CS 6250 Computer Networks **Fall Semester, 2003**

Homework 3

Assigned: September 24 *Due: September 30 (in class)*

1. Consider two approaches to achieving multicast: unicast emulation and network-layer multicast. In unicast emulation, the sender separately unicasts N copies of each packet to the N group receivers. In network-layer multicast, a tree is constructed through the routers to reach the receivers (at the leaves); the routers are responsible for making packet copies.

   Suppose the sender is connected to the receivers through a binary tree of routers. What is the cost of sending a multicast packet in the case of unicast emulation and network-layer multicast, for this topology? Define "cost" as a count of the number of times a packet (or copy of a packet) traverses a link. What topology for connecting the sender, receivers and routers will bring the cost of unicast emulation and true network-layer multicast as far apart as possible?

2. Leon-Garcia, 8.39 (1st edition), 8.45 (2nd edition)

   Let's consider the bandwidth consumption of the RIP protocol.

   (a) Estimate the number of messages exchanged per unit time by RIP, [as a function of the relevant parameters of the network. You will need to figure out what these parameters are, but they might include, for example, the number of nodes.]
   (b) Estimate the size of the messages exchanged as a function of the size of the RIP network.
   (c) Estimate the bandwidth consumption of a RIP network [by combining the results of the two parts above.]

3. Leon-Garcia, 8.55 (1st edition), 8.61 (2nd edition)

   Answer parts (a) and (b). Do not answer part (c) in the text, instead answer the following:

   Suppose AS1 prefers AS2 for transit and AS6 prefers AS5 for transit. What effect does this have on the routing advertisements exchanged between AS1 and AS6 (over the R7-R9 link)?

4. Leon-Garcia, 8.8 (1st edition), 8.12 (2nd edition)

   Perform CIDR aggregation on the following /24 IP addresses ("/24" means that the common prefix length is 24 bits): 128.56.24.0/24, 128.56.25.0/24, 128.56.26.0/24, 128.56.27.0/24

5. Suppose a router has the routing table shown below. The router can deliver packets directly over interfaces 0 and 1, or it can forward packets to routers R2, R3, or R4.

subnet number	subnet mask	next hop
128.96.39.0	255.255.255.128	interface 0
128.96.39.128	255.255.255.128	interface 1
128.96.40.0	255.255.255.128	R2
192.4.153.0	255.255.255.192	R3
¡default¿		R4

   Describe what the router does with a packet addressed to each of the following destinations:

   (a) 128.96.39.10
   (b) 128.96.40.12
   (c) 128.96.40.151
   (d) 192.4.153.17
   (e) 192.4.153.90