

# Module 5 Subnetting

Monday, 13 May 2024 7:59 AM

$$2^{32-16} = 2^{16} = 65536$$

190.100.0.0/16

① 256 Address :

$$2^8 \quad 32-8 = 24$$

1: 190.100.0.0/24 - 190.100.0.255/24

2: 190.100.1.0/24 - 190.100.1.255/24

64: 190.100.63.0/24 - 190.100.63.255/24

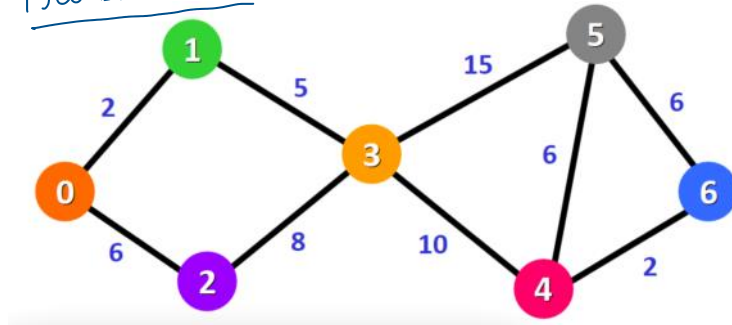
②

# Module 5 Dijkstra Algorithm

Sunday, 12 May 2024

3:15 PM

Problem 1:



Initially:

Distance:

0 : 0

1 :  $\infty$

2 :  $\infty$

3 :  $\infty$

4 :  $\infty$

5 :  $\infty$

6 :  $\infty$

Distance  
is  
unknown  
initially

Unvisited Nodes:

{0, 1, 2, 3, 4, 5, 6}

Starting at Node 0:

Unvisited Nodes : {~~0~~, 1, 2, 3, 4, 5, 6}

0 : 0

1 :  ~~$\infty$~~  2

2 :  ~~$\infty$~~  6

3 :  $\infty$

4 :  $\infty$

5:  $\infty$

6:  $\infty$

Unvisited Nodes:  $\{\cancel{0}, \cancel{1}, 2, 3, 4, 5, 6\}$

Moving to Node 3:

Distance:

0: 0

1:  ~~$\infty$~~  2

2:  ~~$\infty$~~  5

3:  ~~$\infty$~~  7 (2+5)

4:  $\infty$

5:  $\infty$

6:  $\infty$

Unvisited Nodes:

$\{\cancel{0}, \cancel{1}, \cancel{2}, \cancel{3}, 4, 5, 6\}$

Move on Node 4 & 5,

Distance:

0: 0

1: 2

2: 5

3: 7

4:  ~~$\infty$~~  7+10 = 17

5:  $\infty$

6:  $\infty$

Visited Nodes:

$\{\cancel{0}, \cancel{1}, \cancel{2}, \cancel{3}, \cancel{4}, 5, 6\}$

Node 6:

Unvisited Nodes:

Node 6:

0: 0

1: 2

2: 5

3: 7

4: ~~∞~~  $7 + 10 = 17$

5: ∞

6: ~~∞~~  $17 + 2 = 19$

Unvisited Nodes:

~~{0, 1, 2, 3, 4, 5, 6}~~

Node 5:

0: 0

1: 2

2: 5

3: 7

4: ~~∞~~ 17

5: ~~∞~~  $17 + 6$  or  $7 + 15 \Rightarrow 23$  or  $22 : 22$  less 0

Shortest distance:  $0 \rightarrow 1 \rightarrow 3 \rightarrow 5$

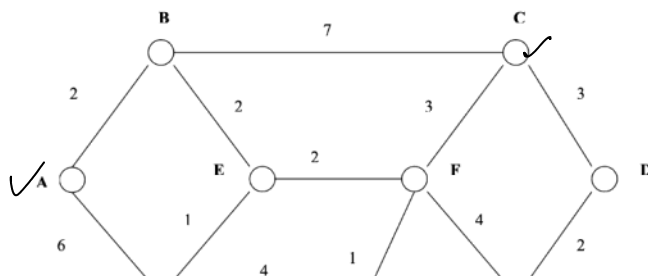
6: ~~∞~~ 22

Unvisited Nodes:

~~{0, 1, 2, 3, 4, 5, 6}~~

Problem 2:

- Dijkstra algorithm is used in computer networks to compute the shortest path between two nodes (hosts) in a network. Explain this algorithm clearly using the network presented in Figure 1 and find the shortest path between A and D.
- What is Distributed Routing Algorithm? Explain clearly using a network (subnet) of your choice with appropriate routing tables at nodes. You must use a network that is different from the ones that I used in class to explain this concept. You must also draw your network graph and provide the routing table that you considered.



