HW3 Review

P5. Consider a datagram network using 32-bit host addresses. Suppose a router has four links, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11100000 00000000 00000000 00000000 through 11100000 00111111 11111111 11111111	0
11100000 01000000 00000000 00000000 through 11100000 01000000 11111111 11111111	1
11100000 01000001 00000000 00000000 through 11100001 01111111 11111111 11111111	2
otherwise	3

a. Provide a forwarding table that has five entries, uses longest prefix matching, and forwards packets to the correct link interfaces.

Prefix	Link Interface
11100000 00	0
11100000 01000000	1
1110000	2
11100001 1	3
*	3

Prefix	Link Interface
11100000 00	0
11100000 01000000	1
1110000	2
11100001 1	3
*	3

b. Describe how your forwarding table determines the appropriate link interface for datagrams with destination addresses:

11001000 10010001 01010001 01010101 => 3

11100001 01000000 11000011 00111100 => 2

11100001 10000000 00010001 01110111 => 3

P7. Consider a datagram network using 8-bit host addresses. Suppose a router uses longest prefix matching and has the following forwarding table:

Prefix Match	Interface
1	0
10	1
111	2
otherwise	3

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

Prefix	Start	End	Number
1	11 000000	11 011111	2^5 = 32
10	10 000000	10 111111	2^6 = 64
111	111 00000	111 11111	2^5 = 32
Otherwise	00000000	01111111	2^7 = 128

P9. In Section 4.2.2 an example forwarding table (using longest prefix matching) is given. Rewrite this forwarding table using the a.b.c.d/x notation instead of the binary string notation.

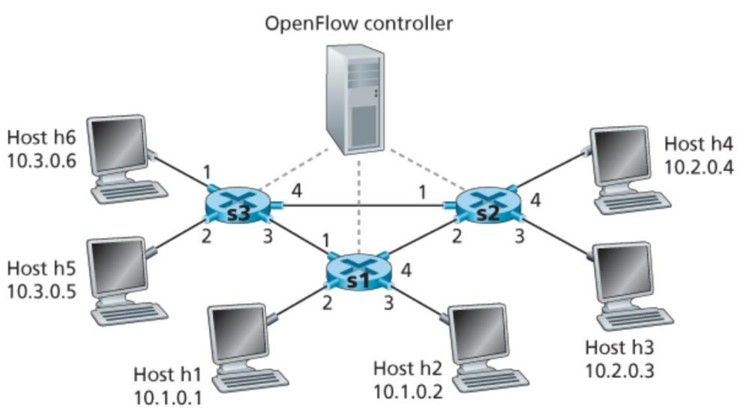
Prefix	Link Interface
11001000 00010111 00010	0
11001000 00010111 00011000	1
11001000 00010111 00011	2
Otherwise	3

a.b.c.d/x	Link Interface
200.23.16.0/21	0
200.23.24.0/24	1
200.23.24.0/21	2
Otherwise	3

P19. Consider the SDN OpenFlow network shown in Figure 4.30 . Suppose that the desired forwarding behavior for datagrams arriving at s2 is as follows:

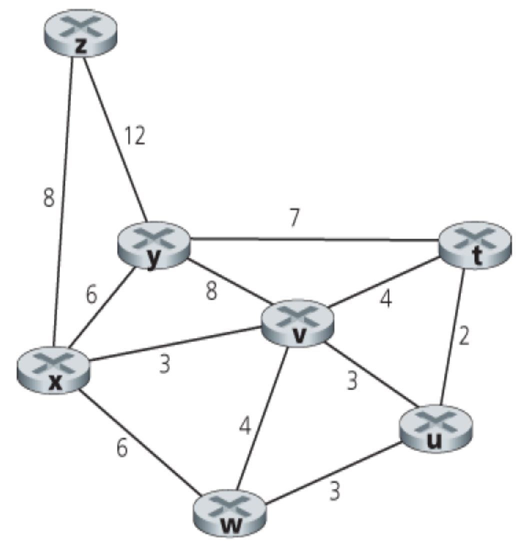
- any datagrams arriving on input port 1 from hosts h5 or h6 that are destined to hosts h1 or h2 should be forwarded over output port 2;
- any datagrams arriving on input port 2 from hosts h1 or h2 that are destined to hosts h5 or h6 should be forwarded over output port 1;
- any arriving datagrams on input ports 1 or 2 and destined to hosts h3 or h4 should be delivered to the host specified;
- hosts h3 and h4 should be able to send datagrams to each other.

Specify the flow table entries in s2 that implement this forwarding behavior.



