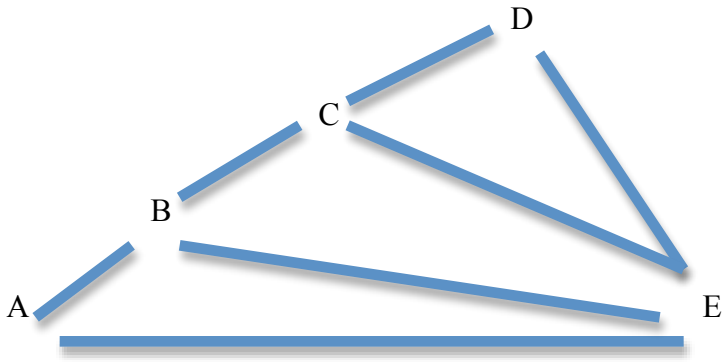
CSE P561: Network Systems
Homework #2
Due: Start of class, week 6

1. In class, we described how the "count to infinity" problem occurs in distance vector routing – where neighboring routers believe each other has a valid route to the rest of the network. Can something similar happen with Ethernet bridges? Explain.

2. A common mistake in implementing the alternating bit protocol is to have the receiver only acknowledge packets whose sequence number is expected. Explain how this strategy will cause the protocol to fail.

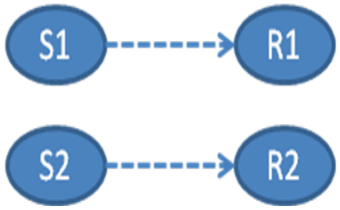
3. A recent study has shown that there are literally thousands of instances per day of (long term) partial black holes – where traffic can be delivered to a destination from some sources, but not from others. These instances persist for longer than it takes BGP to converge, but are often repaired over the course of a few hours. Explain how this could happen.

4. In the network below, assuming every link has equal bandwidth, what is the maximum throughput between A and E assuming (i) shortest path routing (in terms of hop count), (ii) shortest path routing (where each link can be assigned a weight to maximize throughput, and traffic is evenly split among all equal cost paths), and (iii) a route assignment designed to maximize throughput (e.g., using MPLS)?




5. In the network below, S1 sends to R1 and S2 sends to R2. Sender broadcast packets and receiver do not generate acknowledgements. When exactly one link is active (S1→R1 or S2→R2), the maximum

throughput is 1 Mbps.




What is the maximum combined throughput (S1→R1 + S2→R2) when both senders want to send, under each of the following conditions:

a. S1 and S2 do not defer to each other, and each receiver can correctly decode packets from its sender even when the other sender transmits simultaneously.
b. S1 and S2 do not defer to each other, and receivers cannot decode packets from its sender when the other sender transmits simultaneously.
c. S1 and S2 are within carrier sense range of each other and use CSMA for medium access, and each receiver can correctly decode packets from its sender even when the other sender transmits simultaneously.
d. S1 and S2 are within carrier sense range of each other and use CSMA for medium access, and receivers cannot decode packets from its sender when the other sender transmits simultaneously.