$A \rightarrow B$   
 $B \rightarrow E$   
 $E \rightarrow G$   
 $G \rightarrow H$

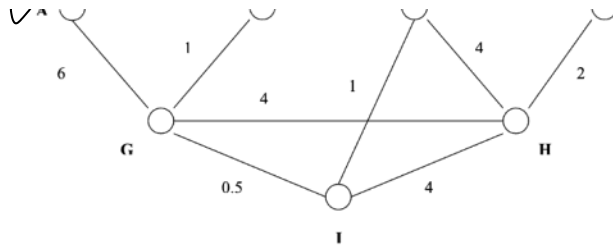


Figure 1: Figure for question 2(a)

$E \rightarrow G$   
 $G \rightarrow I$   
 $I \rightarrow F$   
 $F \rightarrow C$   
 $C \rightarrow D$

(3) Now, for  $E$  and  $F$  and  $E$  and  $G$  —  
 we see distance of  
 $E \rightarrow G < E \rightarrow F$   
 So we pick  $G$  node.

(4) Between  $G$  to  $H$  and  $G$  to  $I$   
 $G \rightarrow H > G \rightarrow I$   
 So, pick  $I$ .

(5) Between

So pick

(6) Between

(7) Between

(8) Between

(9) Between

(10) Between

(11) Between

(12) Between

(13) Between

(14) Between

(15) Between

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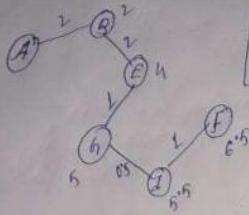
⑤ Between  $I \rightarrow F$  and  $I \rightarrow H$ ,

$$I \rightarrow F < I \rightarrow H$$

$$\begin{aligned} 5.5 + 1 &< 5.5 + 4 \\ 6.5 &< 9.5 \end{aligned}$$

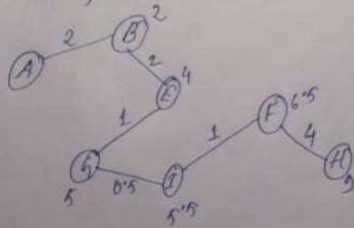
Here,  $6.5$  is  $< 9$ , so we pick  $F$  as shortest

But on the step ④ we get the weight of  $H$  is  $9$ . Now we check with  $6.5$  and  $9.5$ .  $6.5$  is small.  $\odot$



⑥ Between  $F \rightarrow H$  and  $F \rightarrow C$ .

We already get the weight of  $C$  is  $9$  (because from  $B$  to  $C$ , the weight is  $9$ ) and also the weight of  $H$  is also  $9$ . If we see the distance of —  
—  $F \rightarrow H$  and  $F \rightarrow C$  we get the value  $10.5$  and  $9.5$ . Both are greater than  $9$ . So we don't need to change the weight of  $C$  and  $H$ . So we can pick anyone as shortest. We pick  $H$  as shortest path.



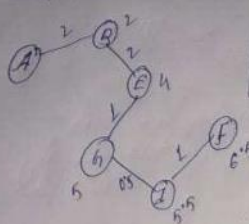
⑤ Between  $I \rightarrow F$  and  $I \rightarrow H$ ,

$$I \rightarrow F < I \rightarrow H$$

$$\begin{aligned} 5.5 + 1 &< 5.5 + 4 \\ 6.5 &< 9.5 \end{aligned}$$

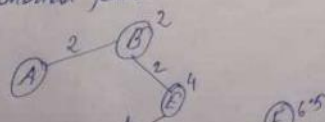
Here,  $6.5$  is  $< 9$ , so we pick  $F$  as shortest

