CS422 Computer Networks (Spring 2024): Homework 3

(Due Date: 23:59:59PM Wed Mar 20, 2024, Total: 25 points)

1. **True or False. (10 points, 1 point each)**

   (a) [**T** **F**] In the traditional per-router routing, the router's forwarding table is used to determine the output link based on the destination address of an incoming packet.

   (b) [**T** **F**] In the traditional per-router routing, the destination address of an incoming packet must belong to only one IP address range in the forwarding table.

   (c) [**T** **F**] A router typically has multiple network interfaces and each interface is associated with one IP address.

   (d) [**T** **F**] The IP header in one IP datagram never changes in its way from the source host to the destination host.

   (e) [**T** **F**] All the devices (including hosts and routers) within the same subnet have the same subnet part of IP address. They can physically reach each other without intervening a router.

   (f) [**T** **F**] The organization that uses the IP address block *200.1.1.0/23* can assign the block of *200.1.1.0/24* to its sub-organization.

   (g) [**T** **F**] The organization that uses the IP address block *200.1.1.0/23* can assign the block of *200.1.2.0/24* to its sub-organization.

   (h) [**T** **F**] DHCP is an application which runs between a host and the DHCP server for the subnet where the host is. As a result, the host will not hear IP datagram which carries a DHCP message from the DHCP server to another hosts within the same subnet.

   (i) [**T** **F**] IP address is used to reach the host, so it is not allowed to use the same IP address for distinct hosts.

   (j) [**T** **F**] As long as one host has a valid IP address, it is reachable by another host which knows its IP address.

2. **(5 points)** DHCP is used to dynamically assign an IP address to the host who requests for a valid IP address in a subnet. In addition to IP address assigned to the host, what else information can be obtain using DHCP? (please list at least two).

3. **(10 points)** Consider the topology shown in Figure 1. Denote the three subnets with hosts (starting 1 clockwise at 12:00) as Networks A, B, and C. Denote the subnets without hosts as Networks D, E, and F.

   (a) Assign network addresses to each of these six subnets, with the following constraints: All addresses must be allocated from 214.97.254.0/23; Subnet A should have enough addresses to support 250 interfaces; Subnet B should have enough addresses to support 120 interfaces; and Subnet C should have enough addresses to support 120 interfaces. Of course, subnets D, E and F should each be able to support two interfaces. For each subnet, the assignment should take the form a.b.c.d/x or a.b.c.d/x - e.f.g.h/y.

   (b) Using your answer to part (a), provide the forwarding tables (using longest prefix matching) for each of the three routers.
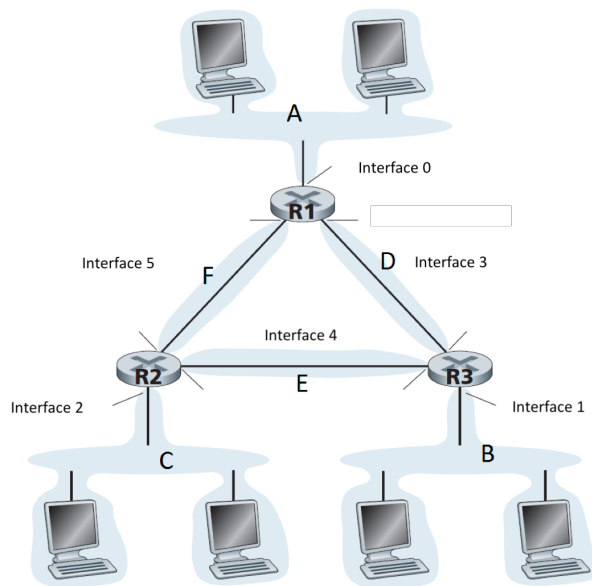
Figure 1: Three routers connecting six subnet