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DEPARTMENT OF INFORMATION TECHNOLOGY

19CSB302 – COMPUTER NETWORKS

III YEAR V SEM

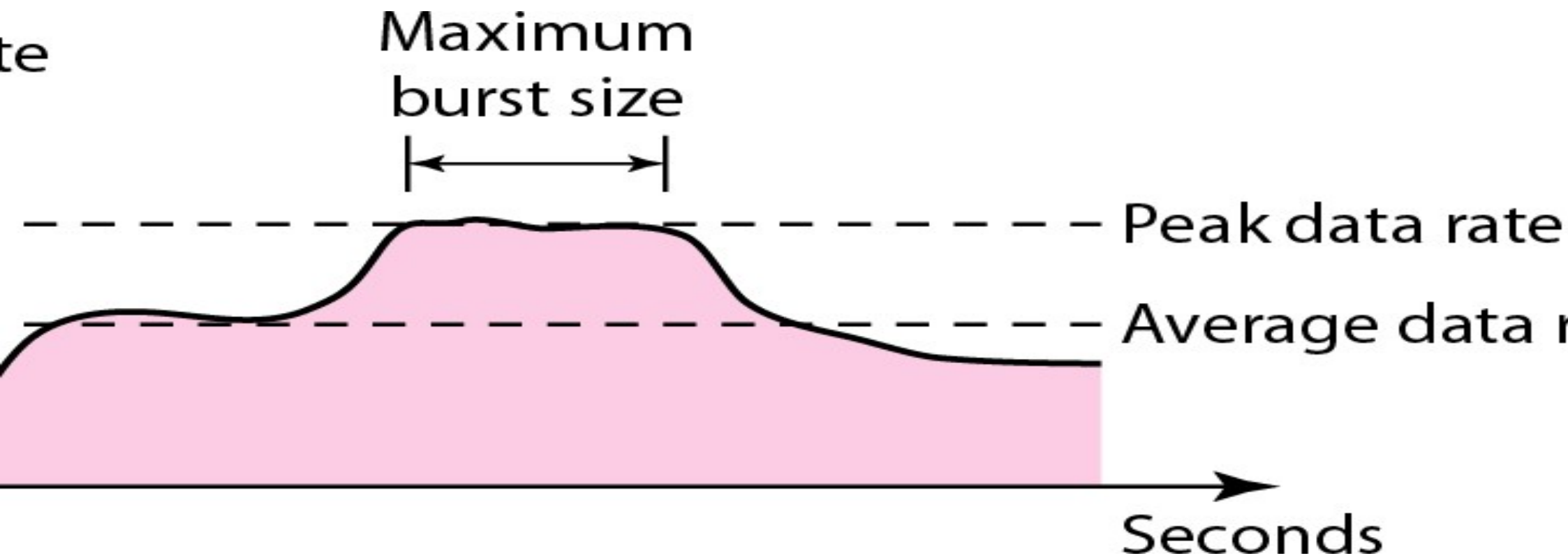
UNIT 3 – TRANSPORT LAYER

Congestion Control

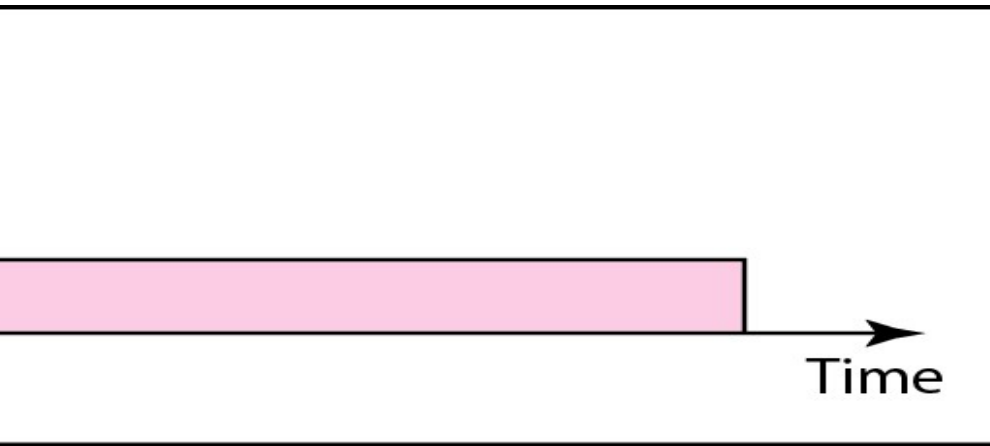
focus of congestion control and quality of service.
traffic. In congestion control we try to avoid congestion.
In quality of service, we try to create a good environment for the traffic. So, before congestion control and quality of service, we try to control traffic itself.

discussed in this section:

