Homework 4

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1.选做5道

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, you can only transmit one packet at a time over a shared bus.
b) No, as discussed in the text, only one memory read/write can be done at a time over the shared system bus.
c) No, in this case the two packets would have to be sent over the same output bus at the same time, which is not possible.

P3. In Section 4.2, we noted that the maximum queuing delay is (n–1)D if the switching fabric is n times faster than the input line rates. Suppose that all packets are of the same length, n packets arrive at the same time to the n input ports, and all n packets want to be forwarded to different output ports. What is the maximum delay for a packet for the (a) memory, (b) bus, and (c) crossbar switching fabrics?
Answer:
a) (n-1)D
b) (n-1)D
c) 0

P4. Consider the switch shown below. Suppose that all datagrams have the same fixed length, that the switch operates in a slotted, synchronous manner, and that in one time slot a datagram can be transferred from an input port to an output port. The switch fabric is a crossbar so that at most one datagram can be transferred to a given output port in a time slot, but different output ports can receive datagrams from different input ports in a single time slot. What is the minimal number of time slots needed to transfer the packets shown from input ports to their output ports, assuming any input queue scheduling order you want (i.e., it need not have HOL blocking)? What is the largest number of slots needed, assuming the worst-case scheduling order you can devise, assuming that a non-empty input queue is never idle?
Answer:
The minimal number of time slots needed is 3. The scheduling is as follows.
Slot 1: send X in top input queue, send Y in middle input queue.
Slot 2: send X in middle input queue, send Y in bottom input queue
Slot 3: send Z in bottom input queue.
Largest number of slots is still 3. Actually, based on the assumption that a non-empty input queue is never idle, we see that the first time slot always consists of sending X in the top input queue and Y in either middle or bottom input queue, and in the second time slot, we can always send two more datagram, and the last datagram can be sent in third time slot.
NOTE: Actually, if the first datagram in the bottom input queue is X, then the worst case would require 4 time slots.

P9. Suppose there are 35 hosts in a subnet. What should the IP address structure look like?
Answer:

Destination Address	Link Interface
200.23.16/21	0
200.23.24/24	1
200.23.24/21	2
otherwise	3

P10. What is the problem of NAT in P2P applications? How can it be avoided? Is there a special name for this solution?

Answer:

Destination Address	Link Interface
11100000 00 (224.0/10)	0
11100000 01000000 (224.64/16)	1
1110000 (224/8)	2
11100001 1 (225.128/9)	3
otherwise	3