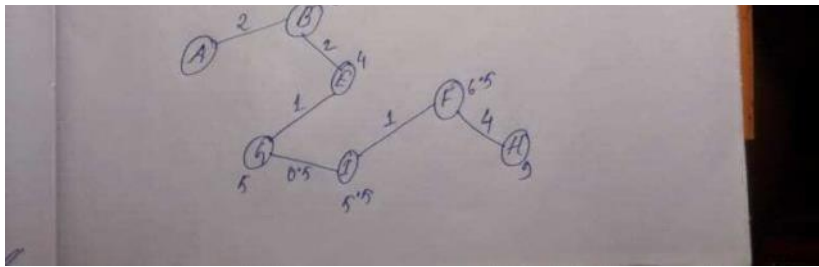
But on the step ④ we get the weight of  $H$  is  $9$ . Now we check with  $6.5$  and  $9.5$ .  $6.5$  is small.  $\odot$



⑥ Between  $F \rightarrow H$  and  $F \rightarrow C$ .

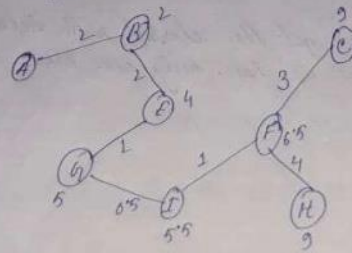
We already get the weight of  $C$  is  $9$  (because from  $B$  to  $C$ , the weight is  $9$ ) and also the weight of  $H$  is also  $9$ . If we see the distance of —  
—  $F \rightarrow H$  and  $F \rightarrow C$  we get the value  $10.5$  and  $9.5$ . Both are greater than  $9$ . So we don't need to change the weight of  $C$  and  $H$ . So we can pick anyone as shortest. We pick  $H$  as shortest path.





⑦ From H we can go to various nodes D. But we also have to check the weight of lefted nodes C and D.

Here we can see that weight of C is 9 which is less than weight of D (as H to D distance is,  $9+2=11$ ). So the path will visit C first.

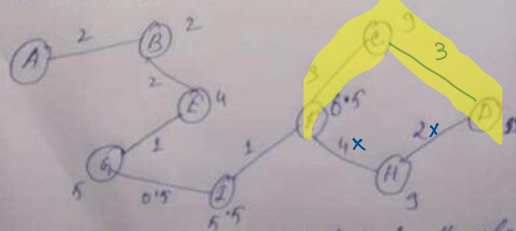


⑧ From point C and D H we can go to D. But we will take the short path. As we see,

$$C \rightarrow D = 9 + 3 = 12$$

$$H \rightarrow D = 9 + 2 = 11$$

So we take the route H to D —



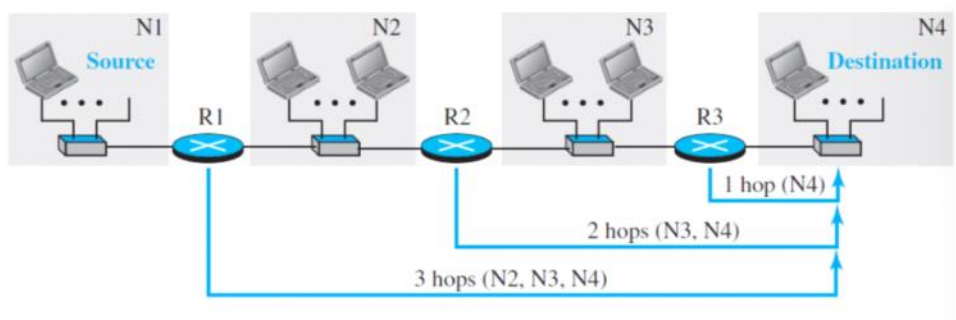
∴ The shortest path from A to D is the above diagram. And the shortest distance from A to D = 11 //

# Module 5 RIP

Sunday, 12 May 2024 3:54 PM

★ H is based on hop count.

★ Forwarding Table



Forwarding Table for R1

Destination Network	Next Router	Cost in hops
N1	—	1
N2	—	1
N3	R2	2
N4	R2	3

Forwarding Table for R2

Destination Network	Next Router	Cost in hops
N1	R1	2
N2	—	1
N3	—	1
N4	R3	2



### Forwarding Table for R3

Destination Network	Next Router	Cost in hops
N1	R2	3
N2	R2	2
N3	—	1
N4	—	1