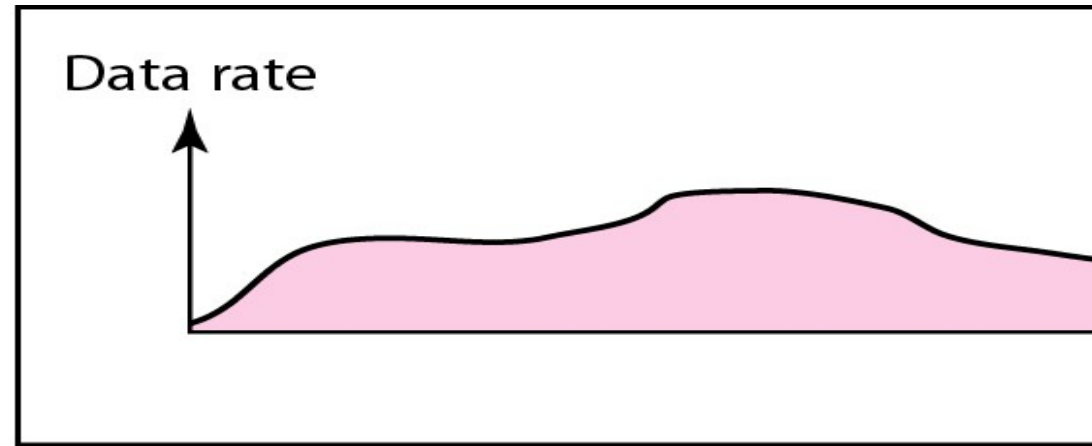
Traffic descriptors



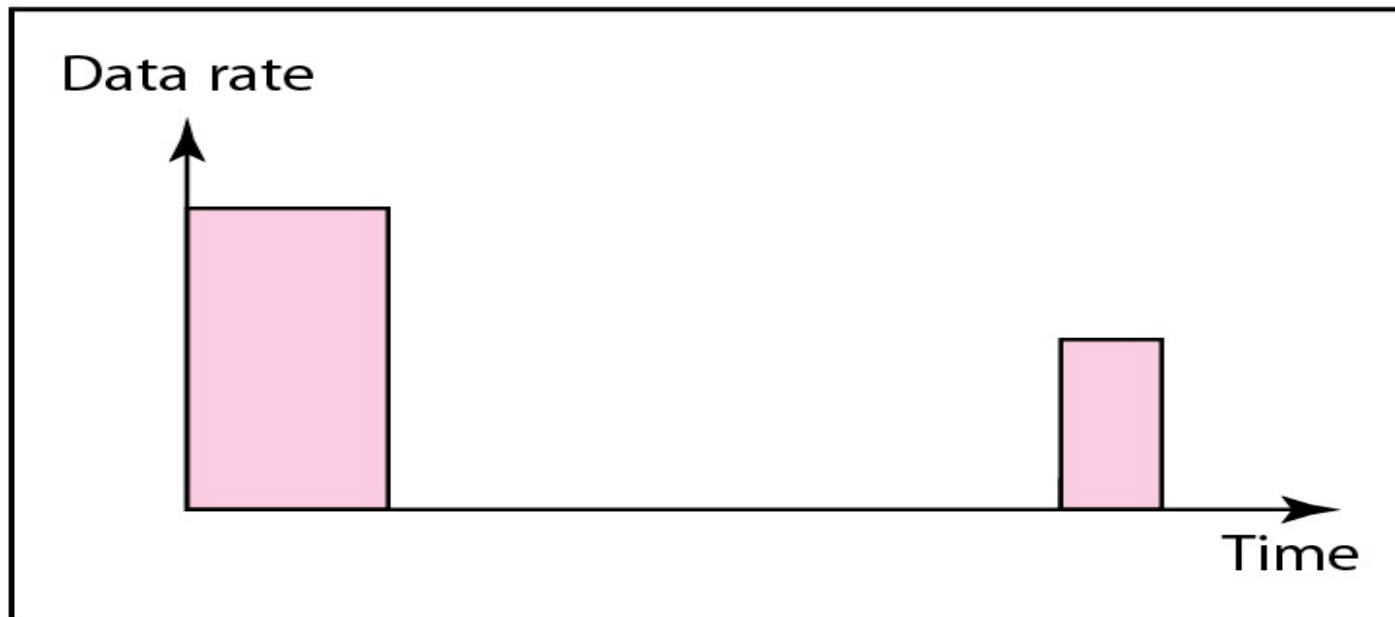
Three traffic profiles



a. Constant bit rate



b. Variable bit rate

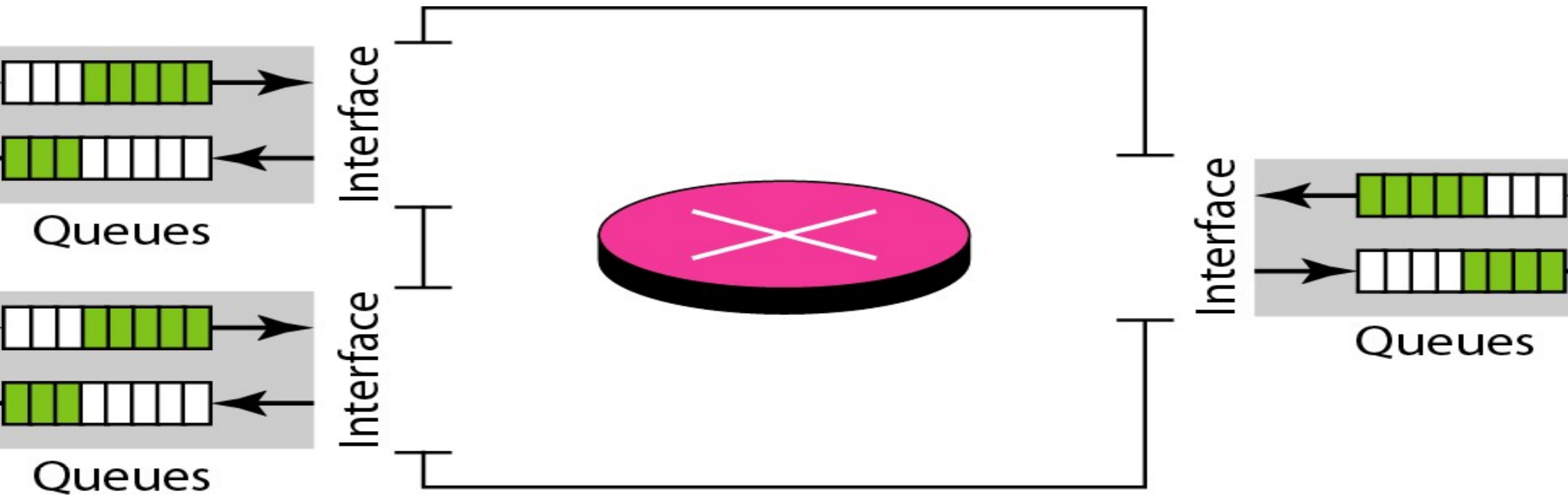


c. Bursty

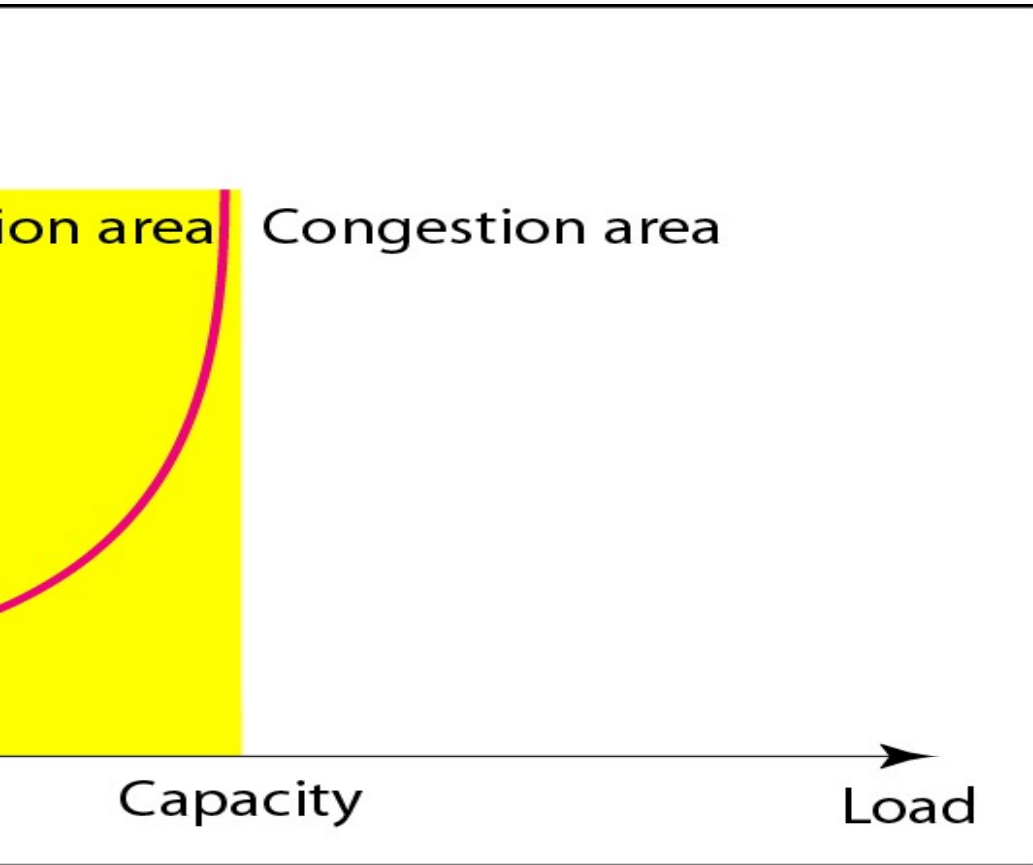
in a network may occur if the load exceeds the number of packets sent to the network beyond the capacity of the network—the network can handle. Congestion control mechanisms and techniques to control the load below the capacity.

discussed in this section:

