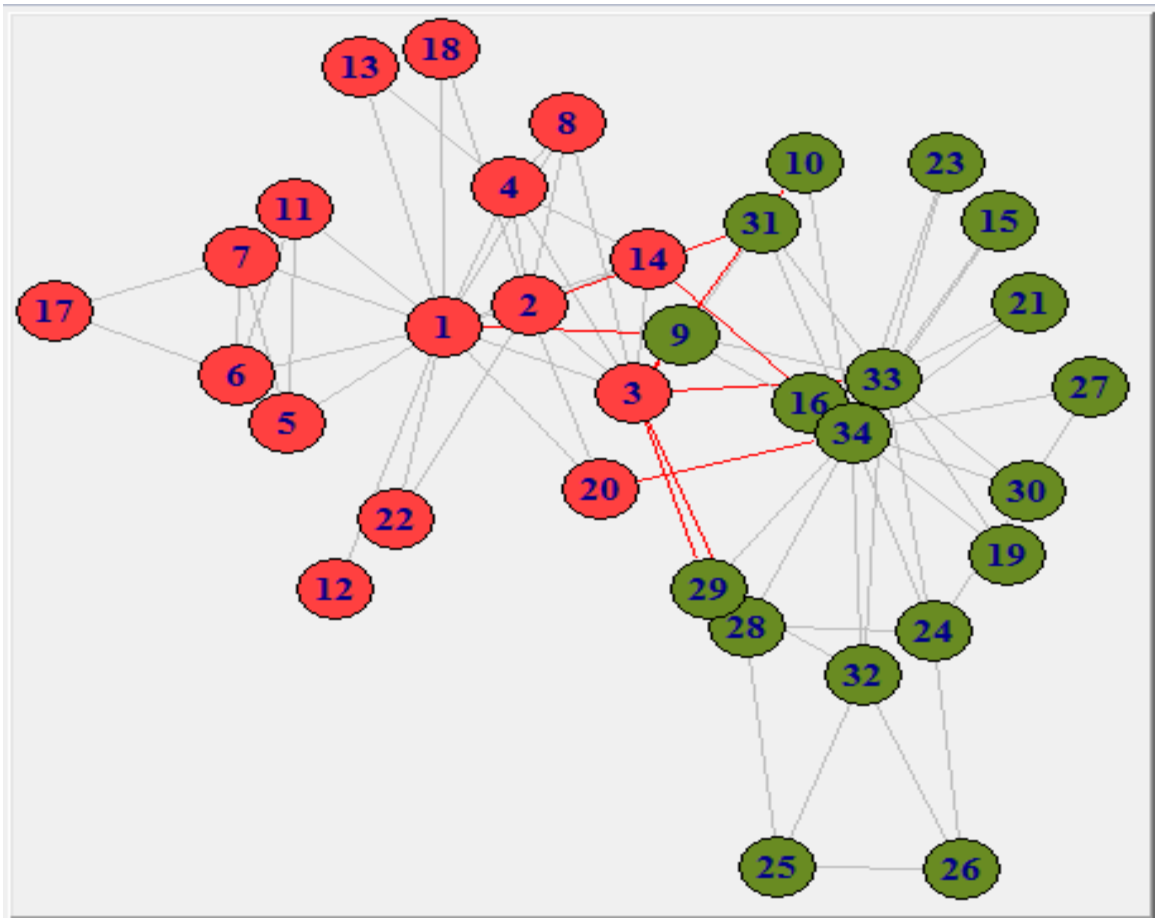
This week's assignment tasked us with proving Wayne W. Zachary's report on "Conflict and Fission in Small Groups", seeing if each edge creates a separation from the clusters. The article describes a scenario where two organizations in which have a disagreement and that they separate. The separation then resulted in now two new independent organizations being formed. The scenario was to describe the whole theory of separation for clusters in fission. Below is a demonstration of a flow graph describing the activity:



This was the initial form of the cluster flow graph before it was separated into two different graphs, in other words fission. As the fission process goes, each number node is disconnected from a particular other number node. As described in the results below:

[1] "Edges will be deleted in the following order : "

[1] "1 -> 32 -- Betweenness = 71.3928571428571"

[1] "1 -> 3 -- Betweenness = 66.8951770451771"

[1] "1 -> 9 -- Betweenness = 77.3173992673993"

[1] "14 -> 34 -- Betweenness = 82.0029059176118"

[1] "20 -> 34 -- Betweenness = 123.232917082917"

[1] "3 -> 33 -- Betweenness = 100.205555555556"

[1] "2 -> 31 -- Betweenness = 143.626984126984"

