01NQQOC - Operations research: Theory and Applications to Networking

Lab 3- Greedy heuristic

Invent and implement a greedy heuristic algorithm for the solution of the LTD problem (you may use the graph library provided):

1) (mandatory) Test it (against a randomly generated topology with the same number of edges) considering a uniform traffic matrix, in which the traffic sent from any source to any destination is a uniform random variable in the range [0.5;1.5], i.e., *tsd*= traffic sent from node s to node d = Uniform[0.5,1.5]. To test topologies you must route traffic over the topology and compute the maximum flow on links *fmax* (your objective function),
2) (mandatory) Consider also several scenarios in which the number of nodes *N* and the number of transmitters and receivers per node assuming delta are given. Plot and briefly comment the values of *fmax* (for your toopology and the random) in the different scenarios.
   For example, plot
   - *fmax(N)* for delta=1,2,4
   - *fmax(°)* for N=20,30,40
   - …

   Suggestion: to estimate *fmax* repeat the experiment several times and plot the average values.
3) (mandatory) Repeat as above, considering a traffic matrix for which the traffic exchanged among nodes can take two possible classes:
   Low traffic: *tsd*=Uniform[0.5,1.5]
   High traffic: *tsd* =Uniform[5,15]
   Consider the case for which 10% of traffic demands belongs to the High traffic class (e.g., with probability 0.1).
4) (recommended) for the case delta=4, develop and implement a new greedy heuristic algorithm I which the topology is a bidirectional Manhattan and nodes are smartly placed (how?)
5) (optional) improve the performance of your solution (point 4) defining and implementing a simple meha- heurstitic algorithm. What is a reasonable move?