Learning Module - Location-based analysis

Locations are an important element of many analytical problems. Two typical questions that can arise in many fields are:
- Where was a specified person or object located at a given time?
- Who or what was located here at a given time?

In this module we'll go through how to use Location data in Constellation, and look at answering some common Location-based analytical questions. We'll cover:
- Location data in Constellation
- Using the Map View
- Finding links between Entities and Locations, and between Locations and Entities
- Using Graph Properties to find popular Locations.

Location data in Constellation

Locations will usually appear on graphs as Nodes, with the Attributes of the relevant Node specifying where in the world that Location is. Locations can be very precise, such as having a latitude and longitude, or more general, such as just a city name, or a cafe or restaurant.
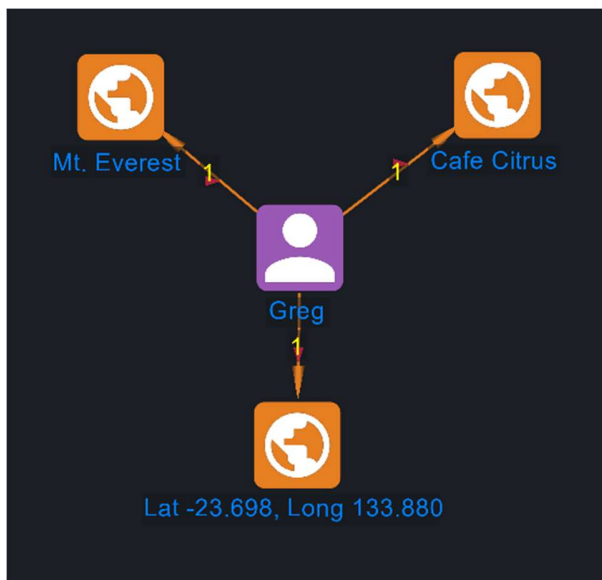

Although not required, to match Constellation's schema Locations are usually displayed as orange Nodes, with orange Relationships linking other nodes to them. Nodes are connected unidirectionally to Location Nodes.

For Location data to appear on the Map View, the Location **must** have the attributes of Geo.Latitude and Geo.Longitude filled in. You can still answer some questions about Location data without this, but spatial visualisation won't be possible, nor will certain analytical techniques.


Using the Map View

To open the Map View in Constellation, click Views > Map View. The View will open with the default map set to the ArcGIS Online world map; you can change this by clicking the drop-down box to select a new map more fit to your purpose.
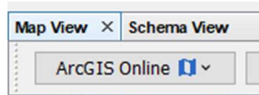

The other buttons in the Map View change how data is viewed on the map, or allow you to zoom to highlighted locations. We'll go through the important ones later.

An important note about the map view: the controls are the reverse to what they are on the graph. In the Map View, you left-click to drag your view around, and right-click to select someone on the map (or right-click and drag to select a box).

