Network Connectivity Visualization

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Introduction

Communication networks involve many participants who are communicating with each other. Visualizing the connections gives a holistic view of the connections within the networks.

Visualizing these connections can support:
• Network Traffic Analysis
• Network Management
• Social Connectivity
• Trending Analysis
• Resource Management
• Capacity Planning

Problem Statement

There is no a priori specification for how the connections within a network would be visualized in 2 dimensions.

Visualization should:
• Arrange nodes based on their connection frequency to each other
• Maintain clarity when the database becomes large/complex

Methods

The selected approach is a dynamic visualization similar to molecular dynamics simulations.

Each node is assigned a “mass” which is determined by how many connections it has. Each connection generates a “force” between nodes. Depending on the distance of the nodes, the force can attract or repel. The equilibrium distance is called the “balance” and is determined by and directly proportional to the masses of the nodes. The forces are added and compared to the “balance” to determine a resultant vector that the node will move to.

Assumptions

• Each node is represented by a unique IP address
• Each line represents a completed connection, regardless of the directions, duration, and amount of packets sent
• Visualization is indiscriminative of network protocols used in the connection

Results

The program was able to successfully visualize simple setups with few servers and connections. More work will be done on the force functions to allow the program to properly visualize more complex networks.

Conclusion

Nodes with more connections (larger masses) will have a larger “balance” among themselves, and will move farther apart than if they had a smaller mass.

As a result, the “popular” IP addresses will be represented by larger nodes and will have the less popular IP addresses clustering around them.