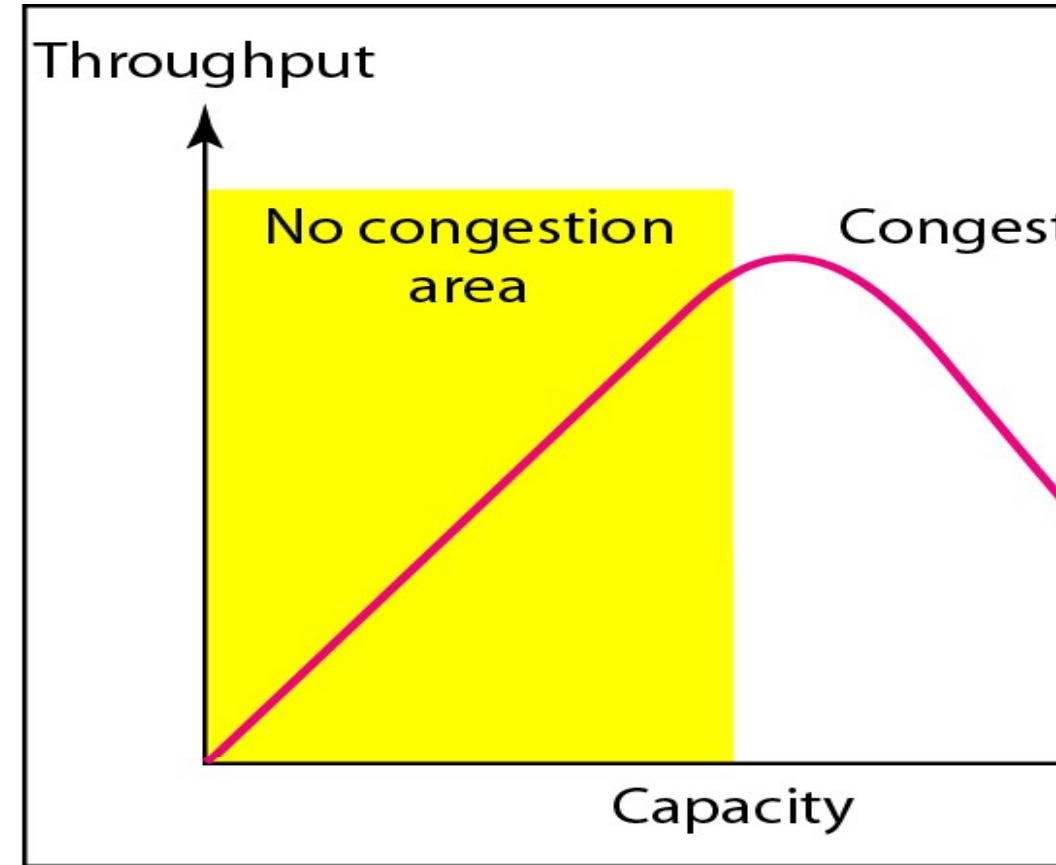
Queues in a router



Packet delay and throughput as functions of load



a. Packet delay as a function of load

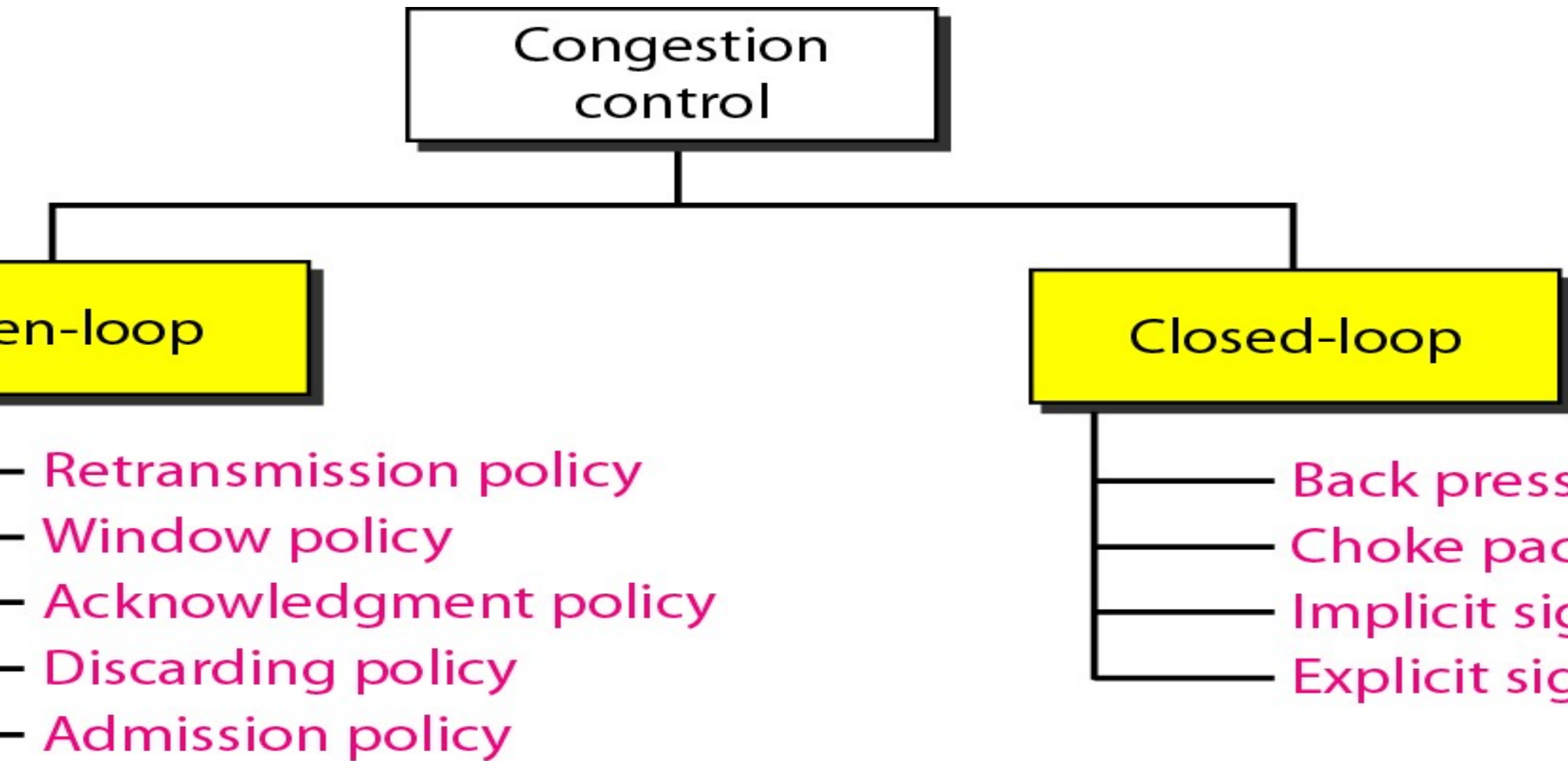


b. Throughput as a function of load

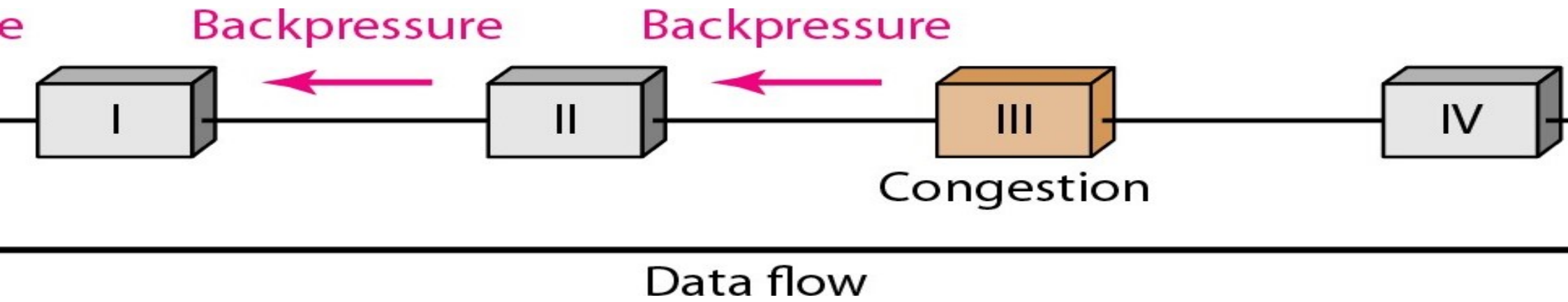
control refers to techniques and mechanisms to either prevent congestion, before it happens, or to remove congestion, after it has happened. In general, congestion control