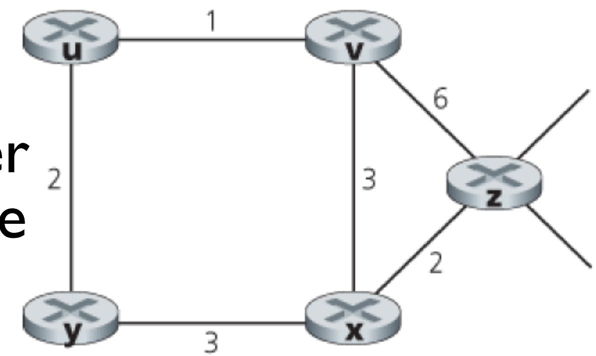
S2 Flow Table	
Match	Action
Ingress Port = 1; IP Src = 10.3.*.*; IP Dst = 10.1.*.*	Forward (2)
Ingress Port = 2; IP Src = 10.1.*.*; IP Dst = 10.3.*.*	Forward (1)
Ingress Port = 1; IP Dst = 10.2.0.3	Forward (3)
Ingress Port = 2; IP Dst = 10.2.0.3	Forward (3)
Ingress Port = 1; IP Dst = 10.2.0.4	Forward (4)
Ingress Port = 2; IP Dst = 10.2.0.4	Forward (4)
Ingress Port = 4; IP Dst = 10.2.0.3	Forward (3)
Ingress Port = 3; IP Dst = 10.2.0.4	Forward (4)

P3. Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from x to all network nodes. Show each step of how the algorithm works.



Step	N'	D(t),p(t)	D(u),p(u)	D(v),p(v)	D(w),p(w)	D(y),p(y)	D(z),p(z)
0	x	∞	∞	3,x	6,x	6,x	8,x
1	xv	7,v	6,v		6,x	6,x	8,x
2	xvu	7,v			6,x	6,x	8,x
3	xvuw	7,v				6,x	8,x
4	xvuwy	7,v					8,x
5	xvuwyt						8,x
6	xvuwytz						

P5. Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the distance-vector algorithm and show the distance table entries at node z.

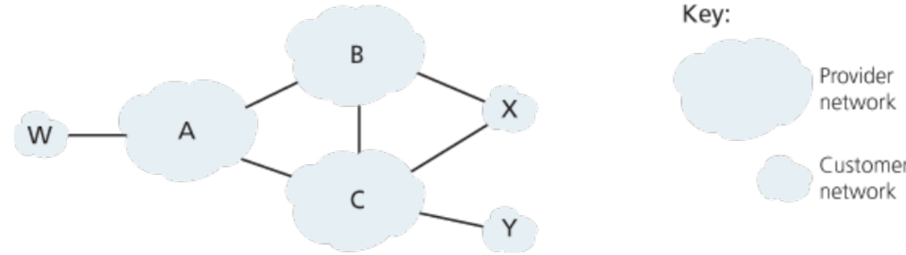


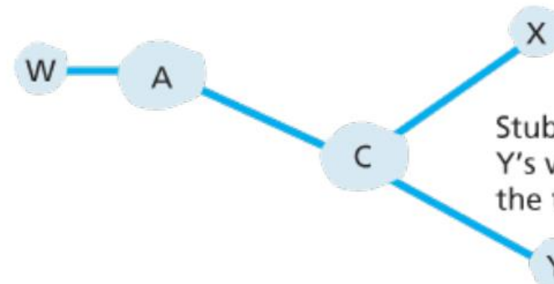
	u	v	x	y	z
u	0	1	∞	2	∞
v	1	0	3	∞	6
x	∞	3	0	3	2
y	2	∞	3	0	∞
z	∞	6	2	∞	0

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

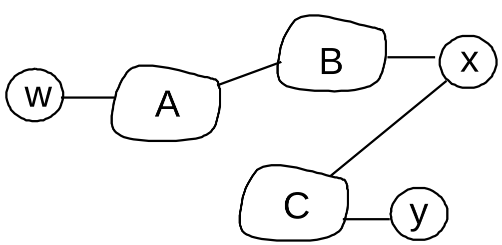
	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

P17. In Figure 5.13 , consider the path information that reaches stub networks W, X, and Y. Based on the information available at W and X, what are their respective views of the network topology? Justify your answer. The topology view at Y is shown below.

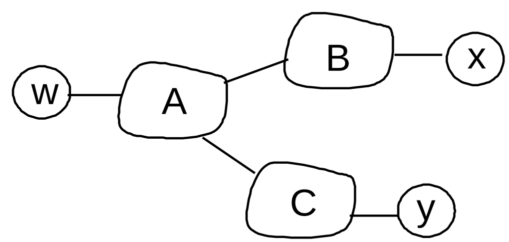




Stub network Y's view of the topology



X's view of the topology



W's view of the topology