GEOSPATIAL ANALYTICS: HOW TO VISUALIZE GEOSPATIAL DATA ON MAPS AND CUSTOM SHAPE FILE
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MicroStrategy Desktop provides out-of-the-box support for ESRI maps. This empowers every user with the ability to conduct geospatial analysis. This hands-on workshop will introduce you to mapping concepts through six different scenarios. These tasks will have you create maps, markers, backgrounds, and layers with various datasets, and use an API resource to better understand local transportation activity.

Pre-Requisite: Make sure you have MicroStrategy Desktop 10.10 installed.

Getting Started

1. First, launch MicroStrategy Desktop by double-clicking the MicroStrategy Desktop icon

2. Click the New Dossier button to bring up the dossier interface

You will now enter the brand-new dossier authoring interface.

Introduction to the Dossier Interface

Dossiers allow you to build a modern and interactive analytical book of your business. Each dossier consists of individual pages arranged in easy-to-navigate chapters. On each page, you can tell compelling stories about your data with powerful visualizations such as graphs and maps. To provide a guided experience for end users, dossiers include a Table of Contents that help content creators logically organize content into chapters and pages.

Before we get started, let’s briefly familiarize ourselves with the interface.
1. **Toolbar**: Provides controls to redo or undo an action, refresh the dossier, add dossier elements (including datasets, pages, chapters, visualizations, on-canvas filters, text, images, and links), change the format, and share your dossier. This is also where you can take advantage of brand new responsive design functionality and preview your dossier in mobile and presentation mode.

2. **Panel Control**: The icons on the far left-hand side of the interface are used to show or hide different panels.

3. **Contents Panel**: With dossiers, you can organize your information into a chapter and page structure, allowing you to tell a story about your data. The Contents Panel is where you add chapters and pages to your dossier. Click on the editor icon in the Panel Control section to show or hide this panel.

4. **Datasets Panel**: The Dataset Panel shows the names and the elements of the datasets you have imported for your dossier. You can add additional datasets, delete datasets, and link two different datasets here. You can also add new metrics, attributes, links, etc. by right-clicking on the data elements in the panel. To show or hide this panel, click on the dataset icon in the Panel Control section.

5. **Editor, Filter, and Formatting Panels**
   
a. **Editor Panel**: This is where you can drag and drop attributes and metrics to add data to your dossiers. Click on the editor icon in the Panel Control section to show or hide this panel.
b. **Filter Panel**: This is where you can add filters to your dossier at the chapter level; you can filter data based on the values of any attribute or metric to change your view to better understand your data. Simple checkboxes, sliders, calendars, and radio buttons make filters easy to use, and the impact of your selections is instantly visible. MicroStrategy also supports adding visualizations as a filter. Click on the filter icon in the Panel Control section to show or hide this panel.

c. **Format Panel**: With dossiers, you can apply formatting options to enhance a user’s ability to view and read the information in your visualizations. Formatting options vary depending on the type of visualization you are formatting. Click on the format icon in the Panel Control section to show or hide this panel.

6. **Visualization Gallery**: Use the Visualization Gallery to quickly select the visualization you want to use to display your data, or import a custom visualization with just a few clicks. Click on the visualization icon in the Panel Control section to show or hide this panel.

**EXERCISE 1 – WORLD POPULATION**

In this exercise, you are going create a map visualization to display the countries of the world on an area map and then define a threshold to help you visualize and quickly analyze which countries have the highest and lowest population growth rates using color ranges.

To complete this exercise, you will need access to the **Maps & geomapping with ESRI - World_Population.xlsx** file, which is provided in the supporting zip file related to this exercise.

**Import data**

3. Under the **DATASETS** panel, click **New Data** to open the **Connect to Your Data** interface.
4. Select **File from Disk** in the **Data Sources** window

![Data Sources Window]

**TIP:** With MicroStrategy you can instantly connect to nearly any data source, from traditional Excel spreadsheets, to cloud-based applications, big data sources, and even social media sources like Facebook and Twitter. MicroStrategy offers over 80+ data import options for even easier analysis.

5. After selecting your data source, click **Choose files** to browse your local machine and import a spreadsheet

6. Search, and find **Maps & geomapping with ESRI - World_Population.xlsx**, and then click **Open**
7. Click **Finish** to return to dossier interface. Your dataset should now match the image below:

![Image of dataset matching](image)

8. To change the visualization from the default grid, click on the **Map** icon within the Visualization Gallery on the far right-hand side of the interface.

