Assignment 6, CSL 858

Due date: March 20, 2007 (Tuesday)

Topics: Subnetting, Link State Routing, NAT

In Figure 1 the routers R1 – R4 run OSPF between them. Each of the subnets S1 – S4 is directly connected to one router as depicted.
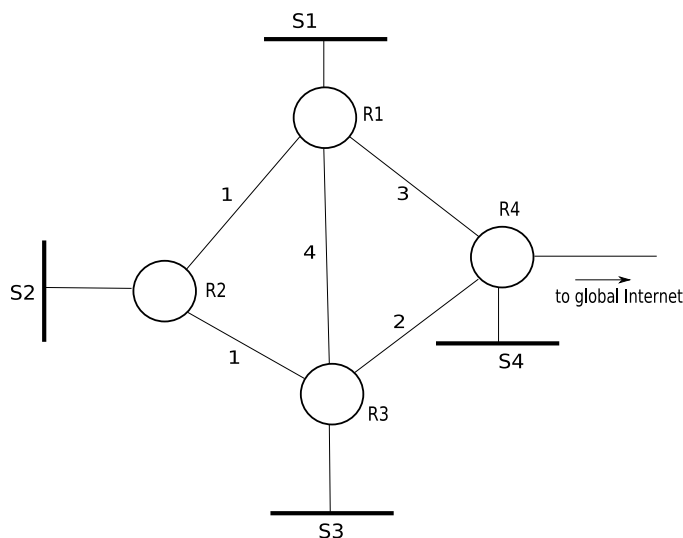

Figure 1: Routing topology

1. The network depicted in Figure 1 has been assigned the Class-B address `132.14.0.0`. Assume that the 4 subnets S1, S2, S3, S4 have a maximum of 1024, 64, 256, 128 hosts respectively. Taking this into account, assign subnet numbers along with subnet masks to each of the subnets.

2. Using Djikstra's algorithm determine the shortest path from R1 to all other routers. Similarly determine the shortest path from R4 to all other routers. Give details of the different stages in creation of the routing trees.

3. Using the results of the previous problems, give the routing tables at R1 and R4. This table should have three columns: Subnet number, subnet mask, next hop. All IP addresses not belonging to this network should be termed `Default` in the first two columns of the table.

4. The link between R2 and R3 gets cut during "routine road maintenance". Assuming the same OSPF weights for all other links, find the shortest path from R1 to all other routers. Determine the routing table at R1.

5. Instead of giving us a Class-B for the network, the ICANN gives us a Class-C address `192.14.10.0`. Since we have more hosts than IP addresses, we instead assign private IP addresses to the hosts. These private addresses belong to the Class-A address `10.0.0.0`. Router R4 now runs NAT.

   (a) A host `10.10.2.67` in S1 sends a TCP packet (source port 1400) to destination `142.32.3.1` (destination port 80). At the same time host `10.10.5.67` in S2 sends a TCP packet (source port 1400) to destination `142.32.3.1` (destination port 80). Show how the NAT box changes the header fields (source and destination addresses and ports) of these IP packets.

   (b) Can a host in S2 run a web-server which is accessible to hosts in the global Internet? If so, how might we accomplish this while still using NAT? Assume that the web-server receives connections on TCP ports 80 (http) and 443 (https).