The SAS/OR Network Visualization Workshop is an interactive, graphics-oriented tool for investigating network or graph data. The tool implements techniques that have proven useful for extracting hidden information in large networks.

Many real world problems can be represented using a collection of nodes and links to form a structure called a network or graph. Common applications include supply chains, web sites, database schema, communications networks, and software module dependencies.

For a supply chain, the nodes can represent manufacturing plants, warehouses, and customer locations and the links or arcs between nodes might represent the flow of goods or products.

For a communications network, the nodes can represent switches or routers and the information associated with each node might include capacity values, device type, traffic volume data, number of dropped packets, etc. The links can represent transmission facilities or media connecting the various nodes and the data associated with the links might be failure rates, error rates, traffic volume, etc.

For a web site, the nodes can depict individual web pages while the arcs represent paths users take through the web site.

The Network Visualization (NV) Workshop is designed for visualizing and investigating these types of networks. Using a combination of data tables, statistical graphs, and network plots, the user can selectively filter the observations to help uncover patterns.
and relationships hidden in the network data. The network plots also offer a variety of different node layout algorithms providing alternative visualizations of the same data.

**Features**

**Data**

*NV Workshop* assumes the network is described by two data sets - one containing *link information* and the other containing *node information*. Both nodes and links can have additional data values associated with them to represent detail information specific to their particular application.

The *data table* featured in *NV Workshop* provides spreadsheet-like, row and column views of the actual data values, while the plot facilities can be used to produce graphic renderings of the data. The data table can be used to edit data values, sort columns, and insert or delete columns. Some of the row observation properties that can be set using the data table include

- Observation color
- Include in plots / Include in calculations properties
- Observation label properties

**Plots**

*NV Workshop* offers two categories of plots - network plots and statistical plots. A network plot uses both the node and link information to create a visualization of the network data.

The network plot offers a variety of different node layout algorithms to obtain alternative visualizations of the same data. The layout algorithms supported include

- Circular layout
- Hierarchical layout
- Hexagonal layout
- Force-directed layout
- Fixed position layout

The statistical plots include histogram, box plot, and scatter plot graphs. These plots facilitate basic exploratory data analysis. All plots and data tables are dynamically linked so that selections in one display are automatically reflected in all other displays. For
example, selecting bars in a histogram created from node data will automatically highlight the nodes corresponding to those bars in any other plots as well.

**Linked Views**

**Selective Filter**

*NV Workshop* provides a visual SQL for filtering the observations in all the displays to help uncover patterns or relationships buried in the data. The following figure illustrates selective filtering. The observations displayed in the left-hand scatter plot below represent the intersection of the values selected in the two histograms while the observations in the right-hand scatter plot display the union of the histogram selections. In this example the scatter plots are acting as *observers* and the histograms are *selectors*. Any plot can be made an observer or selector.