mechanisms are divided into two categories: open-loop congestion control (prevention) and closed-loop congestion control (removal).

~~discussed in this section: Open-Loop Control Closed-Loop~~

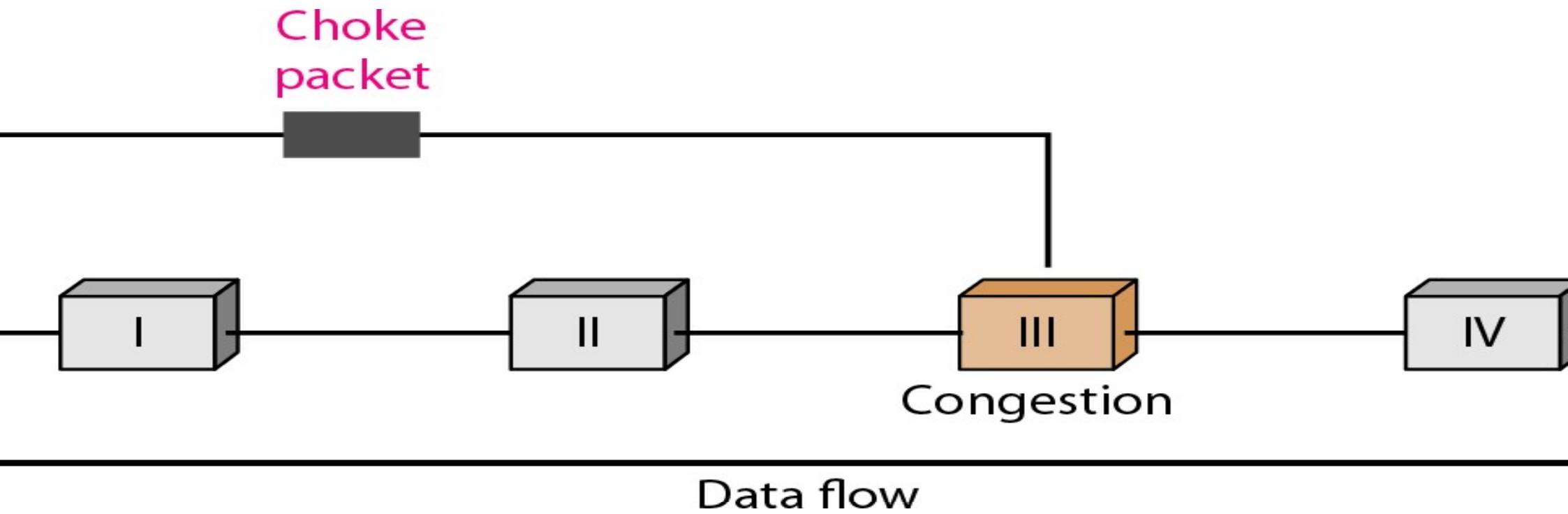
5 Congestion control categories



6 *Backpressure method for alleviating congestion*



Choke packet



*Understand the concept of congestion control
examples: one in TCP and the other in*


discussed in this section:


Control in TCP Congestion

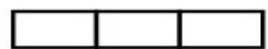
Same Relay

8 *Slow start, exponential increase*

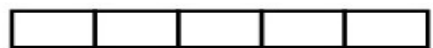
Rnd: Round of transmission

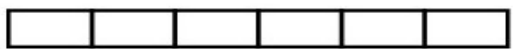
$\text{cwnd} = 2^0 = 1$ 

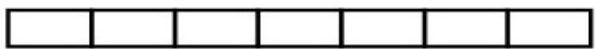
$\text{cwnd} = 2^1 = 2$ 



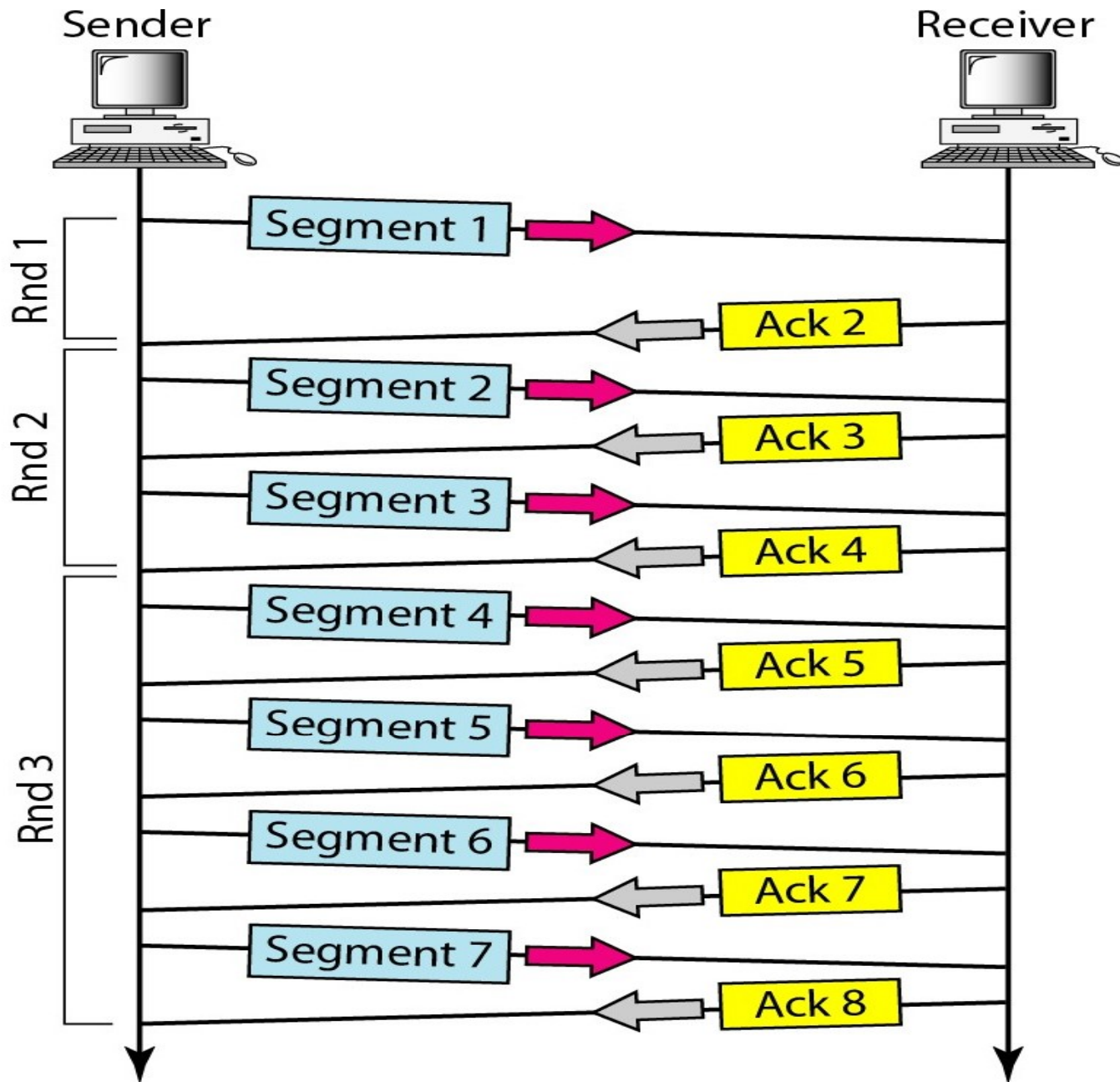
$\text{cwnd} = 2^2 = 4$ 








$= 8$ 





In a slow-start algorithm, the size of the congestion window increases exponentially until it reaches a threshold.

