

Network Homework 3

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5. In the text we have used the term *connection-oriented service* to describe a transport-layer service and *connection service* for a network-layer service. Why the subtle shades in terminology?

Solution:

	Transport-layer	Network-layer
Who maintain the connection state	The routers along the path	The end systems
Terminology	Connection-oriented service	Connection service

8. Consider a datagram network using 32-bit host addresses. Suppose a router has five links, numbered 0 through 4, and packets are to be forwarded to the link interfaces as follows:

- Provide a forwarding table that has four entries, uses longest prefix matching, and forwards packets to the correct link interfaces.
- Describe how your forwarding table determines the appropriate link interface for datagrams with destination addresses:

Solution:

a. Forwarding table:

Prefix Match	Link Interface
11100000 00000000	0
11100000 0000000	1
11100000	2
11100001	3

b.

Destination address	Prefix matched	Link Interface
11001000 10010001 01010001 01010101	Otherwise	4
11100000 10101101 11000011 00111100	11100000	2
11100001 10000000 00010001 01110111	11100001	3

11. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 220.2.240/20. Also suppose that Subnet 1 is required to support up to 2000 interfaces, and Subnets 2 and 3 are each required to support up to 2000 interfaces, and Subnets 2 and 3 are each required to support up to 1000 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.

Solution:

ISP	220.2.240.0/20	11011100 00000010 11110000 00000000
Subnet 1	220.2.240.0/21	11011100 00000010 11110000 00000000
Subnet 2	220.2.248.0/22	11011100 00000010 11111000 00000000

Subnet 3	220.2.252.0/22	11011100 00000010 11111100 00000000
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14 Consider a subnet with prefix 101.101.101.64/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 101.101.128/17. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

Solution:

Example:

Any IP address can be assigned between 101.101.101.64 and 101.101.101.127 on account of 01100101 01100101 01100101 01000000

ISP	101.101.128.0/17	01100101 01100101 10000000 00000000
Subnet 1	101.101.128.0/15	01100101 01100101 10000000 00000000
Subnet 2	101.101.160.0/15	01100101 01100101 10100000 00000000
Subnet 3	101.101.192.0/15	01100101 01100101 11000000 00000000
Subnet 3	101.101.224.0/15	01100101 01100101 11100000 00000000

19 In this problem we'll explore the impact of NATs on P2P applications. Suppose a peer with username Arnold discovers through querying that a peer with username Bernard has a file it wants to download. Also suppose that Bernard and Arnold are both behind a NAT. Try to devise a technique that will allow Arnold to establish a TCP connection with Bernard without application-specific NAT configuration. If you have difficulty devising such a technique, discuss why.

Solution:

It's impossible under NAT. This situation acts the same as so called "low id" in "Emule". Since both P2P user are behind NAT, they cannot establish a direct TCP connection as the NAT will drop the handshake of TCP – the SYN packets from the WAN side without application-specific NAT configuration.