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**Week 7 Homework**

**Review Questions:**

R21) The link-state algorithm’s approach toward computing routing has each node talk with all other nodes and tells each node the cost of its directly connected links only. On the other hand, a distance-vector algorithm has each node only talk to its directly connected neighbors and each node knows the least-cost estimates of all nodes. Link-state in more robust as each node is only sent a forwarding table whereas, a distance-vector node can send the wrong least-cost path. Furthermore, link-state provides a faster speed of convergence as distance-vector can loop until infinity. Finally, message complexity is less in distance-vector as changes are only necessary when a least-cost path is changed.

R22) The hierarchal organization of autonomous systems has made it possible for millions of users to be simultaneously connected to the Internet. The split of systems and their underlying routing algorithms allow for the large complex structure of the Internet to be divided into smaller components involving individual hosts. By breaking the system into smaller hosts that support larger hosts that support the Internet, complexity is reduced and performance is increased allowing for millions to be connected simultaneously.

R23) Each autonomous system does not need to run the same intra-AS routing algorithm because the routing algorithm only effects the route from source to destination within each individual system. The algorithms simply pass a forwarding table that communicate where each autonomous system needs to interact at.

R24) If router D received the given advertisement from router A that the path to subnet z through router C is 10 hops away, nothing will change for router D’s routing table as it is father than router D’s current path through router B to get to subnet z is only 7 hops away.

R25) An RIP advertisement is sent every 30 seconds and contains a list of up to 25 destination subnets, and the senders distance to each subnet within the autonomous system. An OSPF advertisement, on the other hand, are carried directly by IP and are sent every time a link state changes or every 30 minutes. The advertisement is sent to all other routers in the autonomous system and contain an updated routing table.

R26) RIP advertisements typically announce the number of hops to various destinations. BGP updates, on the other hand, announce the routes to the various destinations.

R27) Different intra-AS and inter-AS protocols are used because an inter-AS protocol needs to understand what is happening inside the autonomous system. For example, an intra-AS protocol needs to know the routing paths between individual hosts and routers, but doesn’t need to know the information of connections to hosts and routers in anther autonomous system. The same can be applied to inter-AS protocols where information isn’t needed on routing paths inside of an individual autonomous system, but simply how to get information to another autonomous system. Once the data is delivered to the correct autonomous system the intra-AS protocol can take over and ensure delivery to the correct host.

R28) Policy considerations are just as important for intra-AS protocols as inter-AS protocols as you don’t want other residents’ networks, for example, sending information through your own network slowing your network down and giving them all of the resources. The same applies for ISPs who don’t want traffic from customers of competing ISPs to use their network resources.

R29) A subnet is a group of hosts that are usually connected over LAN or are in the same location. Prefixes represent a single subnet or collection of subnets and if included with a number of BGP attributes creates a BGP route for BGP peers to use.

R30) NEXT-HOP is used by BGP to contain the IP address of a router interface. The router interface it contains allows for the AS-PATH to begin. The AS-PATH contains the autonomous system numbers of the autonomous system’s advertisement has passed through. It is also used to prevent looping and helps when choosing between multiple paths.

R31) A network administrator of an upper-tier ISP can implement a BGP policy to prevent hosts who are customers of other networks to pass data through their ISP’s network and simultaneously allow traffic from other ISPs to send data through their network as part of business deals.

R32) An important difference between implementing multiple unicasts and a single network supported broadcast is that multiple unicasts have multiple copies use the same link whereas a single network supported broadcast will send a single copy across multiple links.

R33) a) Uncontrolled flooding: True

Controlled flooding: True

Spanning-tree broadcast: False

b) Uncontrolled flooding: False

Controlled flooding: False

Spanning-tree broadcast: True

R34) When a host joins a multicast it is not required to change its IP address instead it adds a new IP address that was assigned by the multicast.

R35) IGMP allows a host connected to a router to join a multicast. The multicast allows all hosts in a multicast to receive copies of the same datagrams.

R36) The primary difference between multicast routing using a group-shared tree versus a source-based tree is that a group-shared tree creates a single routing tree to route sender packets through whereas a source-based tree creates a multicast routing tree for each sender.

**Practice Problems:**

P35) BGP detects loops with AS-PATH by looking at the current prefixes loaded into the AS-PATH. This allows it to check if it has already been to a prefix and, if it had, look to a different prefix for moving a packet.

P37)