Open 'Greg and Sarah Network with Locations.star', and use it to explore the Map View controls and follow along with the remainder of the Module.
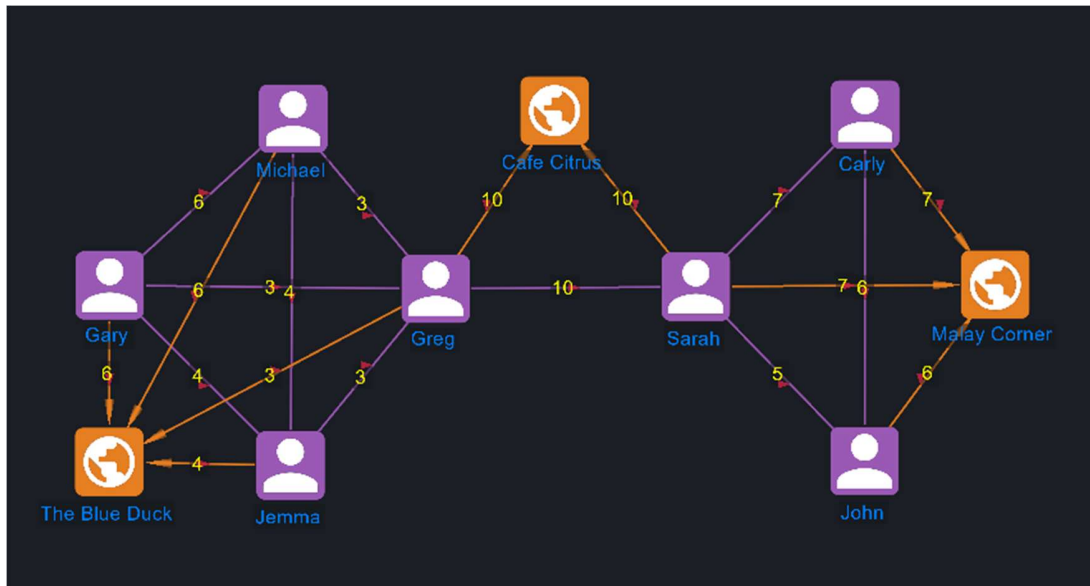
I've added three Locations to the Greg and Sarah network to show where the groups are going for lunch. Each location also has Geo.Latitude and Geo.Longitude Attributes, so it will show up in the Map View.
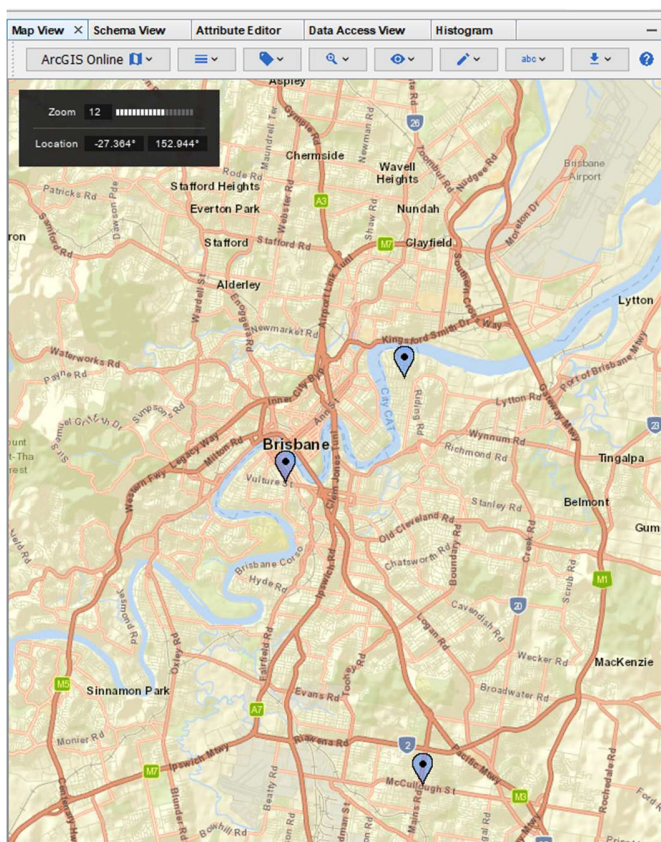
As you can see, the Locations on our graph resolve to three different places around the city of Brisbane. You can highlight a Location on the map by selecting a Location Node on the graph, this will highlight the Node and corresponding map point in red. Likewise, you can highlight a Location from the map, and it will highlight the corresponding Location Node on the graph in red.
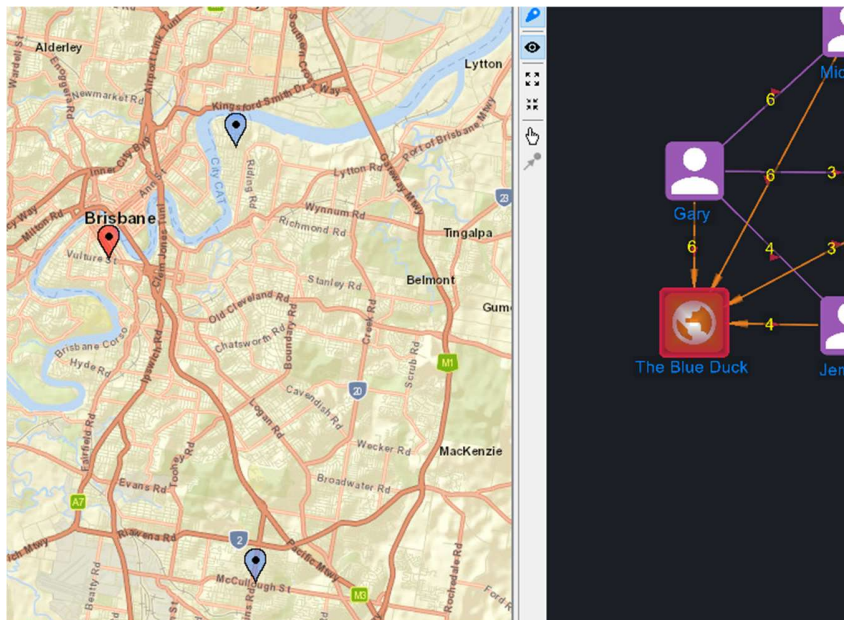
Finding relationships between Locations and other Nodes

