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Q1

- IPv4 only has 32-bit address, the address space soon to be completely allocated. But IPv6 has 128 bits address.
- Header format helps speed processing/forwarding
- Header changes to facilitate QoS

Q2

1. Link-State approach
    - This is a global information, all routers have complete topology, link cost info.
    - It's a static protocol, routes changes slowly
2. Distance Vector
    - It's a decentralized information, router knows physically-connected neighbors, link costs to neighbors.
    - Iterative process of computation, exchange of info with neighbors.

Q3

RIP: DV, Intra-AS, distributed

OSPF: LS, Intra-AS, centralized

BGP: DV. inter-AS, distributed

Q4

No, it's not fair. We should use Max-Min allocation.

Round 1, allocate 10 mbps to each user. Then remove satisfied user (user 3)

Round 2, 40 40 10.

So, user 1 and 2 get 40 mbps, user 3 get 10 mbps.

Q5

First, we give every user resources until one user is satisfied, then remove the satisfied user and repeat

TCP uses max-min fair

Q6

a) cost

Step 1:

E = {(A, B), (A, C), (A,D)}

Step 2:

E = {(AB, C), (AB, E), (A, C), (A,D)}

Step 3:

E = {(AB, E), (AC, B), (AC, D), (A,D)}

Step 4:

E = {(AB, E), (AD, E)}

Step 5:

E = {A-D-E}

b) delay

Step 1:

E = {(A, B), (A, C), (A,D)}

Step 2:

E = {(A,B), (AC, B), (AC, D), (A,D)}

Step 3:

E = {(ACB, E), (AD, E)}

Step 4:

E = {A-C-B-E}

Q7

a) cost

$d_D(A) = min\{3, 2+3\} = 3, d_D(C) = min\{2, 3+3\} = 2, d_D(E) = 4$

$d_D(B) = min\{c(D,A) + d_A(B), c(D,C) + d_D(B), c(D,E) + d_E(B)\} = min\{3+2, 2+2, 4+6\} = 4$

Then we can get the table

	A	B	C	E
From D	3	4	2	4

b) delay

$d_D(A) = min\{4, 3+1\} = 4, d_D(C) = min\{3, 4+1\} = 3, d_D(E) = 4$

$d_D(B) = min\{c(D,A) + d_A(B), c(D,C) + d_D(B), c(D,E) + d_E(B)\} = min\{4+6, 3+4, 4+2\} = 6$

Then we can get the table

	A	B	C	E
From D	4	6	3	4

Q8

As above

Q9

- Each user is equal, when their demand are not satisfied, they should get same resources
- We should not allocate resources exceed users' needs.

Q10

If we use Minimum-cost Broadcast Spanning Tree, we won't chose node C.

In terms of cost, the path is same. But in terms of delay, the path will change to: {A-B-E} or {A-D-E}

Q11