Date 12-06-22

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REG #: SP20-BCS-044

ASSIGNMENT # 3

QUESTION # 1

i) Compare & contrast the advertisements used by RIP and OSPF?

- An advertisement used by RIP sent through a router contains information about all the networks in the AS, although this information is sent to only to its neighbouring routers
- An advertisement used by OSPF is sent through a router that periodically broadcasts the routing information to all the routers in the AS, not only to its neighbouring routers. This routing information has one entry for each neighbour. This entry gives the distance from the router to the neighbour.

ii) How does BGP use the NEXT-HOP attribute? How does it use the AS-PATH attribute?

BGP stands for Border Gateway Protocol. It is an Inter-AS routing protocol. Following are the most important attributes are AS-PATH and NEXT-HOP

- The router uses AS-PATH attribute for multiple paths.
- The NEXT-HOP is the router interface that initiates the AS-PATH.
- The advertisements passed for the prefix values contains the AS's in the AS-PATH.
- The first router is configured in the forward table, the router uses the NEXT-HOP attribute.

QUESTION # 2

i) Why are different inter-AS and intra-AS protocols used in the internet?

- Border Gateway Protocol is used for inter-AS protocols. But, RIP and OSPF are used for intra-AS protocols.
- Inter-AS protocol provides controlled distribution of routing information, but Intra-AS protocol are the policy issues play a much less important role in choosing routes.
- Inter-AS protocol provides is dominates the quality and the performance, but

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Intra-AS protocol focuses on the performance.

ii) Compare and contrast link-state and distance-vector routing algorithms.

Link State routing algorithm	Distance vector routing algorithm
1) The shortest path is calculated using dijkstras algorithm.	1) The shortest cost path is calculated using Bellman Ford algorithm
2) OSPF is an example of link state routing algorithm.	2) RIP is an example of distance vector routing algorithm.
3) The input of the algorithm is the network topology and all the link costs.	3) The input of the algorithm is the associated costs with the current node to all its neighbour.
4) CPU utilization is more	4) CPU utilization is less
5) Convergence time is fast	5) Convergence time is slow
6) Updates are multicasted	6) Updates are broadcasted.
7) More memory	7) less memory.
8) Computes least-cost path from source to destination with complete knowledge on the network	8) It computes least-cost path in an iterative and distributed manner.

QUESTION #3

a) Datagram Forwarding Table

Prefix Match		Link Interface
111 00000	00	0
111 00000	01000000	1
111 0000		2
111 00001	1	3
Otherwise		3

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b) Prefix match for first address is 4^{th} entry : link interface 3
Prefix match for second address is 2^{nd} entry : link interface 1
Prefix match for first address is 3^{rd} entry : link interface 2.

QUESTION # 4

S'	L(t), c(t)	L(u), c(u)	L(v), c(v)	L(w), c(w)	L(y), c(y)	L(z), c(z)
x	∞	∞	3, x	6, x	6, x	8, x
xv	7, v	6, v	3, x	6, x	6, x	8, x
xvu	7, v	6, v	3, x	6, x	6, x	8, x
xvuw	7, v	6, v	3, x	6, x	6, x	8, x
xvuwy	7, v	6, v	3, x	6, x	6, x	8, x
xvuwyt	7, v	6, v	3, x	6, x	6, x	8, x
xvuwytz	7, v	6, v	3, x	6, x	6, x	8, x

So the following are shortest paths from x along with their costs

t: xvt = 7;

u: xvu = 6;

v: xv = 3;

w: xw = 6;

y: xy = 6;

z: xz = 8

QUESTION #5

According to DVA, any node m computes the distance vector as follows.

$D_m(m) = 0$

$D_m(n) = \min\{c(m,n) + D_n(n),\ c(m,n) + D_o(n)\}$

$D_m(O) = \min\{c(m,n) + D_n(O),\ c(m,o) + D_o(O)\}$

*: no distance value.

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Distance vector table for node z

	u	v	x	y	z
u	*	*	*	*	*
x	*	*	*	*	*
z	*	6	2	*	0

Update

	u	v	x	y	z
u	1	0	3	*	6
x	*	3	0	3	2
z	*	6	2	*	0

→ Update the Table with minimum cost using the DVA

Example : v to y, two paths are available v-~~u~~-y and v-x-y with cost 3 and 6. We will select v-u-y as it has minimum cost. Hence update the table with this value.

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

QUESTION #6

$x^4 + x + 1 = 10011$

A string of 4 zeros are appended to the bit stream to be transmitted.

```
              1 1 0 0 0 0 0¹0 1 0
10011 | 1 1 0 1 0 1 1 0 1 1 0 0 0 0
      - 1 0 0 1 1
          1 0 0 1 1
        - 1 0 0 1 1
          0 0 0 0 0 1
          0 0 0 0 0 0
            0 0 0 1 0
            0 0 0 0 0
              0 0 1 0 1
            - 0 0 0 0 0
                0 1 0 1 1 0
              - 1 0 0 1 1
                0 1 0 1 0 0
                  1 0 0 1 1
                  0 1 1 1 0
```

→ Remainder

CRC = 1110

The code word transmitted to receiver =

1101011011 1110

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QUESTION #7

EBGP : external BGP runs between routers in different ASs

IBGP : internal BGP runs between routers in the same AS

a. eBGP : Router 3c learns about x from eBGP

b. iBGP: Router 3a learns about x from iBGP

c. eBGP: Router 1c learns about x from eBGP

d. iBGP: Router 1d learns about x from iBGP

QUESTION #8

a) Since all IP packets are sent outside, so we can use a packet sniffer to record all IP packets generated by the host behind a NAT. Each host generate a sequence of IP packets with sequential number a distinct initial identification number. IP packets can be grouped together with consecutive ID's into a cluster. No. of clusters is the no. of hosts behind the NAT.

b) If ID are not sequentially assigned but randomly assigned. The method mentioned in part (a) won't work as there is no clusters in sniffed data.