Exercises

P2

Suppose two packets arrive to two different input ports of a router at exactly the same time. Also suppose there are no other packets anywhere in the router.

a. Suppose the two packets are to be forwarded to two different output ports. Is it possible to forward the two packets through the switch fabric at the same time when the fabric uses a shared bus?

b. Suppose the two packets are to be forwarded to two different output ports. Is it possible to forward the two packets through the switch fabric at the same time when the fabric uses switching via memory?

c.Suppose the two packets are to be forwarded to the same output port. Is it possible to forward the two packets through the switch fabric at the same time when the fabric uses a crossbar?

Answer

a. No. A shared bus can only transmit one packet at a time.

b. No. Only one memory read/write can be done at a time over the shared bus.

c. No. It's impossible to send two packets over the same output bus at the same time.

P5

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

1. Provide a forwarding table that has five entries, uses longest prefix match- ing, and forwards packets to the correct link interfaces.
2. Describe how your forwarding table determines the appropriate link inter- face for datagrams with destination addresses:

   11111000 10010001 01010001 01010101

   11100000 00000000 11000011 00111100

   11100001 10000000 00010001 01110111

Answer

1.

Prefix	**Link Interface**
11100000 00	0
11100000 01000000	1
1110000	2
11100001 1	3
Other	3

2.

Destination address	**Link Interface**
11111000 10010001 01010001 01010101	3
11100000 00000000 11000011 00111100	0
11100001 10000000 00010001 01110111	3

P6

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

Prefix	Link Interface
00	0
010	1
011	2
10	2
11	3

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

Answer

0 00000000 through 00111111 2^6=64

1 01000000 through 01011111 2^5=32

2 01100000 through 10111111 2^5+2^6=96

3 11000000 through 11111111 2^6=64

P11

Consider a subnet with prefix 128.119.40.128/26. 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 128.119.40.64/26. 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?

Answer

An example of one IP address that can be assigned to 128.119.40.128/26: 128.119.40.129

The prefixes for the four subnets are: 128.119.40.64/28

128.119.40.80/28

128.119.40.96/28

128.119.40.112/28

P14

Consider sending a 2,400-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

Answer

the number of fragments=(2400-20)/(700-20)=4

Each fragment will have the identification number 422.

The first three fraagments will have the flag 1 and the last one will have the flag 0.

The offsets are 0,85,170,255.