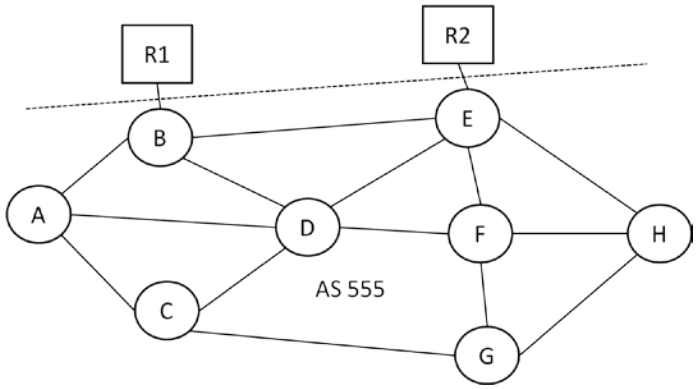
CSE 473 – Introduction to Computer Networks *Roch Guérin*

Quiz 5 Solution

Your Name: *11/13/2014*

1. (5 points total) Consider the network below that belongs to AS 555. It runs OSPF as its IGP (all links are point-to-point links and are configured with the same cost) and connects to the rest of the Internet in two places through routers B and E that have external BGP sessions to routers R1 and R2, respectively. Routers B and E are the only two BGP speakers in AS 555.

   Both routers R1 and R2 advertise prefix 4.4.0.0/16 over their eBGP sessions with routers B and E, respectively. The AS_PATH attribute of the prefix in the BGP Update message from router R1 is equal to <2346><445><17><3369>. Similarly, the AS_PATH attribute of the prefix in the BGP Update message from router R2 is <2346><7832><45><9><1479>.



   (1 points) In which AS did the advertisements for prefix 4.4.0.0/16 originate, and to what ASes do routers R1 and R2 belong to, respectively?

   The advertisements for prefix 4.4.0.0/16 originated in AS 2346. Router R1 belongs to AS 3369, and router R2 belongs to AS 1479.

   (1 point) AS 555 would like to ensure that all traffic destined for 4.4.0.0/16 leaves through router E. How could this be achieved in BGP?

   Router E would advertise (to router B) a higher LOCAL_PREF attribute value for the prefix.

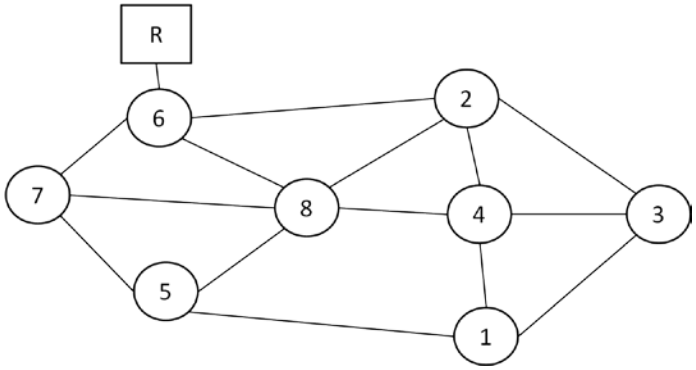
   (1 point) How would the outcome of the BGP decision of the previous question be communicated to the other routers in the AS that only speak OSPF?

   Router E would flood a T5 LSA for the prefix in the OSPF network. Router B would not.

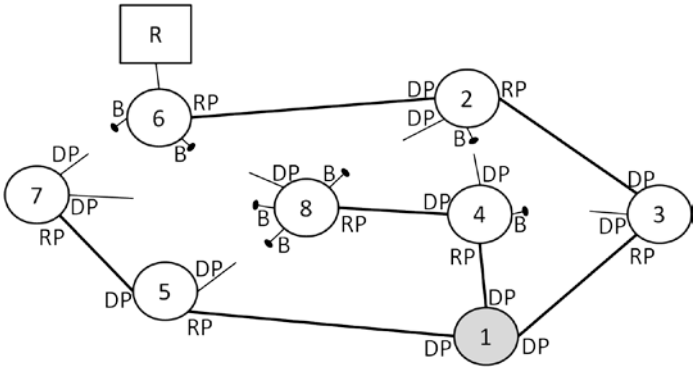
   (2 points) How could router R1 ensure that it receives all traffic for 4.4.0.0/16 from AS 555, independent of how AS 555 configures its BGP decision process?

   Router could split the 4.4.0.0/16 into two longer prefixes, i.e., 4.4.0.0/17 and 4.4.128.0/17. Because the longest prefix match determines the preferred route for any packet and since R1 would be the only one advertising those two more specific routes, it would attract all the traffic for prefix 4.4.0.0/16.

2. (5 points total) Consider the local area network below that consists of eight (8) Ethernet bridges, numbered 1 to 8 based on their bridge ID, and one router, R, connected to bridge 6, which serves as the default gateway for all hosts in the network. All links between bridges are of the same capacity.



(3 points) Indicate on the diagram below, the structure of the spanning tree for this network, and <u>label all switch ports</u> as either root port (RP), designated port (DP), or blocking (B).



(2 point) Assume that the local area network has been assigned subnet 1.2.3.0/24. Consider host 1.2.3.4 attached to bridge 7 that wants to send a packet to host 1.2.4.5. How would host 1.2.3.4 obtain the MAC address needed to reach host 1.2.4.5 and what path would packets destined for host 1.2.4.5 follow in the switched network?

Host 1.2.3.4 would recognize that host 1.2.4.5 is not in its subnet, and that it therefore needs to forward packets destined for host 1.2.4.5 to the gateway router R. If host 1.2.3.4 does not already have the MAC address of R, it would issue an ARP query for R (using R's IP address that it received in the DHCP reply that assigned it its own IP address). The ARP query is broadcast in the entire network to ensure that R receives it, and R's reply provides the desired MAC address. Once host 1.2.3.4 knows R's MAC address, it would send packets for host 1.2.4.5 in Ethernet frames carrying the MAC address of R. Those packets would follow the path on the spanning tree seeded by the ARP reply from R, namely, they would follow the path 7-5-1-3-2-6-R.