![Image of visualization gallery](image)

9. You will notice that the drop zones in the **Editor Panel** have now change. Drag the attribute **Country** to the **Geo Attributes** drop zone and drag the metric **Yearly Change** to the **Color By** drop zone.

![Image of editor panel with drop zones](image)

10. Select the **Format Panel**
11. From the **Graphic Type** dropdown, select **Area**

12. Next, switch back to the **Editor Panel** by clicking on the pencil icon

13. Right-click the metric **Yearly Change** in the **Color By** drop zone, and select **Thresholds**

14. From the threshold window, change the color to **Red-Orange-Green**, and click **OK**
15. To explore your newly created visualization, you use the plus or minus buttons on the top-right corner of the map to change your zoom level.

16. To give your visualization a meaningful title, double-click the title bar of your visualization, and change it from **Visualization 1** to **2016 Yearly Population Change by Country**, and press enter.

17. Under the **Contents** panel, right-click **Chapter 1**, and rename it to **World Map**.

18. Next you will rename **Page 1** to **Area Map**, using the process outlined above.

Now, when you hover over a country, you will see the numbers for yearly population change. If you want to see additional information about each country as you hover over it, you can add additional metrics to the **Tooltip** drop zone.
19. Drag the **Population** and **Area sKM** metrics to the **Tooltip** drop zone, then hover over the country of your choice to see the additional information.

![Tooltip drop zone](image)

20. Save your dossier as **Geospatial Features**

You have now completed Exercise 1 of this workshop. The visualization that you have built allows you to clearly see the negative population growth rates in Russia and Eastern Europe (designated in red), as well as the positive population growth rates for most countries in Africa (designated in green).

**EXERCISE 2: MARKERS**

In this exercise, you are going to display your data using markers, pins, bubbles, and areas to specify what attributes will be used to determine where the markers or areas are displayed.

To complete this exercise, you will need access to the **Maps & geomapping with ESRI - All Cities.xlsx**, which is provided to you in the supporting zip files related to this exercise. We are going to add this as a second dataset to our dossier.

**Create A New Chapter**

21. On the top menu bar, click **Add Chapter**

22. Right-click **Chapter 1** in the **Table of Contents**, and rename it **Styles**
23. Similarly, right-click on **Page 1** rename it **Markers** – you want the second chapter of your dossier to show a variety of marker types that can be defined on a map

You should now have two chapters with one page each, and your Table of Contents should match the image below:

24. On the menu bar, click the **Add Data** icon, and from the menu click **New Data** to open the **Connect to Your Data** interface

25. Select **File from Disk** in the pop-up window
26. Select **Choose files** to browse your local machine and import a spreadsheet

27. Locate the **Maps & Geomapping with ESRI - All Cities.xlsx** file, and click **Open**

28. Click **Finish** to add your second dataset

Your **Contents** and **Datasets** panels should now match the image below:

Filter Data

29. Next, we are going to filter our **Markers** page to show only US cities. Select the **Filter** Panel, and drag the **Country** attribute from the **second** dataset on to this panel.
30. To change the display style of the filter, click the ellipses icon next to **Country**, and from the menu, select **Display Styles**, then select **Drop-down**.

31. In the **Filter** Panel, select **United States** in the drop-down menu to filter your data to show only US cities.

32. Select the **Map** icon from the Visualization Gallery to change your default grid to a map.
33. Double-click the title of your visualization, and rename it **Pins**
34. Go to the **Editor Panel**

35. From the Dataset Panel, drag and drop **City**, from the second dataset, to the **Geo Attributes** drop zone on the **Editor Panel**

36. Switch to **Format Panel**

37. Under **Shape Formatting**, change the **Fill** color to **Yellow**
38. You are now going to duplicate your visualization. On the top-right corner of the Pins Visualization title bar, click the ellipses icon.

39. From the menu, select Duplicate

40. Double-click the title bar of the Pins copy visualization, rename it to Bubbles, and hit enter

41. While the Bubbles visualization is selected, click the Format panel and change the Graphic Type to Bubble, and change the Fill color to Blue
42. Select your first visualization again (titled Pins) by clicking the title bar, and then click on the three ellipses icon and choose to **Duplicate** this visualization for a second time.

43. Rename the visualization from **Pins copy** to **Cluster**, and while this visualization is selected, select the **Format** panel.

44. Change the **Fill** color to **Red** and **Clustering** to **Pie**.

45. Reselect your first visualization and **Duplicate** this visualization for a third time.

46. Rename the visualization from **Pins copy** to **Density**, and while this visualization is selected switch to the **Format** panel.

