ELEC3500 TELECOMMUNICATIONS NETWORKS

Question Set – 7

7-0. In a router forwarding and routing functions are used in the network layer. What are the key differences between routing and forwarding functions used in the network layer?

7-1. A network layer's service model "defines the characteristics of end-to-end transport of packets between sending and receiving hosts." What is the service model of the Internet's network layer? What guarantees are made by the Internet' service model regarding the host-to-host delivery of datagrams?

7-2. Suppose Host A sends Host B a TCP segment encapsulated in an IP datagram. When host B receives the datagram, how does the network layer in host B know it should pass the segment (i.e. the payload of the datagram) to TCP rather than to UDP or to some other upper-layer protocol?

7-3. What field in the IP header can be used to ensure i) that a packet is forwarded through no more than N routers, ii) the packet is receives appropriate priority based on the packet payload. Consider both IPv4 and IPv6.

7-4. When a large datagram is fragmented into multiple smaller datagrams, where are these smaller datagrams reassembled into a single larger datagram?

7-5. Consider sending a 1,600 byte datagram into a link that has an MTU (Maximum Transmission Unit) of 500 bytes. Suppose the original datagram is stamped with identification number 291. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

Answer [4]

7-6. Suppose an application generates chunks of 40 bytes of data every 20 ms, and each chunk gets encapsulated in a TCP segment and then an IP datagram. What percentage of each datagram will be overhead and what percentage will be application data?

Answer [50%]

7-7. What is a private network address? Should a datagram with a private network address ever be present in the larger public internet? Explain.

7-8. Consider the network in figure 7.1.

a. Show the forwarding table in router A, such that all traffic destined to host H3 is forwarded through interface 3.

b. Can you write down a forwarding table in router A, such that all traffic from H1 destined to H3 is forwarded through interface 3, while all traffic from H2 destined to host H3 is forwarded through interface 4.

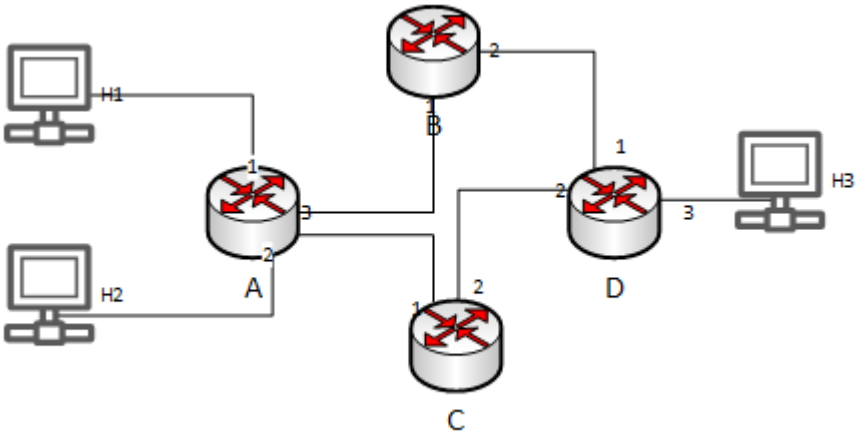

Figure: 7.1

7-9. Consider a datagram network using 8-bit host addresses. Suppose a router uses longest prefix matching and has the following forwarding table:

Prefix Match	Interface
11	0
101	1
100	2
Otherwise	3

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

Answer [1100 0000 to 1111 1111, 1010 0000 to 1011 1111, 1000 0000 to 1001 1111, 0000 0000 to 0111 1111

7-10. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these subnets are required to have the prefix 223.1.17/24. Also, suppose that Subnet 1 is required to support up to 62 interfaces, Subnet 2 is to support up to 106 interfaces, and Subnet 3 is to support up to 15 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.

Answer [223.1.17.0/26, 223.1.17.128/25, 223.1.17.192/28]

7-11. Suppose datagrams are limited to 1,500 bytes (including header) between source Host A and destination Host B. Assuming a 20 byte IP header, how many datagrams would be required to send an MP3 file consist of 5 MB? Also, find the last datagram size in bytes.

Answer [3592, 61B]

****