Appendix 1 Introduction to Networks

This appendix will provide a very basic introduction to networks. This introduction is by no means comprehensive, but should be sufficient for those without network analysis experience to begin following the workflows in section 5 Sample Workflows. Networks, sometimes referred to as graphs, are comprised of two basic elements: points and lines. The points in a network represent entities and lines represent the relationship(s) that connect these points. The simple example below will illustrate this point:

These points and lines are often referred to by different terms. The table below should help you decipher any terms you encounter.

<table>
<thead>
<tr>
<th>Points</th>
<th>Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertices</td>
<td>Edges, Arcs</td>
</tr>
<tr>
<td>Nodes</td>
<td>Links</td>
</tr>
</tbody>
</table>

Throughout this manual we will refer to points as nodes and the lines as edges or arcs. Arcs are directed edges, meaning that the relationship has a direction. You will see an example later in this introduction in the edge attribute section.

Node Attributes

Some important node attributes include:

- **Betweenness Centrality** - is the number of shortest paths a node sits between. In the case of the network below, Node A has the highest betweenness centrality because it sits between four edges that connect to other nodes.
- **Degree** - is the number of edges that connect to a node. For example, Node A has a degree of four and Node F only has a degree of 2.
- **Isolates** - are nodes that are not connected to any others through edges. In the network below Node G is an example of an isolate.
Edge Attributes

Some important edge attributes include:

**Shortest paths** - shortest distance between two nodes. For example the shortest path from *Lenore* to *Mary* is through *Rupert* and not through *Chris* and *Jessica*.

**Weight** - strength of the tie represented by the thickness of the edges between nodes. In the example below, the edge between *Lenore* and *Chris* is the strongest.

**Directionality** - is the connection one-way or two-way? In the example below, and in most directed networks, directionality is indicated by arrows.

**In-degree** - is calculated by determining the number of edges that point to a node, for example *Chris* has an in-degree of 3 and *Rupert* only has an in-degree of 1.

**Out-degree** - is calculated by determining the number of edges that point away from a node, for example *Chris* has an out-degree of 1 and *Rupert* has an out-degree of 3.