CNT 5106
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Homework Assignment 4

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1.

First, forwarding, routers transfer data packets between networks. Second, routing, to direct traffic to the right network interface card for further routing within the destination computer or device being connected to.

2.

A router's memory is finite and can run out of space to accommodate freshly arriving packets, so new packets are ignored, or older packets are dropped if the rate of arrival of the packets is greater than the rate at which packets sent from the router's memory.

3.

(4000-20)/(1500-20)=2.7, and for rounding is 3.

This packet would be divided into 3 fragments, the first two fragments will have a length of 1500 bytes (1480 bytes of data + 20 bytes IP header) and the last fragment will have a length of 1060 bytes (1020 bytes of data + 20 bytes IP header).

The fragflag for first two fragments is equal to 1, and the fragflag for last fragment is equal to 0.

The offset of first fragment is 0, the offset of second fragment is (1480/8)185, and the offset of third fragment is 370.

The identifier for all three fragments is x.

Fragment 1: Length: 1500, Identifier: x, Fragflag: 1, Offset: 0

Fragment 2: Length: 1500, Identifier: x, Fragflag: 1, Offset: 185

Fragment 3: Length: 1060, Identifier: x, Fragflag: 0, Offset: 370

4.

The external host cannot directly initiate communications to these 10 devices, because the router assigns a private IP address to each device in home by the network address translation, and all external data is routed to the router's public IP address.

If the router supports UPnP protocol, which allows an external host to initiate a communication session to a NATed device's host using TCP or UDP.

5. Consider a datagram network using 32-bit host addresses. Suppose a router has four links, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11100000 00000000 00000000 00000000 through 11100000 00111111 11111111 11111111	0
11100000 01000000 00000000 00000000 through 11100000 01000000 11111111 11111111	1
11100000 01000001 00000000 00000000 through 11100001 01111111 11111111 11111111	2
otherwise	3

a. Provide a forwarding table that has five entries, uses longest prefix matching, and forwards packets to the correct link interfaces.

Prefix match	link interface
1110 0000 00	0
1110 0000 0100 0000	1
1110 000	2
1110 0001 1	3
otherwise	3

b. Describe how your forwarding table determines the appropriate link interface for datagrams with destination addresses:

11001000 10010001 01010001 01010101
11100001 01000000 11000011 00111100
11100001 10000000 00010001 01110111

Prefix match for first address is 5th entry, so the link interface is 3.
Prefix match for second address is 3rd entry, so the link interface is 2.
Prefix match for third address is 4th entry, so the link interface is 3.

6.

For prefix match 1, 1100 0000 through 1101 1111, 2^5=32
For prefix match 10, 1000 0000 through 1011 1111, 2^6=64
For prefix match 111, 1110 0000 through 1111 1111, 2^5=32
For prefix match otherwise, 0000 0000 through 0111 1111, 2^7=128

7.

For 128.119.40.128, the binary format is 10000000 01110111 00101000 10, hence the sum of IP address can be assigned is 62 (2^6-2), and range is 128.119.40.128 to 128.119.40.190.

The sum of IP addresses we could use is 64 (32-26=6, 2^6=64), so each subnet has 16 IP addresses.

The first prefix is 128.119.40.64/28, the second prefix is 128.119.40.80/28, the third prefix is 128.119.40.96/28, then the last prefix is 128.119.40.112/28.