values (.csv) file. The file will contain the location information along with any other attributes you want to include. Below is a file for the airports in London. Notice how the headers are separated by commas with no spaces. That is why it is called a comma-separated file: the commas act like the columns in a table.

```
lon,lat,name
-0.45361,51.47196,Heathrow
-0.17899,51.15518,Gatwick
-0.37557,51.8798,Luton
0.23985,51.88516,Stansted
0.70171,51.56612,Southend
```

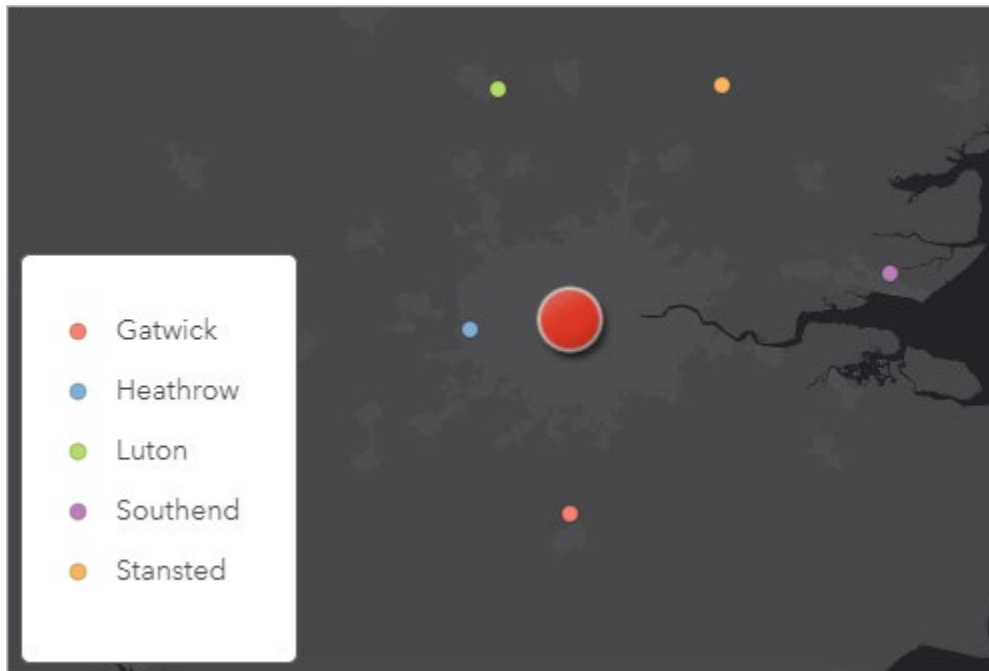
The only included attribute in this example is the airport name. Longitude and latitude values are shown in decimal degree format. These must be exact values, on one line, and with no spaces.

1. Open a text editor such as Notepad.
2. Copy the text above and paste it into the text editor.



```
*Untitled - Notepad
File Edit Format View Help
lon,lat,name
-0.45361,51.47196,Heathrow
-0.17899,51.15518,Gatwick
-0.37557,51.8798,Luton
0.23985,51.88516,Stansted
0.70171,51.56612,Southend
```

3. Save the file on your computer with the name *airports_x_y*. Save it as the file type **.txt**.
4. Drag your new file onto your map. The airport points are drawn on the map.

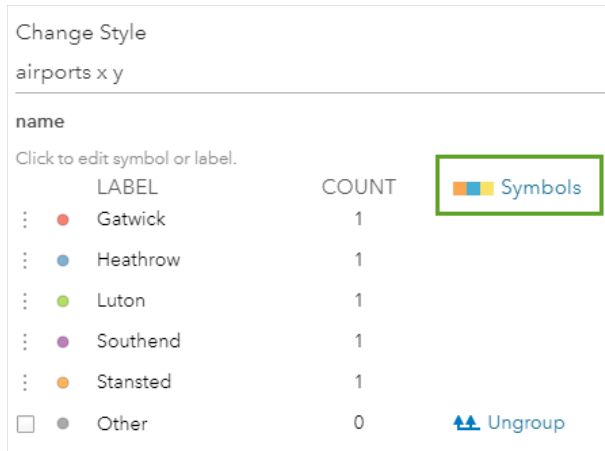


This is the power of GIS. You have taken a table of data and mapped it. If you click on any of the points, you can see the locational information as well as the name of the airport.

Step 3: Change symbology

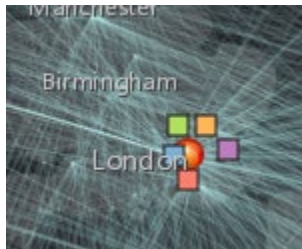
The airports are displayed by **Types (Unique symbols)** with the attributes as the name.

1. In the **Change Style** pane, click **Options**.
2. Click **Symbols**.



3. Change the shape to a square and the size to **15** px.

4. Click **OK** twice and click **Done**.



5. Save the map.

Step 4: Geocode

Add the second two cities (New York and Atlanta) with address information. Geocoding is the proper term for converting an address to an x,y coordinate. By default ArcGIS Online uses the World Geocoding Esri service. Below is what you need for a comma-delimited text file for New York and Atlanta.

Name,address,city,zipcode

LaGuardia,LaGuardia Rd,Flushing,NewYork,11371

John F Kennedy Int'l Airport I 678 S,Jamaica,New York,11430

Hartsfeld-Jackson,6000 N.TerminalPkwy,Atlanta, GA,30320

1. Copy the above lines exactly as shown into Notepad or another text editor.
2. Save the file on your computer with the name *airports_addresses.txt*.
3. Drag the *airports_addresses* file on to your map and click **Add Layer**.

The new airports are added to the map.

4. On the **Change Style** pane, for **Types (Unique symbols)**, click **Options**.
5. Change the symbology to match the square symbol you made for the airports in London.
6. Save the map.

Step 5: Create bookmarks

To get quickly from airport to airport on your map, as the map author, you need to create bookmarks. Bookmarks are based on the current location and scale of the map. When others click a bookmark, the map zooms to that location.

1. Zoom to London so you can see all airports.
2. On the ribbon, click **Bookmarks** and click **Add Bookmark**.
3. Name the bookmark *London* and close the bookmarks window.
4. Zoom to New York and create a bookmark for that city as well.
5. Zoom to Atlanta and create a bookmark for that city as well.
6. Save the map.

By completing this map, you have given the IFATCA a visual representation of the flight routes to London, New York, and Atlanta. To do that you used the following GIS skills:

- Searching for ArcGIS Online layers
- Filtering layers
- Mapping table data with an x,y coordinate
- Mapping tables with an address
- Creating bookmarks

Assessment

Repeat the above procedure using the following information:

City	Airport	Longitude, latitude
<i>Beijing</i>	<i>Beijing Capital International Airport</i>	<i>40.0724,116.5975</i>
<i>Chicago</i>	<i>O'Hare International Airport</i>	<i>-87.904722,41.978611</i>
<i>Tokyo</i>	<i>Tokyo Haneda Airport</i>	<i>139.7798,35.5494</i>

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About the author

This lesson was written by a K-12 educator with support from the Learn ArcGIS team at Esri.

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