47. Change **Graphic Type** to **Density**.

You should now have four visualizations that match the image below:
You can rearrange individual visualizations by clicking and dragging the title bar to the desired location. Rearrange your visualizations so that Pins and Bubbles are on top, and Cluster and Density are on the bottom.

48. **Save** your dossier

49. Next, we will explore the dossier in presentation view. Click on the **View** menu on your menu bar, and select **Enter Presentation Mode**.

Your dossier should match the image below:
50. You can now exit presentation mode by selecting View, then Exit Presentation Mode
51. At this point you should save your dossier

You have now completed Exercise 2 of this workshop. You have seen how MicroStrategy automatically assigns geo roles to attributes based on the geographical information contained in the data. By automatically augmenting latitude and longitude information to a geo attribute, MicroStrategy makes it possible to display this data through a wide variety of map markers.

EXERCISE 3: BACKGROUND STYLE

In this exercise, you are going to explore various styles for each map. You can create different styles to customize the display of the data. You can choose from the preconfigured styles to draw the layer in different ways. The style you applied last before saving the map is the style that is displayed by default for a layer when the map is opened. To get started, we are going to duplicate your last page.

52. In the Contents panel, right-click the Markers page, and select Duplicate Page

Right-click the Markers Copy, and rename it to Background

Change Map Styles
53. Select the **Pins** visualization by clicking on the title bar

54. Select the Format Panel, and from **Map style**, select **Street**

55. Select the **Bubbles** visualization, and for **Map style**, select **Relief**

56. Select the **Cluster** visualization, and for **Map style**, select **Satellite**

57. Select the **Density** visualization, and for **Map style** select **Topographic**.

Your **Background** page should match the following image:

58. You should now **Save** your dossier.

You’ve completed exercise 3 Map Background.

You can view different types of maps, such as a topographical map or a satellite image. You can also cluster map markers in a circle when a large number of map makers are displayed in the same map area. You can also zoom in on the area and display individual map markers by clicking a cluster.

**EXERCISE 4: USE MAP AS A SELECTOR**

In this exercise, you are going to explore the map as selector feature. This type of selector allows users to click locations in a map visualization to update data displayed in targeted Grid or Graphs Visualization. For example, you can filter the data that is sent so that the
target control displays only the information for the specific location that is selected on the map visualization. Conversely, the map visualization can be used as a target so that the information it displays reflects a selection made in another visualization. You are going to add one more page to the Styles chapter.

Create Map Selector Page

59. With the Background page selected, hover on the menu item and select Add Page from the menu bar

60. Right-click the new page named Page 1, and rename it Map Selector
61. Change the visualization type to a map.
62. Drag City from the second dataset to the Geo Attribute drop zone
63. On the menu bar, click Insert Visualization

64. Rename Visualization 1 to World Cities
65. Rename Visualization 2 to Selected Cities

66. While Selected Cities is selected (designated by blue line around the visualization), drag Country, City, Latitude, and Longitude attributes from the second dataset to the Rows drop zone
67. Select the **World Cities** map, and from the visualization menu, click **Select Targets**

   ![Select Targets screenshot]

68. Next click on the title of the second visualization **Selected Cities**

You should see the **Source** icon on **World Cities** and **Target** icon on the **Selected Cities** visualization as shown below:

   ![Selected Cities visualization]

69. Click the blue **Apply** button on the top ribbon to apply your selections

   ![Apply button]

70. You can now select any of the selection tools on your map to filter the cities shown in the targeted grid

71. Select the **Freeform selection tool**, and then draw a line around a group of cities of your choice

   ![Freeform selection tool]

72. Once you have selected a group of cities, the **Selected Cities** grid will only display details for those cities

73. You can now **save** and **close** your dossier
You have now completed Exercise 4 of this workshop. As you have seen, you can use a map to easily filter other visualizations within a dossier.

**EXERCISE 5: MULTIPLE LAYERS**

In this exercise, you are going to display data from three different tables within the same dataset and display them on multiple layers of a single map. Each table will represent a layer on the map, and each layer can be configured separately. This lets you overlay different information or combine different marker styles, area maps, and paths in the same map. You configure each layer on its own tab, which is identified by the name of the dataset.

To complete this exercise, you will need access to the Airbnb Data.xlsx file, which is provided in the supporting zip files related to this exercise.

**Creating A New Dossier**

74. Click **File** and select **New Dossier** to create a new dossier.

75. Under the **DATASETS** panel, click on the **New Data** button to open the **Connect to Your Data** interface.

76. Click **Choose Files**, find Airbnb Data.xlsx and click **open**, then click **Prepare Data**.

The data preparation feature allows you to explore your data to evaluate its quality and usability.

