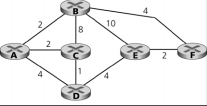
**Worksheet 12**

1. Compare and contrast link-state and distance-vector routing algorithms.

* message complexity
  + LS: with n nodes, E links, O(nE) msgs sent
  + DV: exchange between neighbors only • convergence time varies
* speed of convergence
  + LS: O(n2) algorithm requires O(nE) msgs •
    - may have oscillations
  + DV: convergence time varies •
    - may be routing loops •
    - count-to-infinity problem
* Robustness
  + LS: •
    - node can advertise incorrect link cost •
    - each node computes only its own table
  + DV: •
    - DV node can advertise incorrect path cost •
    - each node’s table used by others •
    - error propagate thru network

2. Is it possible that every autonomous system use the same intra-AS routing algorithm? Why or why not?

3. Consider the network shown below. Show the operation of Dijkstra’s (link-state) algorithm for computing the least cost path from D to all destinations. What is the shortest path from D to B, and what is the cost of this path?



D -> C -> A -> B Cost: 5

| N | D(A), p(A) | D(B), p(B) | D(C), p(C) | D(E), p(E) | D(F) , p(F) |
| --- | --- | --- | --- | --- | --- |
| D | 4, A | inf | 1,D | 4,D | inf |
| DC | 3,C | 9,C |  | 4,D | inf |
| DCA |  | 5,A |  | 4,D | inf |
| DCAE |  | 5,A |  |  | 6,E |
| DCAEB |  |  |  |  | 6,E |

4. Consider the count-to-infinity problem in the distance vector routing.

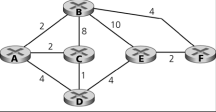
1. Will the count-to infinity problem occur if we decrease the cost of a link? Why?
2. How about if we connect two nodes which do not have a link?
3. No. News travels faster during a decrease.

During an increase, the previous information was a smaller number. The previous information is trying to be used.

1. No.

It is equivalent to a decrease when you add a link.

5. Consider the network shown below.



a. What are A, B, C, D, E, and F’s distance vectors? Note: you do not have to run the distance vector algorithm; you should be able to compute distance vectors by inspection. Recall that a node’s distance vector is the vector of the least cost paths from itself to each of the other nodes in the network.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| node | A | B | C | D | E | F |
| A | 0 | 2 | 2 | 3 | 7 | 4 |
| B | 2 | 0 | 4 | 5 | 6 | 4 |
| C | 2 | 4 | 0 | 1 | 5 | 7 |
| D | 3 | 5 | 1 | 0 | 4 | 6 |
| E | 7 | 6 | 5 | 4 | 0 | 2 |
| F | 6 | 4 | 7 | 6 | 2 | 0 |

b. Now consider node C. From which other nodes does C receive distance vectors?

From its neighbors. A B and D. Note that C does not receive a distance vector from nodes E and F, since they are not direct neighbors.

c. Consider node C again. Through which neighbor will C route its packets destined to E? Explain how you arrived at your answer, given the distance vectors that C has received from its neighbors.

DcE = minN={A,B,D} {CcN + DNE}

C’s cost to E via B is c(C,B) + DB(E) 8 + 6 = 14

C’s cost to E via A is c(C,A) + DA(E) = 2 + 7 = 9

C’s cost to E via D is c(C,D) + DD(E) = 1 + 4 = 5

d. Consider node E. From which other nodes does E receive distance vectors?

D,B,F

e. Consider node E again. Through which neighbor will E route its packets destined to B. Explain how you arrived at your answer, given the distance vectors that E has received from its neighbors.

DEB = minB,D,F { CEB + DBB = 10 + 0 = 10

CED + DDB = 4 + 5 = 9

CEF + DFB = 2 + 4 = 6 }

F is the shortest path. Cost = 6.

Djikstra’s and DV tables/cost calculation will be on FINAL!