9 Congestion avoidance, additive increase

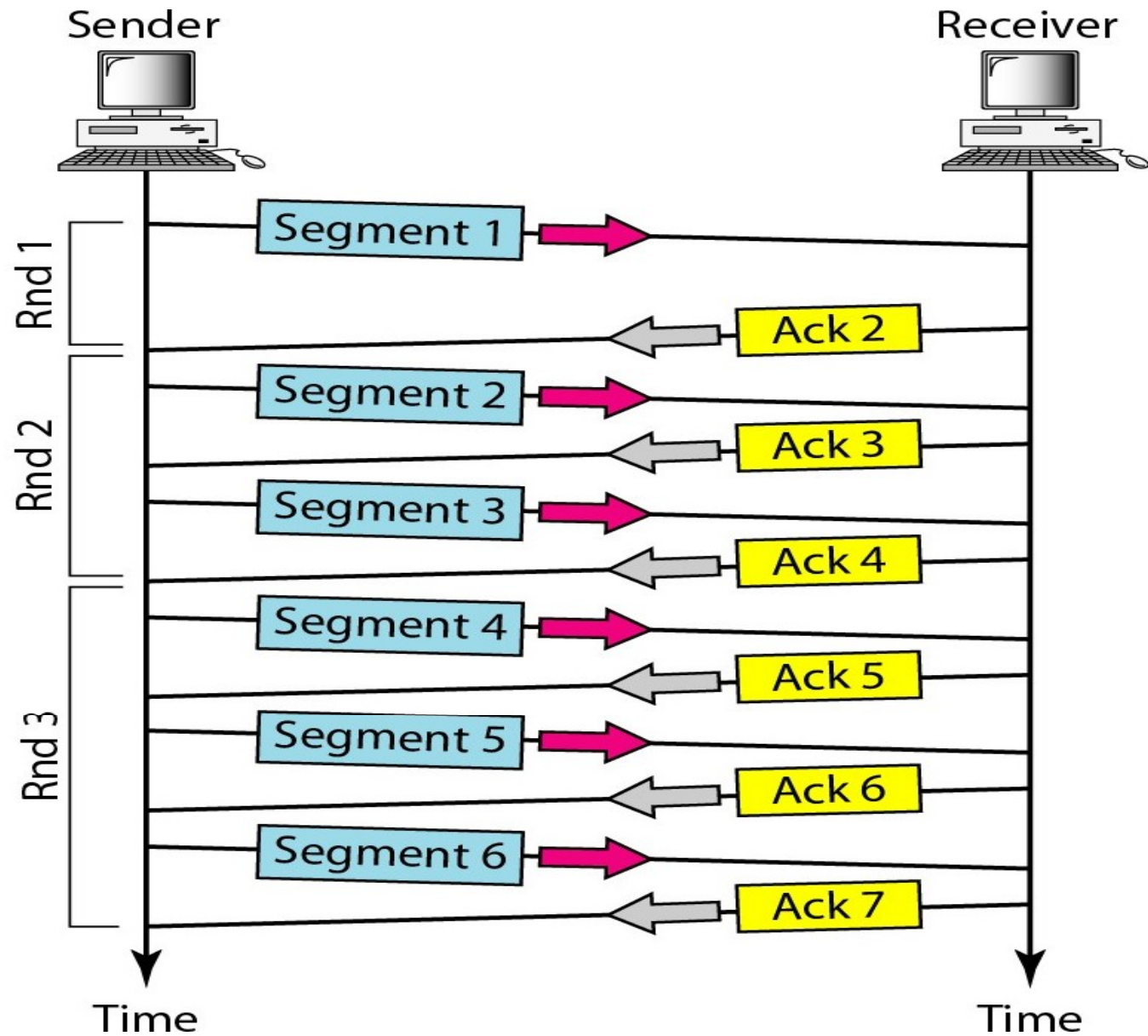
Round of transmission

$cwnd = 1$ 

$cwnd = 1 + 1 = 2$ 

$cwnd = 2 + 1 = 3$ 

$cwnd = 3 + 1 = 4$ 



**congestion avoidance algorithm
of the congestion window incre
additively until
congestion is detected.**

n reacts to congestion

the following ways:

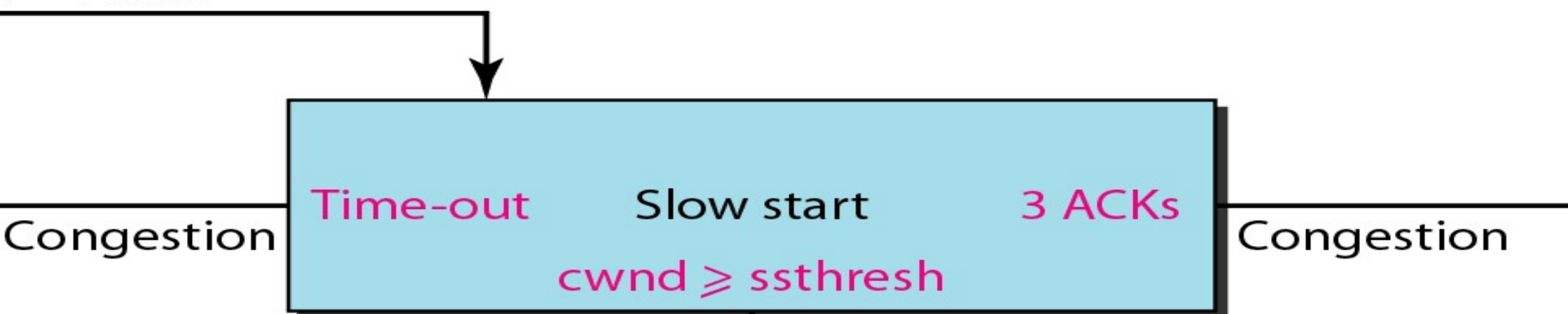
is by time-out, a new slow
arts.

