CS 168
Fall 2017

Introduction to the Internet
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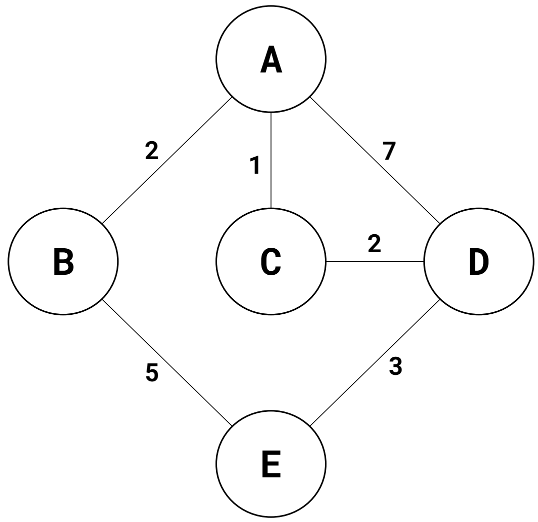
Discussion 4: Routing II

1 Distance-Vector Routing



The nodes in the above network communicate with each other using distance-vector routing. Below are the initial routing tables for each node, and a table showing the costs for each of their neighboring links.

In the routing tables, each row represents a neighbor and a column represents a destination. Each cell entry is of the format `(shortest known distance to dest, next hop)`.

Node A

Nbr	*Cost*
A	0
B	2
C	1
D	7

From \ To	A	B	C	D
A	0, A	2, B	1, C	7, D
B	-	0	-	-
C	-	-	0	-
D	-	-	-	0

Node B

Nbr	*Cost*
A	2
B	0
E	5

From \ To	A	B	E
A	0	-	-
B	2, A	0, B	5,E
E	-	-	0

Node C

Nbr	*Cost*
A	1
C	0
D	2

From \ To	A	C	D
A	0	-	-
C	1, A	0, C	2, D
D	-	-	0

Node D

Nbr	*Cost*
A	7
C	2
D	0
E	3

From \ To	A	C	D	E
A	0	-	-	-
C	-	0	-	-
D	7, A	2, C	0, D	3, E
E	-	-	-	0

Node E

Nbr	*Cost*
B	5
D	3
E	0

From \ To	B	D	E
B	0	-	-
D	-	0	-
E	5, B	3, D	0, E

The following questions indicate events that happen consecutively. You can assume that there are no other packet exchanges than the ones specified.

EVENT: *C sends its update to A and D.*

(1) What do the routing tables for *A* and *D* look like after receiving *C*'s update? (You may not need to fill in all columns)

Node A

Neighbor	Cost
A	0
B	2
C	1
D	7

To / From					
A					
B					
C					
D					

Node D

Neighbor	Cost
A	7
C	2
D	0
E	3

To / From					
A					
C					
D					
E					

(2) Which nodes among *A* and *D* are expected to send routing updates after receiving *C*'s update?

EVENT: *A sends its update to B, C, and D.*

(3) What do the routing tables for *B*, *C*, and *D* look like after receiving *A*'s update? (You may not need to fill in all columns)

Node B

Neighbor	Cost
A	2
B	0
E	5

To / From					
A					
B					
E					

Node C

Neighbor	Cost
A	1
C	0
D	2

To / From					
A					
C					
D					

Node D

Neighbor	Cost
A	7
C	2
D	0
E	3

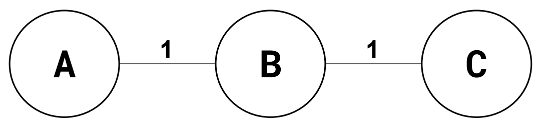
To / From					
A					
C					
D					
E					

(4) At this point, what route does D use to reach B? It knows that it can route to A via C with total distance 3 and that A can reach B with distance 2. Should it use this information to optimize the route to B or should it wait for an update from C?

(5) Which nodes among B, C, and D are expected to send routing updates after receiving A's update?

2 Poison Reverse

Consider the following simple network topology:



(1) Assuming that poison reverse was used when exchanging route information, what does B's routing table look like before the link from A to B goes down?

Node B

Neighbor	Cost
A	1
B	0
C	1

A			
B			
C			

EVENT: *B detects a link outage between A and B and sends an update to C.*

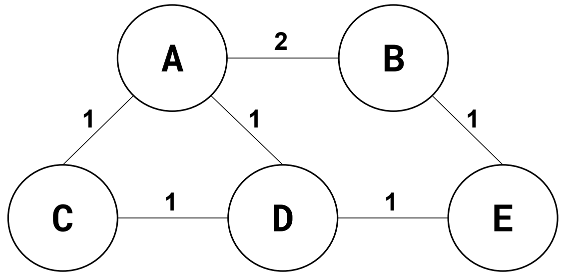
(2) What information is contained in B's update?

(3) What does C's routing table look like after receiving the update?

Node C

Neighbor	Cost
B	1
C	0

3 Split Horizon and Poisoned Reverse



(1) Assume that the routers use **split horizon**. Say that *E* sends its initial update (*B*: 1, *D*: 1) to *D*. Assuming that *D* has received no other updates, what does *D* now tell *E* about *D*'s path to *B*?

(2) Assume that the routers use **poisoned reverse**. Furthermore, assume that the routing tables haven't converged, and *D* believes its shortest path to *B* is *D*-*A*-*B* (length 3). *D* sends this update to *E*. Now, *E* sends its first update (*D*: 1, *B*: 1) to *D*. After recomputing its routes, *D* sends an update to *E*. In this update, what is the advertised distance to *B*?

(3) Now assume that the routers use **split horizon *and* poisoned reverse**. After the same scenario as in (2), what distance to *B* does *D* advertise to *E*?

(4) Consider the simple topology (*A*-*B*-*C*) from (2). After the routing tables have converged, link *A*-*B* goes down. When *B* sends *C* an update containing (*A*: ∞), is this an act of **poisoning a route** or **poisoned reverse**?

(5) **Poisoning a route** and **poisoned reverse** might sound similar, but actually we can think of one of them as being honest while the other one is lying. Which one tells the truth, and which one tells a white lie to keep the network functioning?