There are two common questions that arise when looking at Location data:
- Where was a specified person or object located at a given time?
- Who or what was located here at a given time?

As with previous examples, we can look at our graph and visually identify which person Nodes are visiting which Location Nodes. With a larger graph featuring many more people or Locations, this becomes difficult.

To answer the first question takes a couple of steps:

- Highlight the person of interest and Hop Out One (this selects all Nodes connected directly to the person)
- Using the Histogram, filter on the Node Type to include only Location Nodes

We'll use the example of Greg. Hopping Out One from Greg highlights every Node directly connected to him, which includes two Location Nodes, as well as four people Nodes.
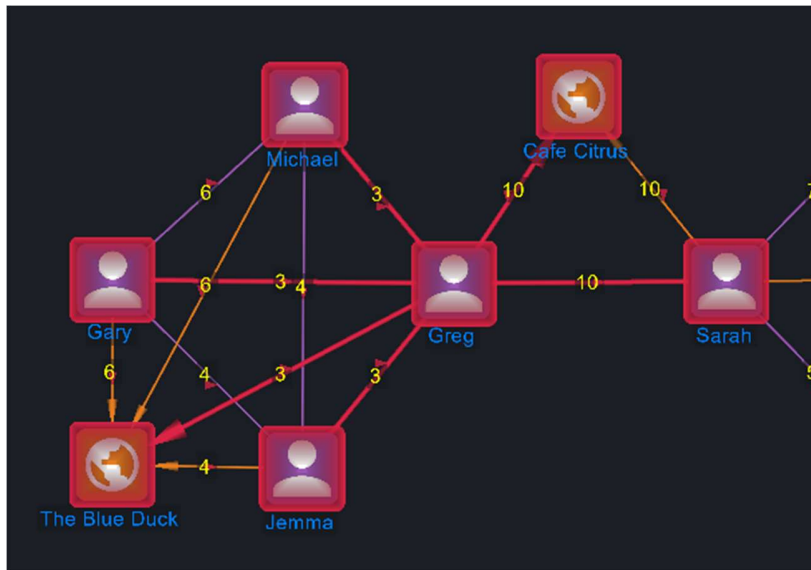
We then use the Histogram to filter on this selection (so we don't include the other results in our set), and then select only Location type Nodes.
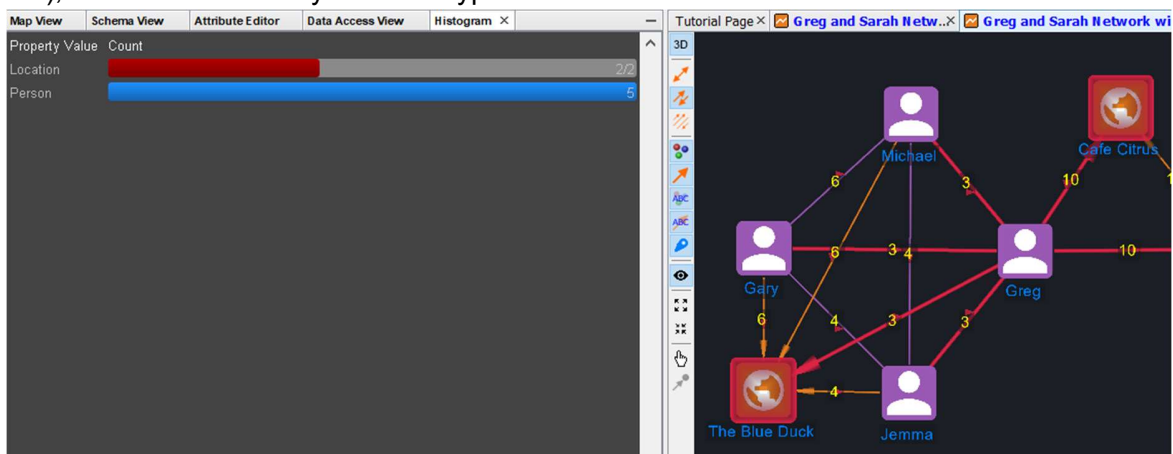
We can now see that the Locations that Greg visits are Cafe Citrus, and The Blue Duck.

