1. Consider the following network. With the indicted link costs, use Dijkstra’s shortest-path algorithm to compute the shortest path from C to all network nodes. Show how the algorithm works by computing a table similar to Table 5.1:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S | N’ | A | B | C | D | E | F | G | H | I | J | K | L | M |
| 0 | C |  | 1, C | 0, C |  | 5, C | 3, C |  |  |  |  |  |  |  |
| 1 | CB | 5, B |  |  | 6, B |  |  |  |  |  |  |  |  |  |
| 2 | CBF |  |  |  |  |  |  | 5, F |  |  | 5, F | 5, F |  |  |
| 3 | CBFG |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 | CBFGA |  |  |  |  |  |  |  | 8, A |  |  |  |  |  |
| 5 | CBFGAJ |  |  |  |  |  |  |  |  | ~~12, J~~ |  |  |  | 10, J |
| 6 | CBFGAJE |  |  |  |  |  |  |  |  | 6, E |  |  |  |  |
| 7 | CBFGAJED |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | CBFGAJEDI |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 | CBFGAJEDIH |  |  |  |  |  |  |  |  |  |  |  | 10, H |  |
| 10 | CBFGAJEDIHK |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 | CBFGAJEDIHKM |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 | CBFGAJEDIHKML |  |  |  |  |  |  |  |  |  |  |  |  |  |

1. Consider a general topology (that is, not any specific network) and a synchronous version of the distance-vector algorithm. Suppose that at each iteration, a node exchanges its distance vectors with its neighbors and receives their distance vectors. Assuming that the algorithm begins with each node knowing only the costs to its immediate neighbors, what is the maximum number of iterations required before the distributed algorithm converges? Justify your answer.

Let H be the longest distance—in terms of “hops”—between two nodes on the network. The max number of iterations before the algorithm converges is H-1. This is because the farthest node’s information will have reached the other end; meaning that the entire network can now be updated accordingly with the up to date information.

1. Will a BGP router always choose the loop-free route with the shortest ASPath length? Justify your answer

The BGP router will try to avoid and refuse advertisements with loops in them, so the route will be loop free. However, the ASPath length will not always be the shortest, although it is considered often. The path won’t always be the shortest because of routing preference taking priority over the distance; so theoretically the shortest path could be locked behind priority access.

1. Suppose that AS1 and AS2 are running OSPF for their intra-AS routing protocol. Suppose that AS3 and AS4 are running RIP for their intra-AS routing protocol. For each of the routers 2b, 4a, 3b, and 1c, by which protocol (RIP, OSPF, eBGP, or iBGP) will the router learn about x?

2b— IBGP

4a— eBGP

3b— iBGP

1c— iBGP

1. Consider the two ways in which communication occurs between a managing entity and a managed device: request-response mode and trapping. What are the pros and cons of these two approaches, in terms of (1) overhead, (2) notification time when exceptional events occur, and (3) robustness with respect to lost messages between the managing entity and the device?
2. Overhead:
   1. Request-Mode has more variables to set but a smaller header than Trap messages.
   2. Trap messages have more header than Request-Mode, but only has two variables to set.
3. Notification time:
   1. Request mode PDUs are more for changing or getting information, and have a response from the server. These are not in reaction to an event. (Con for event notification)
   2. Trap messages are for notifying a server and are in reaction to an event. (Pro event notification)
4. Robust with lost messages:
   1. This is a con since both use UDP and reliable transfer isn’t a feature.