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CS455 Data Communications
Homework #8
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1. Explain the meaning of the term "dotted decimal". Hence derive the net-id and hosted for the following IP addresses expresses in dotted decimal notation:

Dotted Decimal notation is used to make it easier to communicate IP addresses. The 32 bits are broken into four bytes. Each byte is then converted into its equivalent decimal form and the total IP address is represented as the four decimal numbers with a dot (period) between each. This form is known as Dotted Decimal notation.

i. 45.34.40.0	**Net ID: 45**	**Host ID: 34.40.0**
ii. 155.12.40.14	**Net ID: 155.12**	**Host ID: 40.14**
iii. 195.40.230.12	**Net ID: 195.49.230**	**Host ID: 12**
iv. 45.0.0.0	**Net ID: 45**	**Host ID: 0.0.0**
v. 238.0.0.0	**Net ID: 238.0.0**	**Host ID: 0**

2. (9.20) In relation to the distance vector algorithm, with the aid of the example shown in figure 9.13 explain:

The distance vector algorithm is a distributed algorithm that enables each router to build up a routing table (the vector) that contains the path cost (the distance) to reach all the netids in the internetwork.

i. The meaning of the term "connectivity/adjacency table" and how the tables contents are obtained

Each router on a network knows only the identity of, firstly, the netids of the networks that are attached to it – through gateways – and their related local line numbers, and secondly, the identity of the lines – and their cost – that form direct links to other routers. Normally, this information is either entered by network management or by the exchange of configuration messages with the other routers when each router is first brought into service. This information is held in the connectivity/adjacency table.

ii. How the final routing table entries for R3 are built up.

In the case of R3, this receives the updated contents of the routing tables held by R2 and R4. Hence after R3 receives the first set of updated tables from them, it determines that the shortest path to reach netid 2 has a distance of 1 via R2 and, to reach netid 4, the distance is 2 via R4. At the same time, R2 and R4 have themselves received update information from their own neighbors and, as a result, on receipt of the second set of updated tables from them, R3 determines that the shortest path to reach netid 1 has a distance of 3 via R2. Note that with the distance vector algorithm an entry is updated only if a new distance value is less than the current value. Also, those routes with equal path cost values are discarded.

iii. How a packet from a host attached to net-id 3 is routed to a host attached to net-id 1

A packet from net-id 3 is routed through net-id 2 to reach the destination net-id 1. The cost of this route is 3.

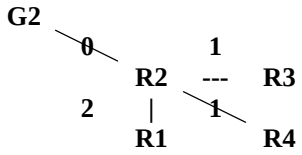
iv. The limitations of the algorithm including how looping may arise.

Since entries are updated in the order in which they are received and paths of equal distance/cost are discarded, routers may have dissimilar routes to the same destination. As a result, packets addressed to certain destinations may loop rather than going directly to the desired router/gateway.

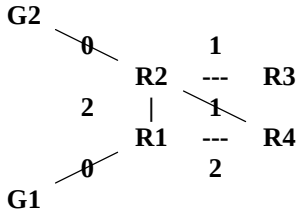
3. Assuming the connectivity/adjacency tables given in Figure 9.14(a), show how the overall network topology is built up by router R2 using the overall network topology is built up by router R2 using the link state algorithm. Hence derive the contents of net-id location table for R2.

Topology build-up by R2:

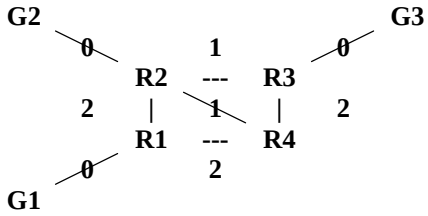
(i) Initial:



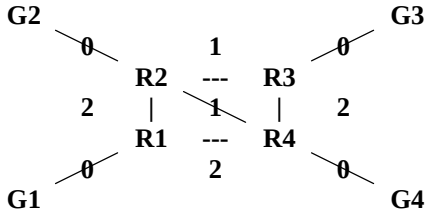
(ii) After connectivity information from R1:



(iii) After connectivity information from R3:



(iv) After connectivity information from R4:



Final Routing Table:

G/Netid	R, D
G1/1	R1, 2
G2/2	R2, 0
G3/3	R3, 1
G4/4	R4, 1