To answer the second question is more simple. We start by highlighting the Location Node we are interested in (either through the Map View, or selecting it on the graph). This time, we'll use Malay Corner as the example.

Starting by selecting Malay Corner, we then Hop Out One , which gives us every Node that is directly connected to Malay Corner.
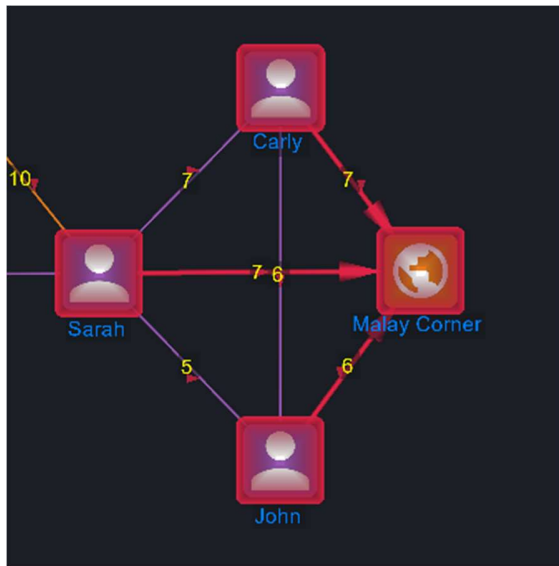
In this example we only have Location and people Nodes on our graph, so we can tell using this technique that John, Carly, and Sarah are the people that have visited Malay Corner. In more complex graphs, we might need to use the Histogram filtering technique again to filter our results so that only the people Nodes are left in the selection.


**Using Graph Properties to find popular Locations**

There are two questions we might ask of a graph containing Locations using the underlying Graph Properties:
- Which location has been visited by the most people?
- Which location has the most total visits?