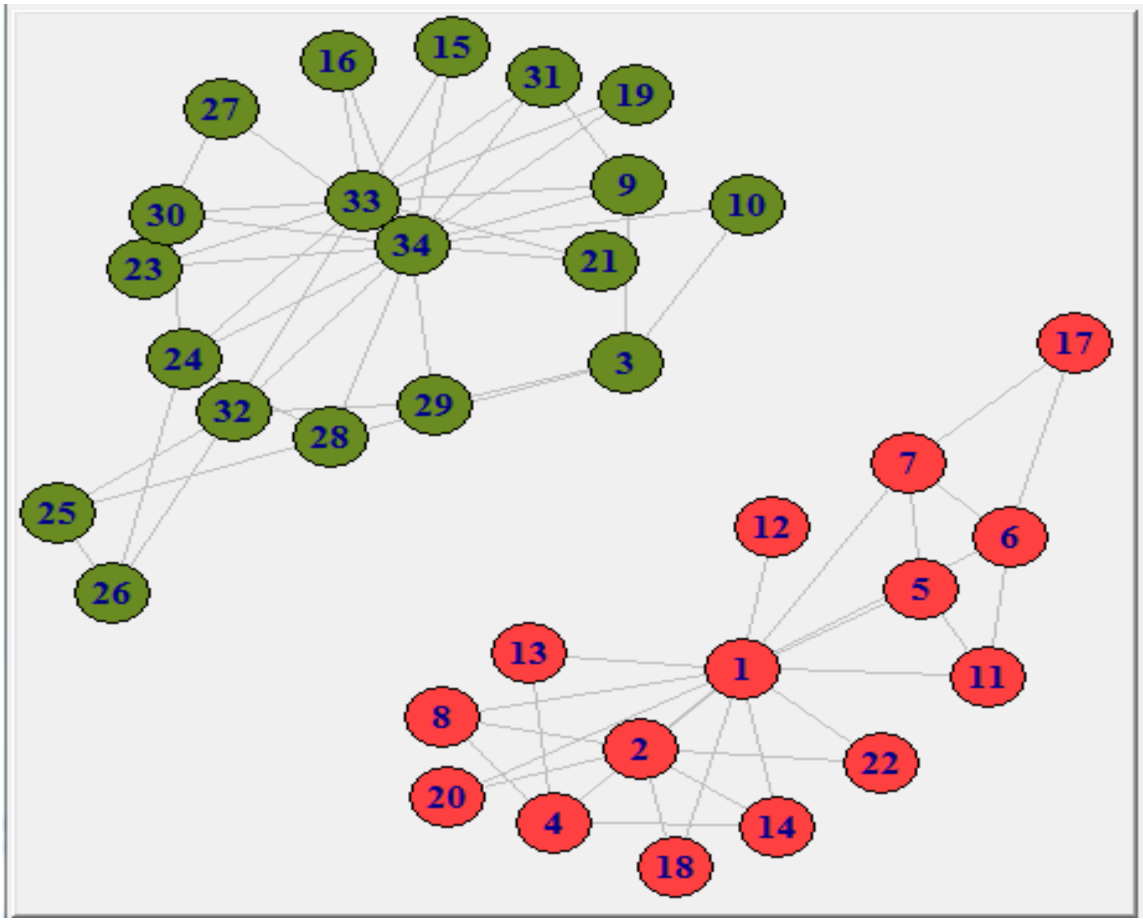
[1] "2 -> 3 -- Betweenness = 109.25"

[1] "3 -> 4 -- Betweenness = 107.666666666667"

[1] "3 -> 8 -- Betweenness = 142.75"

[1] "3 -> 14 -- Betweenness = 285"

Below, it can be seen such a separation can be done when edges are deleted in a certain order:



Of course the graph was conducted using an algorithm that was described in Zachary's report. That algorithm is called the Girvan-Newman Algorithm. Along with a process of "*edge betweenness",* each edge is deducted from the graph, thus the connection that was initially established has been severed from its state. As that occurs, every separation would cause a soon completely separated graph.

```
#Edges are beign calcualted below...
edges_betweenness <- edge.betweenness(g)
#Seperation of Edges are codnucted with the maximum value of edges
max_value <- max(edges_betweenness)
#Edges are deleted as followed.
edge_to_delete <- match(c(max_value),edges_betweenness)
#Graph is updated after each seperation
print(paste(paste(paste(get.edgelist(g)[edge_to_delete,1]," ->
"),get.edgelist(g)[edge_to_delete,2]),paste("  -- Betweenness =
",max_value)))
g <- delete.edges(g, E(g,
P=c(get.edgelist(g)[edge_to_delete,1],get.edgelist(g)[edge_to_delete,2])))
cluster_no <- clusters(g)['no']
```

Thus it is proven that this process of fission would have been easily predicted if given graphical demonstrations of the changes in edges goes along its description. The code above is a representation of the algorithm for this process to show in the R script.

Newman, Mark. "Network Data." *Network Data*. Network Data, n.d. Web. 03 Mar. 2016

Broux, Yanne. "Six Degrees of Spaghetti Monsters." *: Zachary's Karate Club*. N.p., n.d. Web. 03 Mar. 2016.

"Edge Betweenness." *Encyclopedia of Systems Biology* (2013): 647. *Edge Betweenness*. Encyclopedia of Systems Biology. Web.

Zachary, Wayne W. "R: Karate Club Social Network of Zachary (1977)." *R: Karate Club Social Network of Zachary (1977)*. U. Penn, n.d. Web. 03 Mar. 2016.