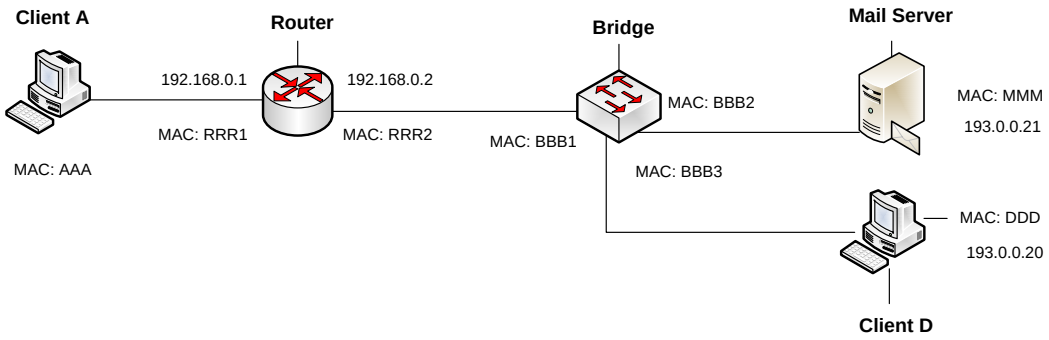
EP1100 Datakommunikation och datornät

6. Previous Exam Problems

C1. You are employed as a system administrator at a company. You are presented with the following company network, consisting of two networks 192.168.0.0/24 and 193.0.0.0/28.



a) On your first working day your boss comes to you and complains that he cannot access the database and the mail server from his personal computer (client in the picture above). You realize the network has been misconfigured. List all the problems in the network that you see which prevent your boss from accessing the servers? (3p)

b) Suppose that the link between the client and the router has an MTU of 300 bytes, and the link between the router and the server has an MTU of 900 bytes. The client sends out a request of 850 bytes to the mail server. How many packets will arrive at the mail server? Show the packet and frame headers (IP source/destination as well as MAC source/destination addresses) that the request has on its way from the client to the server. (2p)

c) Assume that all ARP caches are empty, and the broadcast MAC address is denoted with BRC. Client D sends a single IP packet to Client A with a TTL value of 64. You are observing the packet exchange on the link between Client A and the Router. List all frames you see in their correct order. For each frame specify the source and destination MAC addresses, as well as the IP addresses and the TTL values wherever applicable. (3p)

C2. Show that you know how TCP works. (Assume that the sender always has data to send; receiver window: *rwnd*; congestion window: *cwnd*) (1p/item)

a) How is a connection established?

b) Acknowledgments with sequence numbers 321, 321 and 321 are received in congestion avoidance. What does the sender do?

c) The connection is in slow start and *cwnd* is 140 segments. A sent segment is acknowledged. What is the new value of *cwnd*?

d) The connection is in congestion avoidance and *cwnd* is 1000 segments. A full congestion window is acknowledged. What is the new value of *cwnd*?

e) The source has 512 byte of data to send and *cwnd* is 1024 byte. It receives an ACK with a *rwnd* of 384 bytes. What will it do?

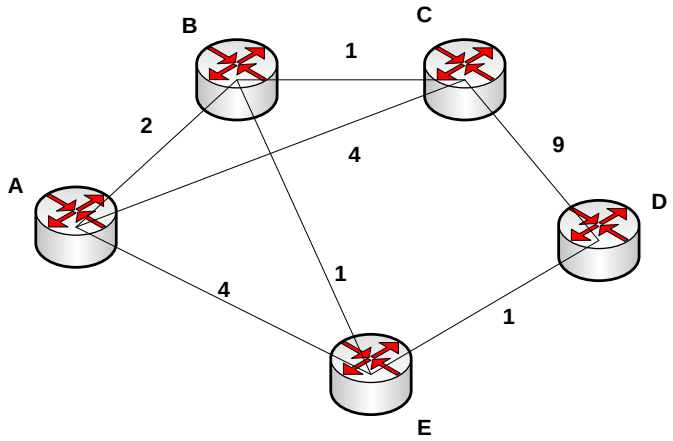
f) No acknowledgement is received despite data being sent. What happens after retransmission time out?

C3.

a) Assume that the signal-to-noise ratio at the output of a transmitter is 12 dB. The bandwidth of the transmission channel is 30 MHz. The channel introduces an attenuation of 3 dB. What is the capacity of this system given that the thermal noise added at the receiver is 3 dB higher than the thermal noise at the transmitter? (3p)

b) Assume that $M = 8$ symbols are used to represent binary data on a channel with a signal-to-noise ratio of 20 dB. Which limit determines the rate, the Shannon's or Nyquist's? Motivate your answer (1p)

C4. Consider the following network.



a) First, assume that all nodes in the network are routers, and the network is running OSPF as a routing protocol. After receiving updates from nodes in the network, router C has formed the following view of the network topology (see figure above). What topology information does router C send out and to whom does it send it? (2p)

b) Calculate the routing table from the viewpoint of node C (in a). (3p)

c) Now assume that all nodes in the network are bridges with IDs from 1 to 5 where 1 corresponds to A and 5 corresponds to E. Show the spanning tree for the network. Mark root node, root ports, designated ports and blocked ports on each bridge. Does the spanning tree defer from the routing table at node C? Why or why not? (2p)