CS4450 Problem Set #3

Spring 2025

1 Forwarding Tables

A

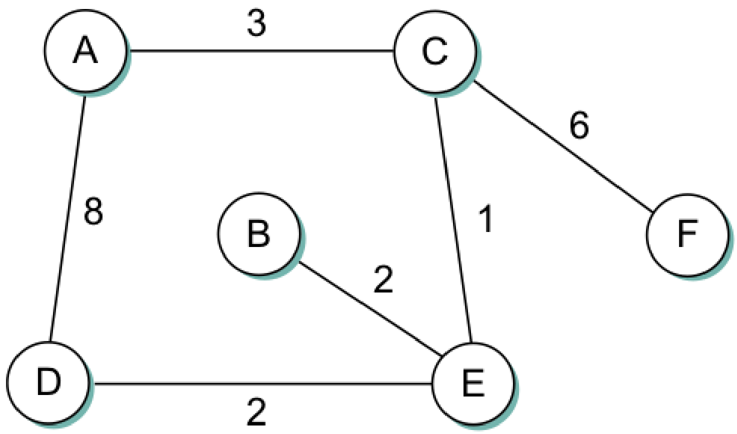
Node	Cost	Nexthop
B	1	B
C	1	C
D	2	B
[redacted]		
F	2	C

F

Node	Cost	Nexthop
A	2	C
B	3	C
C	1	C
D	2	C
E	1	E

Suppose we have a network in which all links have cost 1. Suppose the above forwarding tables are given for nodes A and F. Give a diagram of the smallest network consistent with these tables.

2 Distance Vector Routing



In the above network, links are labeled with costs. Assume distance vector routing.

a) Give the routing tables for this network such that each packet is forwarded via the lowest-cost path to its destination.

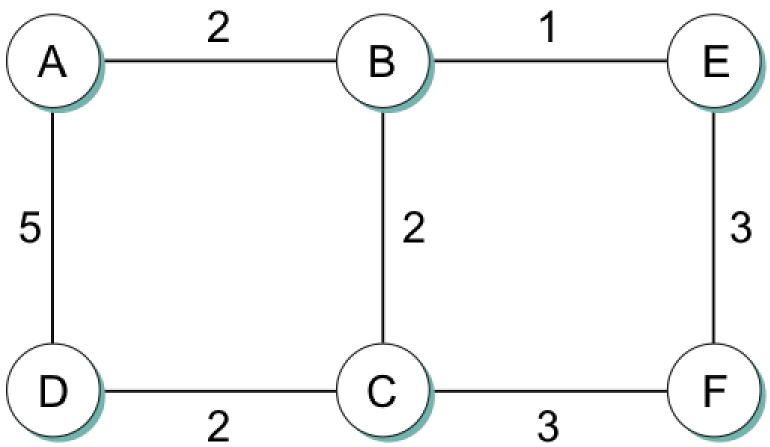
Now, assume the C-E link fails. Give the forwarding tables of

b) A, B, D and F after C and E have reported the news.

c) A and D after their next mutual exchange.

d) C after A exchanges with it.

3 Distance-Vectors



In the above network, links are labeled with costs. Assume we have distance-vector routing. Give the routing tables when

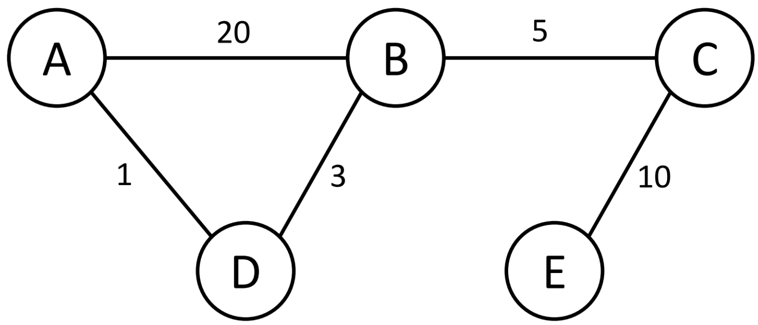
a) Each node knows only the distances to its immediate neighbors.

b) Each node has reported the information it had in the preceding step to its immediate neighbors.

c) Step (b) happens a second time.

d) Step (b) happens a third time.

4 Count-to-infinity Problem



In the above network, links are labeled with costs. Assume we use the basic distance vector algorithm.

a) Give the routing tables.

b) What will happen if the link between B and D fails? Perform the first three iterations of the algorithm following the failure.

c) Assume each node broadcasts its routing information every t seconds, calculate how long it takes for the routing tables on different nodes to become stable again.

d) In class, we have discussed *poisoned reverse*. Explain how *poisoned reverse* fixes this problem.

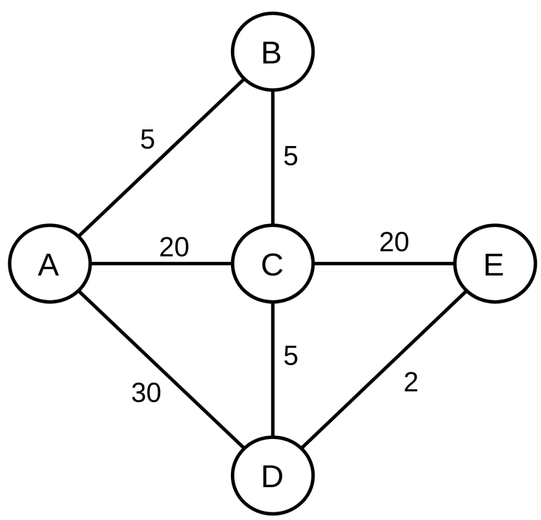
e) Identify a scenario using the network given in which *poisoned reverse* fails. What solutions could we use then?

5 Distance Vector Routing

The number on a link between any pair of nodes is the latency between the two nodes (equal to the propagation delay for both data packets and control packets). We will use latency, cost and distance interchangeably in this problem.

- Assume distance-vector routing and that at time t = 0, each node knows the distance only to its immediate neighbors.
- Assume that all nodes send their current distance vectors to all neighbors at every 10 seconds, starting at t = 0.
- Assume the nodes' clocks are perfectly synchronized.
- Assume that transmission time is 0 for both data packets and control packets
- Assume that processing a received distance vector and updating the routing/forwarding tables takes time 0.
- Assume that if the entry to a particular destination has cost/latency/distance equals to ∞, then a packet to that destination is dropped.

Given the above assumptions, below is node A's routing/forwarding table at t = 0.



A's Forwarding Table at t=0

Destination	Next Hop	Cost
B	B	5
C	C	20
D	D	30
E	-	∞

(a) Fill in A's forwarding table at the following times.

t = 6s

Dest.	Next hop	Cost
B		
C		
D		
E		

t = 16s

Dest.	Next hop	Cost
B		
C		
D		
E		

t = 26s

Dest.	Next hop	Cost
B		
C		
D		
E		

(b) Suppose three packets destined to E arrive at A, one packet p_1 at time t = 6s, another packet p_2 at time t = 16s and finally another packet p_3 at time t = 26s. Show the paths taken by and the end-to-end latency for each of the packets (ignoring transmission time). Also give reasons for the correctness of the paths computed for the packets.