## CHAPTER 22: Network Layer: Delivery, Forwarding, and Routing

## **Solutions to Selected Review Questions**

## **Review Questions**

- 1. We mentioned two groups of multicast routing protocols: the source-based tree and the group-shared tree. In a *source-based tree* protocol, each router needs to have one shortest path tree for each group. The shortest path tree for a group defines the next hop for each network that has loyal member(s) for that group. In a *groupshared tree* protocol, only one designated router takes the responsibility of distributing multicast traffic. The designated router has *m* shortest path trees in its routing table. The rest of the routers in the domain have none.
- 2. We discussed two different methods of delivery: direct and indirect. In a *direct delivery*, the final destination of the packet is a host connected to the same physical network as the deliverer. In an *indirect delivery* the packet goes from router to router until it reaches the one connected to the same physical network as its final destination.
- 3. The *hop count limit* helps RIP instability by limiting the number of times a message can be sent through the routers, thereby limiting the back and forth updating that may occur if part of a network goes down.
- 4. A routing table can be either static or dynamic. A *static routing* table contains information entered manually. A *dynamic routing table* is updated periodically by using one of the dynamic routing protocols such as RIP, OSPF, or BGP.
- 5. BGP is an *interdomain* routing protocol using path vector routing.
- 6. A RIP *message* is used by a router to request and receive routing information about an autonomous system or to periodically share its knowledge with its neighbors.
- 7. The time-out for the *expiration time* is **6** times that of the *periodic timer* to allow for some missed communication between routers.

- 8. OSPF messages are propagated immediately because a router using OSPF will immediately *flood* the network with news of any changes to its neighborhood. RIP messages are distributed slowly because a network using RIP relies on the *periodic updates* that occur every 30 seconds to carry any news from one router to the next and to the next.
- 9. The three common forwarding methods used today are: next-hop, network-specific, and default methods. In the *next-hop method*, the routing table holds only the address of the next hop for each destination. In the *network-specific* method, the routing table holds only one entry that defines the address of the destination network instead of all hosts on that network. In the *default method*, a host sends all packets that are going out of the network to a specific router called the default router.
- 10. In OSPF, four types of links have been defined: point-to-point, transient, stub, and virtual. A *point-to-point* link connects two routers without any other host or router in between. A *transient* link is a network with several routers attached to it. The packets can enter and leave through any of the routers. A *stub* link is a network that is connected to only one router. The data packets enter the network through this single router and leave the network through this same router. This is a special case of the transient network. When the link between two routers is broken, the administrator may create a *virtual* link between them, using a longer path that probably goes through several routers.
- 11. The two major shortcomings are *two-node instability* and *three-node instability*. For the former, infinity can be re-defined as a number such as 20. Another solution is the split horizon strategy or split horizon combined with poison reverse. These methods do not work for three-node instability.
- 12. RIP is an *intradomain routing protocol* that enables routers to update their routing tables within an *autonomous* system.