To answer the first question, we need to do the following:
- Using the Histogram, select all Location Nodes, and filter to this selection.
- Using the Histogram, look at the Node Graph Property of Neighbour Count
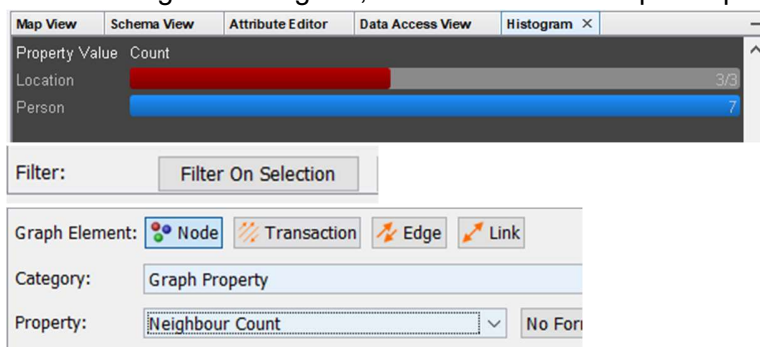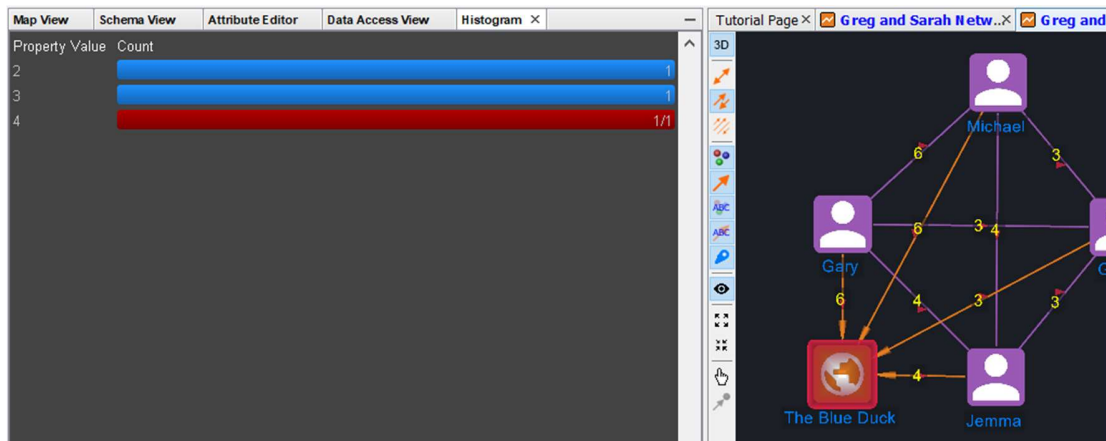
We can see from the results that there is one Location with four Neighbours: The Blue Duck.

To answer the second question we need to do the following:
- Repeat the first step by using the Histogram, select all Location Nodes, and filter to this selection.
- Using the Histogram, look at the Node Graph Property of Transaction Count
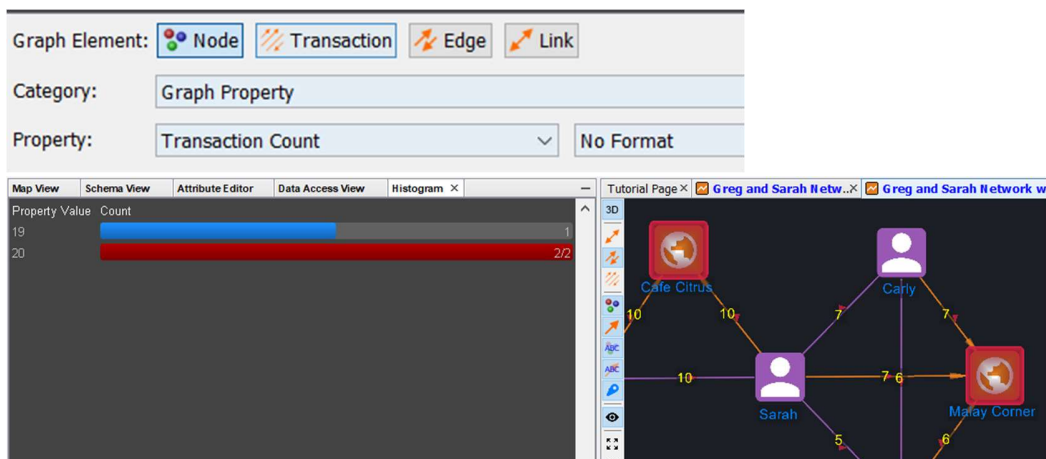
This shows us that there are two Locations with 22 Transactions, or visits: Cafe Citrus, and Malay Corner. Despite being visited by more people, The Blue Duck had less overall visits than the other Locations on the graph.