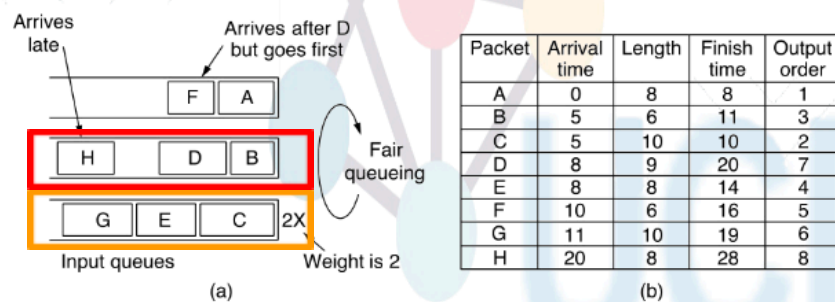


Queueing exercise

- Consider the packet queues shown in Fig. 5-29
- What is the finish time and output order of the packets if the **middle** queue, instead of the bottom queue, has a weight of 2?
- Order packets with the same finish time alphabetically



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Figure 5-29. (a) Weighted Fair Queueing. (b) Finishing times for the packets.

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- What is the finish time and output order of the packets if the middle queue, instead of the bottom queue, has a weight of 2?

Queue 1 (Weight 1): Packets A, F

Queue 2 (Weight 2): Packets B, D, H

Queue 3 (Weight 1): Packets C, E, G

Given Packet Lengths:

- A: 8
- B: 6
- C: 10
- D: 9
- E: 8
- F: 6
- G: 10
- H: 8

Packet	Arrival time	Length	Finish time	Output order
A	0	8	8	1
B	5	6	$5+(6/2)=8$	1
C	5	10	$5+10=15$	3
D	8	9	$8+(9/2)=12,5$	2
E	8	8	$8+8=16$	4
F	10	6	16	4
G	11	10	$11+10=21$	5
H	20	8	$20+(8/2)=24$	6

2. Order packets with the same finish time alphabetically.

Packet	Arrival time	Length	Finish time	Output order
A	0	8	8	1
B	5	6	$5+(6/2)=8$	1
E	8	8	$8+8=16$	4
F	10	6	16	4

Token bucket exercise

A computer on a 6-Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 1 Mbps. It is initially filled to capacity with 8 megabits.

How long can the computer transmit at the full 6 Mbps?

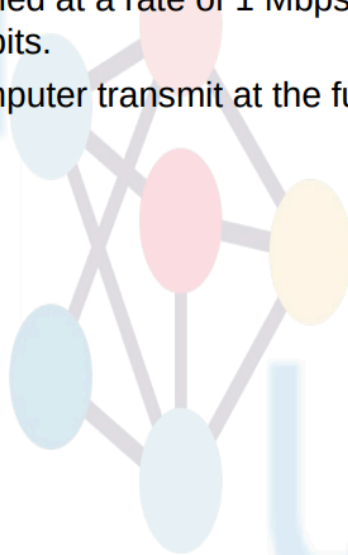


Fig. 5-30

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1. Token Bucket Details:

- The token bucket is filled at a rate of 1 Mbps.
- The token bucket initially has a capacity of 8 megabits (tokens).

2. Transmission Rate and Token Consumption:

- The computer wants to transmit at a rate of 6 Mbps, which will consume tokens from the bucket at 6 Mbps.

3. Token Refill Rate:

- Tokens are added to the bucket at a rate of 1 Mbps while the computer is transmitting.

Step-by-Step Solution:

1. Determine the net rate of token consumption:

- Since tokens are consumed at 6 Mbps but are added at 1 Mbps, the net rate of token consumption is

$$6 \text{ Mbps} - 1 \text{ Mbps} = 5 \text{ Mbps}$$

2. Calculate how long the tokens will last:

- The bucket starts with 8 megabits of tokens.
- At a net consumption rate of 5 Mbps, we can calculate the time t (in seconds) that the computer can transmit at 6 Mbps before the bucket is empty:

$$t = \frac{\text{Initial tokens in bucket}}{\text{Net rate of token consumption}}$$

$$t = \frac{8 \text{ Mb}}{5 \text{ Mbps}}$$

$$t = 1.6 \text{ seconds}$$

The computer can transmit at the full rate of 6 Mbps for **1.6 seconds** before the tokens in the bucket are exhausted.