

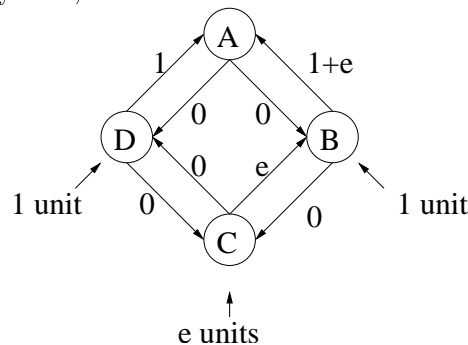
## Homework 2

Assigned: September 17

Due: September 23 (in class)

- Using as small a network topology as possible, demonstrate a situation in which the poison reverse technique does not prevent the counting-to-infinity problem in distance vector protocols. (Hint: realize that poison reverse only addresses problems that involve an immediate neighbor)
- Leon-Garcia, problem 7.20. Suppose that a datagram network has a routing algorithm that generates routing tables so that there are two disjoint paths between every source and destination that is attached to the network. Identify the benefits of this arrangement. What problems are introduced?
- Leon-Garcia, problem 7.22. Suppose a routing algorithm identifies paths that are “best” in the following sense: (1) minimum number of hops, (2) minimum delay, or (3) maximum available bandwidth. Identify the conditions under which the paths produced by the different criteria are the same. Repeat to identify when they are different.
- This illustrates a problem that can arise if link state updates and computations are synchronized. Consider a network in which the cost of a link  $(x, y)$  is the amount of traffic carried from  $x$  to  $y$ . Note that the costs are associated with link direction – generally the traffic from on  $(x, y) \neq (y, x)$  and hence the costs in the two directions are different. The cost of a path is the sum of the link costs.

Consider the following network. All traffic is destined for node A; 1 unit originates at B, 1 unit originates at D, and  $e$  units originate at C. In the initial condition, the traffic at D goes directly to A, the traffic at B goes directly to A, and the traffic at C takes the C-B-A path.



Suppose nodes B and C both have current link state information, and decide to simultaneously compute new routes. Show the next state of the system, indicating how the traffic flows and what the new link costs are. From this point, suppose nodes A, B and C all have current link state information and simultaneously compute new routes. Show the next state of the system. Comment on what has occurred and what might correct this problem.

- Suppose you are the administrator of a network domain. You have been assigned the class B address 150.24.x.x. You plan to organize your endhosts into 6 groups; all endhosts in the same group will share the same local area network. You have two groups whose maximum size is 256 hosts each, 2 groups whose maximum size is 128 hosts each, and 2 groups with maximum size 64 hosts each. You own three IP routers. You will connect to the rest of the Internet via one of the routers.

Design a network topology and subnet addressing scheme for your domain. Show the routing table at the router that connects to the rest of the Internet, indicating (for each entry) the network id, mask, and next hop.