

### 1. High level question

- a. When a new router is brought up in link state, how does it get information about the network? How is it done for distance vector?
- b. Can link-state experience count-to-infinity problems? Why or why not?
- c. Link-state routing is comparable to watching a map (e.g. your GPS) when you drive. Another way to navigate your car is to look for "landmarks" – big structures like buildings, which helps you know where you are. Describe how you would develop a routing protocol (as an alternative to link-state and distance-vector) that used a similar concept to landmarks to route.
- d. Consider an alternate Internet where we are only allowed to use one address per host (the MAC address), and we need to get rid of IP addresses. What implications would this have for the Internet? Describe how you would redesign the Internet to do this, and challenges that arise.

### 2. Window size

Consider an error-free 512-kbps satellite channel used to send 1024-byte data frames in one direction, with very short acknowledgements coming back the other way. Assume an earth-satellite propagation delay of 270 msec.

- a. What is the maximum throughput for window size of 1 and 7?
- b. At what minimum window size can the protocol run at the full rate of the channel?

### 3. IP Addressing

Suppose a router has the following routing table:

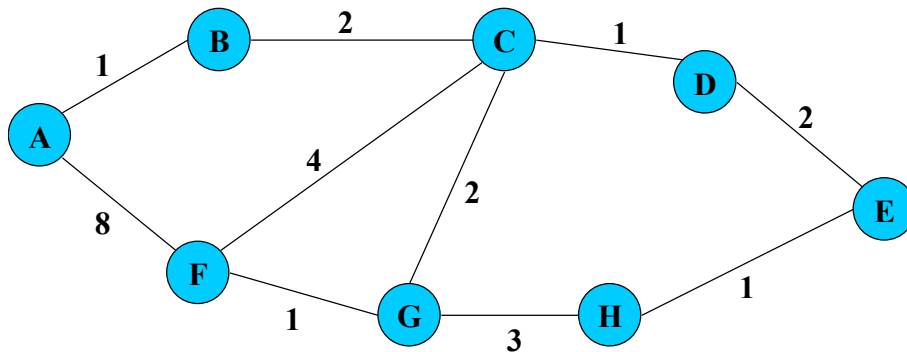
64.20.44.0/24	if1
64.20.44.100/30	if2
64.20.32.0/20	if3
64.20.46.0/23	if4
64.0.0.0/10	if5
0.0.0.0/0	if6

- a. For each entry in the table, list the range of IP addresses that will be matched by that entry (ignoring any overlap between entries) and state the number of addresses in each group. Exclude the IP addresses for the network address and the broadcast address in these calculations.
- b. Which interface will be used for each of the following addresses? Remember that routers use the rule with the longest matching pre\_x.
  - i. 64.20.44.102
  - ii. 64.20.45.102

- iii. 64.20.47.102
- iv. 64.20.48.102

#### 4. Link-state routing

Show how the link-state algorithm builds the routing table for node A in the following network. Follow the same format as in P258 of P&D, however you don't need to have the comments column.



#### 5. Distance-vector routing

A network has nodes A, B, C, D, E, F, G, H. Node A boots up and learns that first B then F are neighbors, with distances 1 and 8 respectively. For parts a), b) and c) of this question, give both the outgoing link to use and the distance from A for each of the 8 nodes.

- a. Node A discovers neighbors B and F. What is A's routing table?
- b. Node A receives the routing vector (1,0,2,3,11,8,9,10) from B. What is A's new routing table?
- c. Node A subsequently receives the routing vector (7,5,3,4,6,0,1,4) from F. Again, what is A's new routing table?