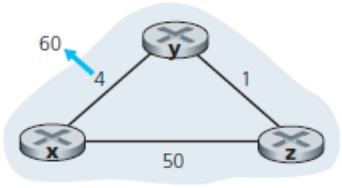
Principles of Computer Networks

Tutorial 9

Problem 1: Poisoned Reverse

Consider the following figure.



Suppose there is another router w, connected to router y and z. The costs of all links are given as follows: $c(x,y) = 4$, $c(x,z) = 50$, $c(y,w) = 1$, $c(z,w) = 1$, $c(y,z) = 3$. Suppose that poisoned reverse is used in the distance-vector routing algorithm.

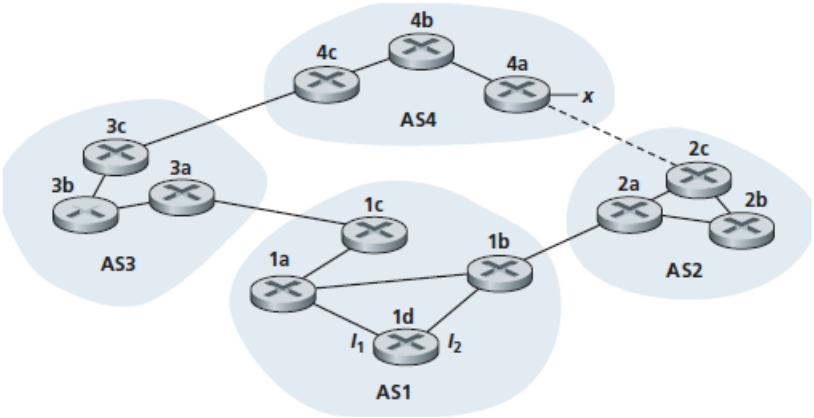
a) When the distance vector routing is stabilized, router w, y, and z inform their distances to x to each other. What distance values do they tell each other?

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, then how many iterations are needed for the distance-vector routing to reach a stable state again? Justify your answer.

c) How do you modify $c(y,z)$ such that there is no count-to-infinity problem at all if $c(y,x)$ changes from 4 to 60?

Problem 2: RIP, OSPF, BGP

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?

Problem 3: BGP

Referring to the previous problem, once router 1d learns about *x* it will put an entry (*x*, *I*) in its forwarding table.

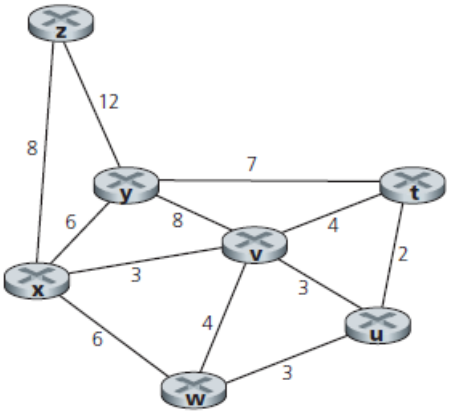
a) Will *I* be equal to *I*1 or *I*2 for this entry? Explain why in one sentence.

b) Now suppose that there is a physical link between AS2 and AS4, shown by the dotted line. Suppose router 1d learns that *x* is accessible via AS2 as well as via AS3. Will *I* be set to *I*1 or *I*2? Explain why in one sentence.

c) Now suppose there is another AS, called AS5, which lies on the path between AS2 and AS4 (not shown in diagram). Suppose router 1d learns that *x* is accessible via AS2 AS5 AS4 as well as via AS3 AS4. Will *I* be set to *I*1 or *I*2? Explain why in one sentence.

Problem 4: Minimal Cost Tree

Consider the following network. Show the minimal-cost tree rooted at *z* that includes (as end hosts) nodes *u*, *v*, *w*, and *y*.



Problem 5: Reverse Path Forwarding (RPF)

Using the topology below, find a set of paths from all nodes to the source node *A* (and indicate these paths in a graph using thicker-shaded lines) such that if these paths were the least-cost paths, then node *B* would receive a copy of *A*'s broadcast message from nodes *A*, *C*, and *D* under RPF.