Exercise 3: RIP

S-38.121 Routing in Communications Networks

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1 What are the undesirable features of the Distance Vector protocol? And why are undesirable?

The undesirable features of the Distance Vector protocol are:

- Bouncing effect.
- Counting to infinite.

The "bouncing effect" is produced by a link failure, and temporal inconsistent routing tables in some nodes of the network caused by the link failure and a wrong order of the distance vector message delivery.

The undesirable results of "bouncing effect" are loops in the routing tables, packets losses and links congested.

The "counting to infinite" is produced by some link failures that isolate two nodes, and a loop is installed between these two nodes and the routing tables are inconsistents. Then the distances from one of this two nodes to another nodes out of the isle, increase continuously.

The undesirable results of "counting to infinite" are loops in the routing tables, links congested, possible routing packets losses.

2 What techniques can reduce the effect of above features? How much do they take effect

The techniques used to reduce the bad effects are:

- Split Horizon: It's a method based in the idea that a node A doesn't announce to a node B the short distance from A to X, if the packet from A to X go through node B.
- Triggered Updates: The nodes have to send distance vector messages as soon as they notice a change in their routing tables, instead of wait a period of time.

The "Split Horizon" can kill two-hop loops, but it can not eliminate all kind of loops, the three-hop loops are possible.

With "Triggered Updates" we can minimize the effects of loops caused by spurious packet losses, because it takes a much shorter time to count to infinity. But some loops can be formed.

3 Use the Bellman-Ford algorithm to find the routes in Figure 1 from node A to all the other nodes in Network 1

I have used the Bellman-Ford algorithm, following the steps that are explained in the course book (Routing in the Internet, Christian Huitema, page 98). And the development of the routing table is shown in the next table:

H	D_b^h	D_c^h	D_d^h	D_e^h	D_f^h
0	∞ -	∞ -	∞ -	∞ -	∞ -
1	4 A-B	∞ -	6 A-D	10 A-E	∞ -
2	4 A-B	10 A-B-C	6 A-D	9 A-B-E	14 A-E-F
3	4 A-B	10 A-B-C	6 A-D	9 A-B-E	12 A-B-C-F

The last row is the final routing table of A node.

4 Compare the pros and cons of RIP from the performance point of view, such as scalability, stability, complexity, functionality and loop avoidance

(functionality) RIP is a distance vector protocol that find the shortest path in a distributed way. RIP-2 support authentication and multicasting.

(scalability) RIP is a suitable protocol for relatively small networks, it cannot be used in networks in which routes may use more than 15 hops, because 16 indicates infinity. (complexity) But in small networks it's a good protocol to use, because it's simple, there are only two messages and only one table.

(stability) RIP is stable if the network topology isn't too complex and if there isn't many link failures, if there is a complex network topology or/and many link failures RIP is very unstable.

(loop avoidance) In RIP, routing loops are posible, but there is a mechanism to detect them, it's by the "count to infinity".In some cases the routing tables can be temporarily inconsistents and can have routing loops, and in some cases the process to put the routing tables in a consistent way can be very slow by counting to infinity.