COMP 4622 Homework #1

Due Date: Oct 8, 2013 at 11:59pm

Notes:
1) No late submission is accepted.
2) Submit in class or to COMP4622 homework deposit box (in Rm4030)
3) Electronic submissions are not allowed.

1. [8×4 points] True or false, and why? Briefly explain why the statement is true or not true.

- In P2P network, performance bottleneck is the only disadvantage of a centralized architecture.

- In Distributed Hash Table, Hash values of the IP addresses of the peers are stored in a centralized server.

- When a host joins a multicast group, it doesn't have to change its IP address to that of the multicast group it is joining.

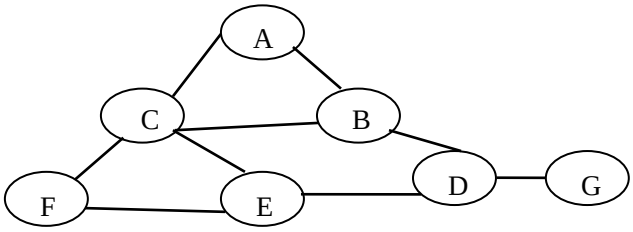
- IGMP is a protocol run only between the host and its first-hop multicast router.

2. [22 points] In a Peer-to-Peer network, the nodes and links in its overlay network form a connected graph with N nodes and N-1 edges. All links are bidirectional.

(1) Are there loops (cyclic paths) in the overlay network? Describe the structure of the overlay network.

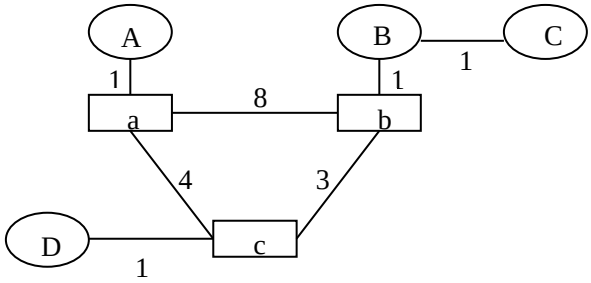
(2) Analyze the worst case asymptotic complexity for BFS (Breadth First Search), DFS (Depth First Search), and IDS (Iterative Deepening Search) searches on this overlay network.

3. [22 points] Consider the following topology. Suppose that all links have unit cost and that node E is the broadcast source. Using arrows to indicate links over which packets will be forwarded using RPF, and links over which packets will not be forwarded, given that node E is the source.



4. [24 point] Application-level multicast

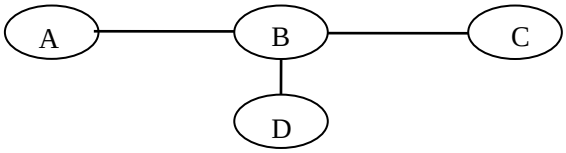
Consider the following network topology:



A, B, C, D are End Systems, a, b, c are Routers.

The numbers are the routing cost/delay between nodes. For example the routing delay between D and c is 1 and the routing delay between b and c is 3.

Now, node A, B, C and D form an End System Multicast group. Following is the current mesh overlay topology.



(1) [4 points] Name one benefit and one disadvantage of End System Multicast.

(2) [10 points] Suppose the packets are routed along the shortest cost path between nodes in unicast. In End System Multicast, under current overlay topology, what is the delay between node A and D?

(3) [10 points] Suppose if adding an edge can reduce the total routing delay of link A-B, A-C, A-D (Utility Gain) for more than 3 (Add Threshold), this edge should be added. Under current overlay topology, should the link A-D be added or not? Explain your answer.