Assignment 5

Gui Wenxuan, 2016302580142

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1 Problem1 and 2

Looking at Figure 5.3, enumerate the paths from y to u that do not contain any loops
And repeat Problem P1 for paths from x to z, z to u, and z to w.

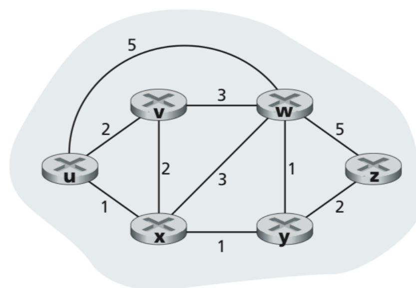

Figure 5.3 ♦ Abstract graph model of a computer network

Figure 1: Figure 5.3

Solution:

1. *y to u*

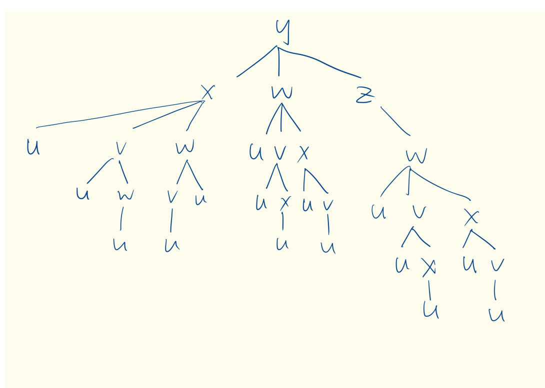

Figure 2: y to u

2. *x to z*

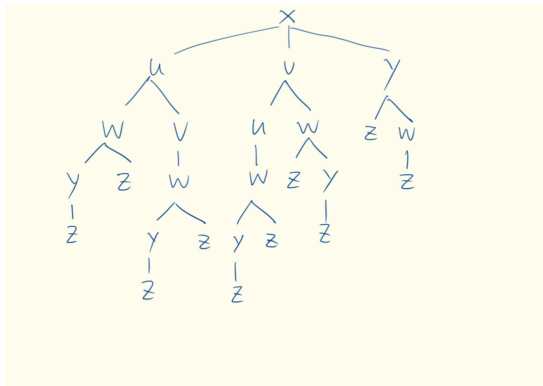

Figure 3: x to z

3. *z to u*

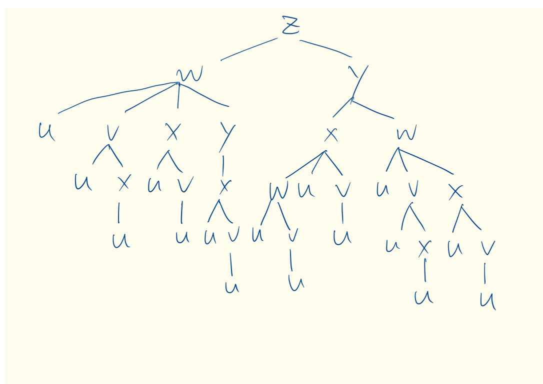

Figure 4: z to u

4. *z to w*

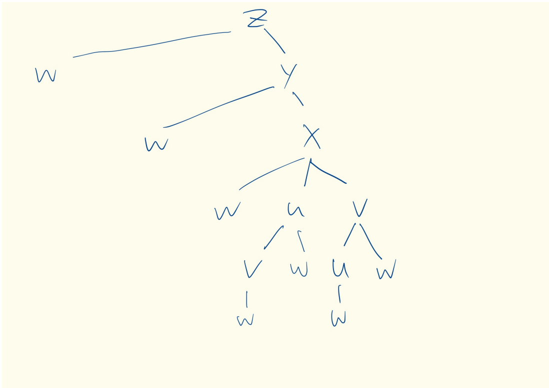

Figure 5: z to w

2 Problem 3

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 how the algorithm works by computing a table similar to Table 5.1.

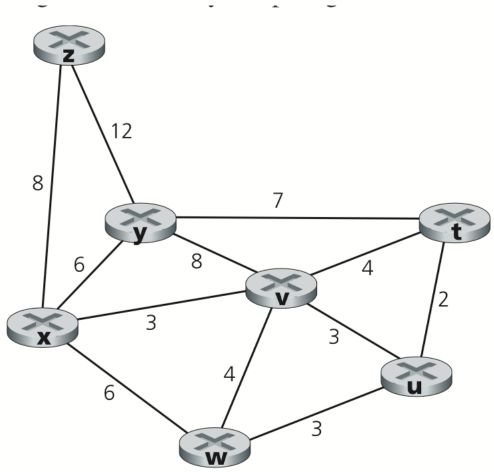

Figure 6: Problem3

Solution:

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

3 Problem 5

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

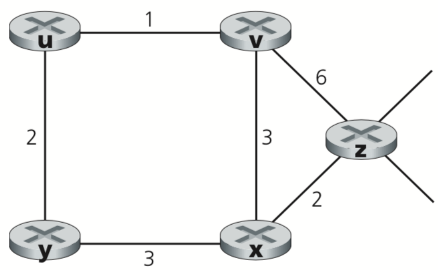

Figure 7: Problem5

Solution:

destination	hit	cost
x		2
y	x	5
u	x-v	6
v	x	5

Table 1: TableCaption

4 Problem 12

What is the message complexity of LS routing algorithm?

Solution: We have seen that LS requires each node to know the cost of each link in the network. This requires O($|$N$|$ $|$E$|$) messages to be sent. Also, whenever a link cost changes, the new link cost must be sent to all nodes. With n nodes, with an average of l links/node, each node sends O(nl). Total messages O(n^2l)

5 Problem 14

Consider the network shown below. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is no physical link between AS2 and AS4.
a. Router 3c learns about prefix x from which routing protocol: OSPF, RIP, eBGP, or iBGP?
b. Router 3a learns about x from which routing protocol?
c. Router 1c learns about x from which routing protocol?
d. Router 1d learns about x from which routing protocol?

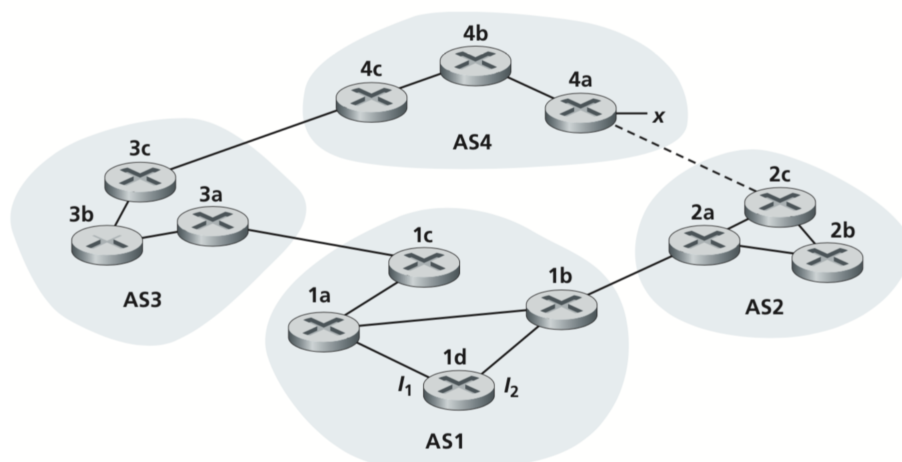

Figure 8: Problem14

Solution:

1. eBGP because 3c spans two ASs
2. iBGP because 3a learns about x from 3c, they are in the same AS.
3. eBGP
4. iBGP because 1a and 1b are in the same AS and 1d is between them