50.012 Networks (2020 Term 6)

Homework 4

Hand-out: 24 Nov

Due: 4 Dec 23:59

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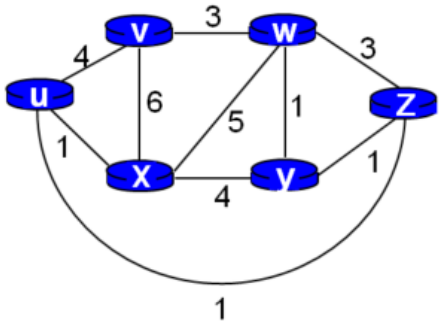
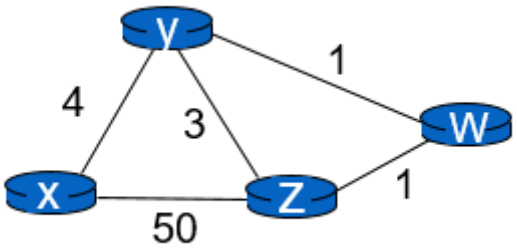
1. (Adapted from last year's final exam) Consider the network in the Figure below (noticed that there is a direct link between node u and z), where the numbers show the symmetrical link costs. Assume a link state routing protocol is used. **Node x** applies Dijkstra's algorithm to compute the best route to every other node. Step 0 of Dijkstra's algorithm (i.e., immediately after initialization) is shown below. Write down **all** the rows after step 0 until the algorithm completes.



STEP	N'	D(U), P(U)	D(V), P(V)	D(W), P(W)	D(Y), P(Y)	D(Z), P(Z)
0	x	1, x	6, x	5, x	4, x	∞
1	x, u		5, u	5, x	4, x	2, u
2	x, u, z		5, u	5, x	3, z	
3	x, u, z, y		5, u	4, y		
4	x, u, z, y, w		5, u			
5	x, u, z, y, w, v					

2. (textbook chapter 5, problem P11): Consider the network below and suppose that poisoned reverse is used in the distance-vector routing algorithm.



a. When the distance vector routing is stabilized, router w, y, and z inform their distances to x to each other. What distance values do they tell each other?
b. Now suppose that the link cost between x and y increases to 60. Will there be a count-to-infinity problem even if poisoned reverse is used? Why or why not? If there is a count-to-infinity problem, show the first three rounds of message exchanged among w, y, and z and how their DV change.

Solution template:

a)

Router z	Informs w, $D_z(x)$= infinity
	Informs y, $D_z(x)$= 6
Router w	Informs y, $D_w(x)$= infinity
	Informs z, $D_w(x)$= 5
Router y	Informs w, $D_y(x)$= 4
	Informs z, $D_y(x)$= 4

b) Now suppose that the link cost between x and y increases to 60. Will there be a count-to-infinity problem even if poisoned reverse is used? Why or why not?

There is still a count-to-infinity problem. They will just keep informing each other of the new value, and the value will keep increasing.

If there is a count-to-infinity problem, you can use the following table to fill in the first few iterations.

time	t0	Round 1	Round 2	Round 3
Z	inform: w, **infinity** y, **6**	inform: w, **infinity** y, **6** **No Change**	inform: w, **infinity** y, 10 + 1 = **11**	
W	inform: y, **infinity** z, **5**	inform: y, **infinity** z, 9 + 1 = **10**		inform: y, **infinity** z, **10** **No Change**
Y	inform: w, 6+3 = **9** z, **infinity**		inform: w, **9** z, **infinity** **No Change**	inform: w, 11 + 3 = **14** z, **infinity**