The Network Design Game is a game where users try and traverse a path, with the smallest weight on the path, from their source node to their sink node. The Network Design Game has as input a number of players *k* for each *i =* 1, 2, …*k* such that each player has a source and sink node *si* and *ti*respectively in the graph *G*. A strategy for a player consists of player *i* and a set *P* that is their path through *G* from their source to their sink*.* Each edge *e* in *E* has a cost *ce* For each player *i* calculates their cost by dividing the edge cost *ce* by the number of players on that edge *ne.* The output of The Network Design Game is to create a network that minimizes the total cost of the paths connecting the source and sink of each player.

For The Network Design Game there are several analyses that we can use to find the efficiency of a players path on a specific graph *G.* For every graph there is an optimal strategy, called OPT, that minimizes the total cost of all players on *G.* This optimal strategy will have the greatest social welfare possible, i.e. each player benefits from the set of optimal paths. Another strategy to use on a graph is a selfish strategy. We call this Nash Equilibrium (NE), and this means that each player is trying to minimize their own path through *G* regardless of what path the other players are taking. Finally we will analyze of graph based of off its Price of Anarchy (POA), which is when we take the worst case NE over the cost of OPT. This will allow us to compare the costs of these two strategies and compare the efficiency of different paths.