77. Make sure all three checkboxes are selected (to import data for all three tabs from the Excel file), and then click **Select**.

**TIP: MicroStrategy allows users to import multiple sheets at the same time. This allows for easy uploading of entire Excel worksheets, without requiring you to delete sheets that aren’t used for your visualization. Each sheet will automatically be treated as a different table within the dataset, allowing you to create joins between tables.**
78. Click on the **Metro** table, right-click **Lat**, and select **Convert to Attribute**.

![Image of Metro table with Lat attribute selected]

79. Repeat the same step for the **Lon** metric.

During the data import process, MicroStrategy Desktop automatically attempts to determine if any data columns in the data that you have chosen to import contain geographical information and automatically assigns a geo role. Attributes that have been identified as geographic will be designated with a geo attribute icon next to the attribute. However, if you discover that this is not done automatically (as is the case here), you can also manually define geo roles.

80. Right-click the **Lat** attribute, and select **Define Geography**. From the menu, select **Latitude** to convert this attribute to a geo location attribute.

![Image of Define Geography menu]

81. Repeat the same step for the **Lon** attribute, but this time select **Longitude** from the drop-down menu.

82. Right-click the **Value** attribute, and select **Convert to Metric**.

![Image of Convert to Metric option]

83. Repeat the previous steps for the **Attractions** table, converting **Att Lat** and **Att Lon** to attributes and defining geography roles for each attribute.
84. Click **Finish** to import your data
85. On the Dataset Panel, click the ellipses icon to open the Dataset menu
86. From the menu, select **Table View**, so you can see each dataset separately
87. Change **Visualization 1** to a map visualization
88. Right-click on **Layer 1** and rename it **Attractions**
89. Drag **Attraction Name** (from the Attractions table) to the **Geo Attributes** drop zone
90. Drag the **Att Lat** attribute to **Latitude** drop zone
91. Drag the **Att Lon** attribute to **Longitude** drop zone
92. Switch to the **Format** panel, and change the **Zoom behavior when filtering** option to **Dynamic**
93. Change the **Fill** color to **Red** and the **Marker Type** to **Diamonds**

94. **Save** your dossier
95. Select the **Editor** Panel
96. Add another **Layer** to the map

97. Rename the second layer **Metro**

98. Drag **Metro** (from the Metro table) to **Geo Attributes**
99. Drag **Lat** (from the Metro table) to the **Latitude** drop zone
100. Drag **Lon** (From Metro table) to the **Longitude** drop zone
101. Switch to the **Format** panel, and in the section **Shape Formatting**, change the color to dark green, and set the opacity to 70%.
Your map layers should now match the image below:

102. Save your dossier
103. Switch to the Editor panel, add one more layer, and rename it Airbnb
104. Switch to the Format panel, and change the Graphic Type to Area

105. Return to the Editor panel, and drag the zipcode attribute from the DC listing table to the Geo Attributes drop zone
106. In the same table, locate the price metric, right-click, and select Aggregate By, and then select Average
This will create a derived metric called \textbf{Avg (price)} that will be located at the bottom of the dataset panel.

Derived metrics are metrics that an analyst can create based on existing metrics in a dataset. A derived metric performs a calculation on the fly with the available data, without needing to re-execute the dossier against the data source.

107. Drag the \textbf{Avg (price)} derived metric to the \textbf{Color By} drop zone to highlight the area map based on average prices
108. Run your dossier in presentation view. Click on the \textbf{View} menu in your menu bar, and select \textbf{Enter Presentation Mode}.

Your dossier should match the image below:

You have now completed Exercise 5 of this workshop. You have seen how multiple attributes and metrics can be overlaid on a single map to create a rich geospatial analysis within MicroStrategy Desktop.

\textbf{EXTRA CREDIT}

\textbf{EXERCISE 6: API DATA - TRANSPORTATION ACTIVITY}
In this exercise, you will play the role of a project engineer for the Los Angeles Metro. To support transportation planning for operation optimization, you want to connect directly to live metro data in order to understand how the current bus fleet operates.

102. Create a new dossier
103. Open a web browser, and go to [https://tinyurl.com/kc3we7n](https://tinyurl.com/kc3we7n)

We’ll be using URLs from this webpage to connect to and directly access live Los Angeles Metro data.

