Khoi Ly

014707121

**P1.**

**Path from y to u**

y -> x -> u

y -> w -> u

y -> x -> v -> u

y -> w -> x -> u

y -> x -> w -> u

y -> z -> w -> u

y -> z -> w -> x -> u

y -> z -> w -> x -> u

y -> z -> w -> v -> u

y -> x -> w -> v -> u

y -> z -> w -> x -> v -> u

**P3.**

**Use Dijkstra’s algorithm to compute the shortest path from x to all network nodes.**

Chart

Description automatically generated with medium confidence

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Step | N’ | D(y), p(y) | D(w), p(w) | D(z), p(z) | D(v), p(v) | D(t), p(t) | D(u), p(u) |
| 0 | x | 6, x | 6, x | 8, x | 3, x |  |  |
| 1 | xv | 6, x | 6, x | 8, x |  | 7, v | 6, v |
| 2 | xvu | 6, x | 6, x | 8, x | 3, x | 7, v |  |
| 3 | xvut | 6, x | 6, x | 8, x | 3, x |  | 6, v |
| 4 | xvutw | 6, x |  | 8, x | 3, x | 7, v | 6, v |
| 5 | xvutwy |  | 6, x | 8, x | 3, x | 7, v | 6, v |
| 6 | xvutwyz | 6, x | 6, x | 8, x | 3, x | 7, v | 6, v |

Shortest path from x to y: x -> y (6)

Shortest path from x to v: x -> v (3)

Shortest path from x to w: x -> w (6)

Shortest path from x to z: x -> z (8)

Shortest path from x to u: x -> v -> u (6)

Shortest path from x to t: x -> v -> t (7)

**P5.**

**A picture containing text, clock, different

Description automatically generated**

Show the distance table entries at node z

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | z | v | x | u | y |
| z | 0 | 6 | 2 |  |  |
| v |  | 0 |  |  |  |
| x |  |  |  |  |  |

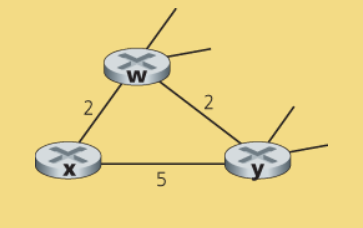
After connected to node x and v

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | z | v | x | u | y |
| z | 0 | 6 | 2 | 7 | 5 |
| v | 3 | 0 | 3 | 1 | 6 |
| x | 2 | 3 | 0 | 4 | 3 |

After connected to node u and y

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | z | v | x | u | y |
| z | 0 | 6 | 2 | 7 | 5 |
| v | 3 | 0 | 3 | 1 | 3 |
| x | 2 | 3 | 0 | 4 | 3 |

**P7.**

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**a. Give x’s distance vector for destinations w, y, and u.**

Minimum cost from x to w: 2

Minimum cost from x to y: 4

Minimum cost from x to u: 2 + 5 = 7  
**b. Give a link-cost change for either c (x, w) or c (x, y) such that x will inform its neighbors of  
a new minimum-cost path to u as a result of executing the distance-vector algorithm.**

Min cost from y to u is 6, and w to u is 5.

c (x,w) = 2, c (x,y) = 5.

If the current cost from x to u is x -> y -> u = 5 + 6 = 11, but the cost from x to u can be less than 11 by going to w (min cost is 7). In this case, x will inform its neighbors of the new min-cost path to u. **c. Give a link-cost change for either c (x, w) or c (x, y) such that x will not inform its neighbors  
of a new minimum-cost path to u as a result of executing the distance-vector algorithm.**

On the other hand, if the current cost is already the minimum cost (x to u is 7), the new cost from x to u will not inform its neighbors.

**P9.**

No, count-to-infinity problem will not occur. Instead, it will update the current count-to-infinity cost by the new cost.

When we connect two nodes without the link, it will update the cost by the new cost if the current cost is count-to-infinity. Therefore, it will decrease the cost of the link.

**P12.**

When the router finds its own AS number which is present in the list, the advertisement is rejected by the router. The routers use AS-PATH attribute for detecting and preventing the looping advertisement. Therefore, loops in paths can be detected in BGP.

**P13.**

In BGP, the router may contain more than 1 route to any one prefix, and it invokes some elimination rules to obtain one route sequentially. There is one rule which is based on choosing the route with the shortest AS-PATH. Therefore, the routes in BGP router are always loop-free with the shortest AS-PATH length for routing.

**P14.**

**a. Router 3c learns about prefix *x* from which routing protocol: OSPF, RIP, eBGP, or iBGP?**

eBGP  
**b. Router 3a learns about *x* from which routing protocol?**

iBGP  
**c. Router 1c learns about *x* from which routing protocol?**

eBGP  
**d. Router 1d learns about *x* from which routing protocol?**

iBGP

**P15.**

**a. Will *I* be equal to *I* or *I* for this entry? Explain why in one sentence.**

I1 because this interface begins the least cost path from 1d towards the gateway router 1c.  
**b. Now suppose that there is a physical link between AS2 and AS4, shown by the dotted  
line. Suppose router 1d learns that *x* is accessible via AS2 as well as via AS3. Will *I* be  
set to *I* or *I* ? Explain why in one sentence.**

I2. Both routes have equal AS-PATH length, but I2 begins the path that has the closest NEXTHOP router.  
**c. Now suppose there is another AS, called AS5, which lies on the path between AS2 and  
AS4 (not shown in diagram). Suppose router 1d learns that *x* is accessible via AS2 AS5  
AS4 as well as via AS3 AS4. Will *I* be set to *I* or *I* ? Explain why in one sentence.**I1 begins the path because it maintains the shortest AS-PATH.

**P16.**

Broder Gateway Protocol specifications:

* Border Gateway Protocol is a gateway protocol used to exchange routing and reach ability information among various autonomous systems (AS) on the internet
* Flow specification is most important aspect of BGP which tells the AS’S from where to direct the traffic from one AS’s to another AS’s in the network.

BGP mechanism used by C:

One way for the ISP C to force B in order to send the entire B’s traffic to D only on the east coast of C because C advertises its route to D through the east cost peering point with C.

Initially, the traffic from A is sent to the ISP B, and ISP B uses an external Boarder Gateway Protocol (eBGP) protocol to force the traffic from B to the east coast peering router in C because, C advertises its route to D. Therefore, ISP C sent the traffic received by the B to the ISP D.