Homework 3: Five problems, one on each page

(Due: March 25)

1. Assume (1) that each link has a bandwidth of 1Gbps and a latency of 100ns, (2) that routers do not introduce routing delay, and (3) packet size is 1000 bits. Consider the random uniform traffic on the following topology, give a tight estimation of the lower bound of average packet delay and the upper bound of the aggregate throughput. (20 points)
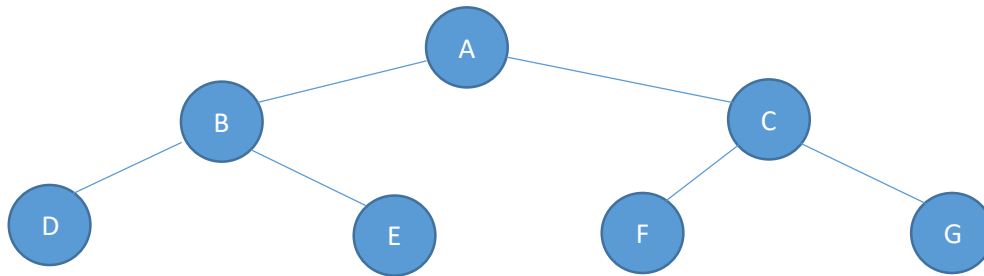
2. Compute the nodal degree, diameter, average shortest path hop count, and bisection bandwidth of the following topology. (20 points)
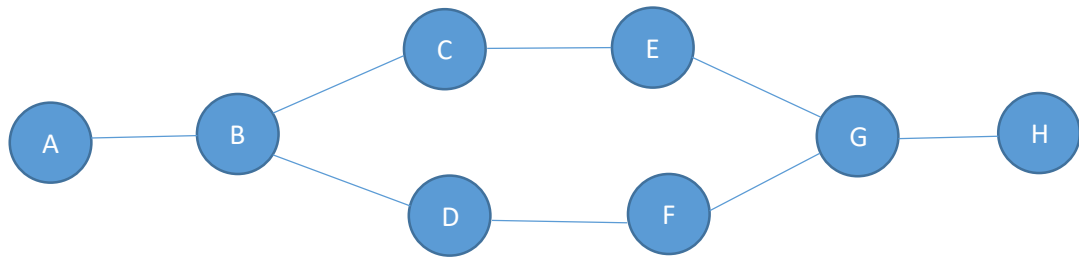
3. Explain why the diameter of the Dragonfly topology is 3. Given a source and a destination in the Dragonfly network, describe the minimal path from the source to the destination (the path should be at most 3 hops since the diameter of the network is 3. (20 points)

4. Assume (1) that each link has a bandwidth of 1Gbps and a latency of 20ns, (2) that there is no routing delay in the routers, and (3) that packet size is 1000 bits and the flit size is 20 bits. Let a packet goes through 4 hops to reach its destination, what is the packet latency with packet switching? What is the packet latency with virtual cut-through switching? (20 points)

5. Mr. X is designing an experiment to compare deterministic routing with adaptive routing. He likes the tree topology and decides to use the topology in question (1) for the experiment. Based on the information, do you think his experiment will be successful. Briefly explain your answer. (20 points)