**Connecting to LA Metro Data**

104. We are going to import bus activity data first. Scroll down and copy the following link: [http://api.metro.net/agencies/lametro/routes/704/vehicles/](http://api.metro.net/agencies/lametro/routes/704/vehicles/)
105. In Desktop, click the **Add Data** icon and select **New Data**

106. Choose **Data from URL**

107. Paste the link, click **Add**, and then click **Prepare Data**

You are now in the data preparation interface.

**Creating Multiform Attributes**
When you import data, each column in a table will be imported as a separate attribute. If your data contains different attribute forms of the same attribute saved in separate columns, you can create a multiform attribute to combine the forms into a single attribute.

108. Let’s create a multi-form attribute for the buses. Hold shift, and click on id, latitude, and longitude. Right-click, and then select Create Multiform Attribute.

109. Name the new attribute Buses. For latitude, select latitude from the dropdown under Form Category. Repeat the same step for longitude, so your multi-form attribute is set up as follows:

110. Click Submit to create the attribute
111. In the data preparation window, convert Heading to an attribute by right-clicking on it and choosing Convert to Attribute

112. Similarly, convert Predictable to a metric by hovering over the column, right-clicking, and choosing Convert to Metric
113. Click **Finish** to return to your dossier

114. Now we’re going to add bus station data. Head back to the LA Metro webpage, and copy the following URL to your clipboard:

   http://api.metro.net/agencies/lametro/routes/704/sequence

115. Back in Desktop, click **Add Data**, and choose **New Data**

116. Choose **Data from URL**

117. Paste the link from your clipboard, click **Add**, and then click **Prepare Data**

118. Next, we’ll create the station multi-form attribute. Hold shift and click on **id**, **latitude**, and **longitude**.

119. Right-click, and select **Create Multiform Attribute**

120. Name the new attribute **Stations**. For latitude, select latitude from the dropdown under **Form Category**. Repeat the same step for longitude, so your multi-form attribute is set up as follows:

121. Click **Submit** to create the attribute

122. Right-click the **display name** attribute, select **Rename**, and name it **Station Cross Street**
123. Back in the data preparation interface, click **Finish**
124. Change **Visualization 1** to a map
125. In Layer 1, drag **Buses** from the vehicles dataset into the **Geo Attribute** drop zone

![Image of data preparation interface](image1.png)

126. Rename Layer 1 to **Buses** by right-clicking on the layer and choosing **Rename**
127. Let’s add another layer for the stations, click **Add** located under the Buses layer

![Image of adding additional layer](image2.png)

128. Rename Layer 2 to **Stations**

129. Add the **Stations** attribute from the sequence dataset to the **Geo Attribute** drop zone in **Stations** layer

Now you should have data for buses and stations on your map. However, we can’t tell which is which. Let’s do some formatting so we can differentiate stations from buses.

130. In the **Stations** layer, head to the **Format** panel by clicking on the gear icon. Change the **Marker type** to **Squares**.
131. Under **Shape Formatting**, change the **Fill** color to **Red**.

Now you can clearly see all the stations on Route 704.

132. Rename this visualization **Live Position of Buses** by double-clicking on the visualization’s title bar.

133. Let’s give this dossier some context. Add a text box by clicking the **Insert** text icon on the menu bar.

134. In the text box, type in **Live Position of Line 704 Buses in Los Angeles**.

135. In the **Format** panel, choose **Center Alignment**, and change the **Fill Color** to whatever you like - be sure to change the font color to something that is readable against your chosen fill color.

136. Next, let’s add a simple grid to add more context to the dossier. Click on **Insert Visualization**. Drag and drop the visualization so that it sits below **Live Position of Buses**.

137. From the vehicles dataset, drag and drop **Buses** and **seconds since report** into the visualization.

138. To make the attribute forms within an attribute visible, right-click on the **Buses** attribute in the rows drop zone, find **Display Attribute Forms**, and choose **On** from the drop down. Click OK.

139. Rename the grid to **List of Buses**.

140. Head to **File** in the top menu. Go to **Dossier Properties**. Check the option for **Refresh** so that it automatically refreshes the data every 60 seconds. Click **OK** to save changes.
141. Finally, change the style of the map to street view by clicking on Styles and choosing Street
142. Save your dossier as Map API
143. In order for data to auto-refresh, the dossier needs to be in Presentation Mode. Click on the View menu on your menu bar, and select Enter Presentation Mode. Your dossier should now match the image below:

![Map API](image)

Conclusion

Congratulations, you have now completed the maps workshop! Over the course of this workshop, you have:
- Explored the various ways that geographic information can be display on out-of-the-box maps with MicroStrategy
- Built a dossier that contains multiple sheets of map analysis
- Leveraged an API for live data updates
- Changed settings to automatically update dossier data