is by three ACKs, a new

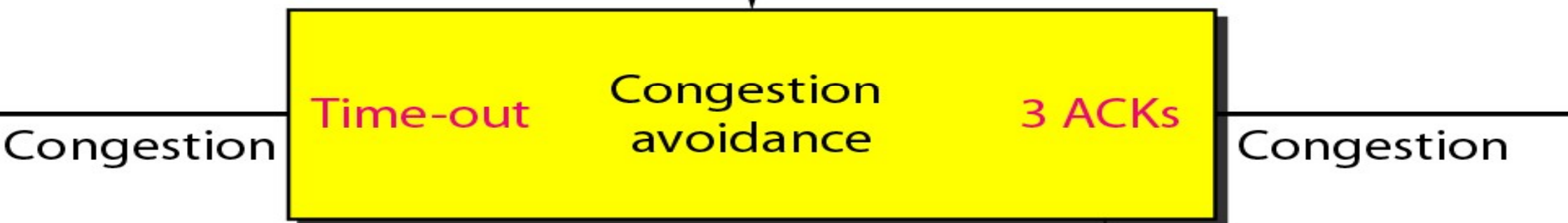
oidance phase starts.

10 TCP congestion policy summary

$ssthresh = 1/2$ window
 $slow_start_thresh = 1$ MSS

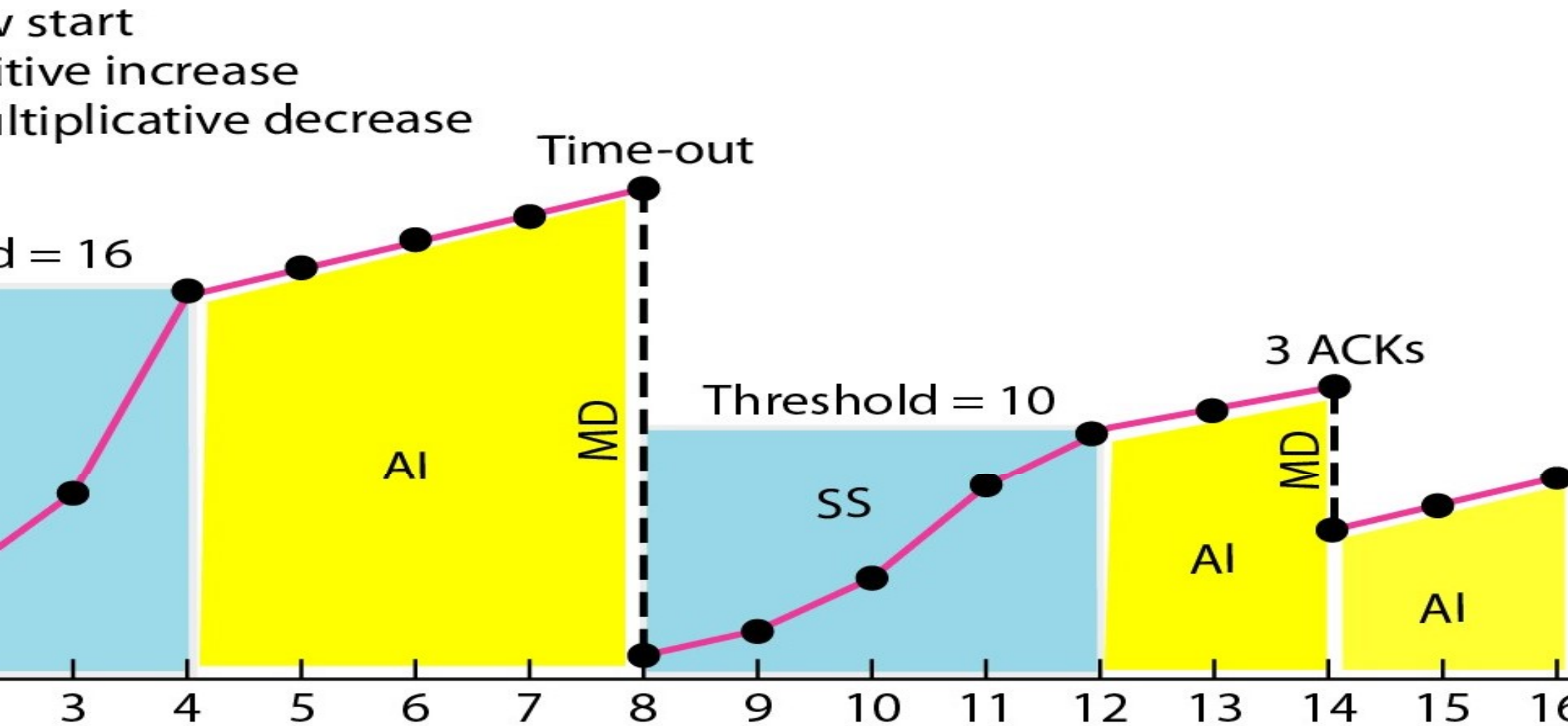


$ssthresh = 1/2$ window
 $cwnd = ssthresh$

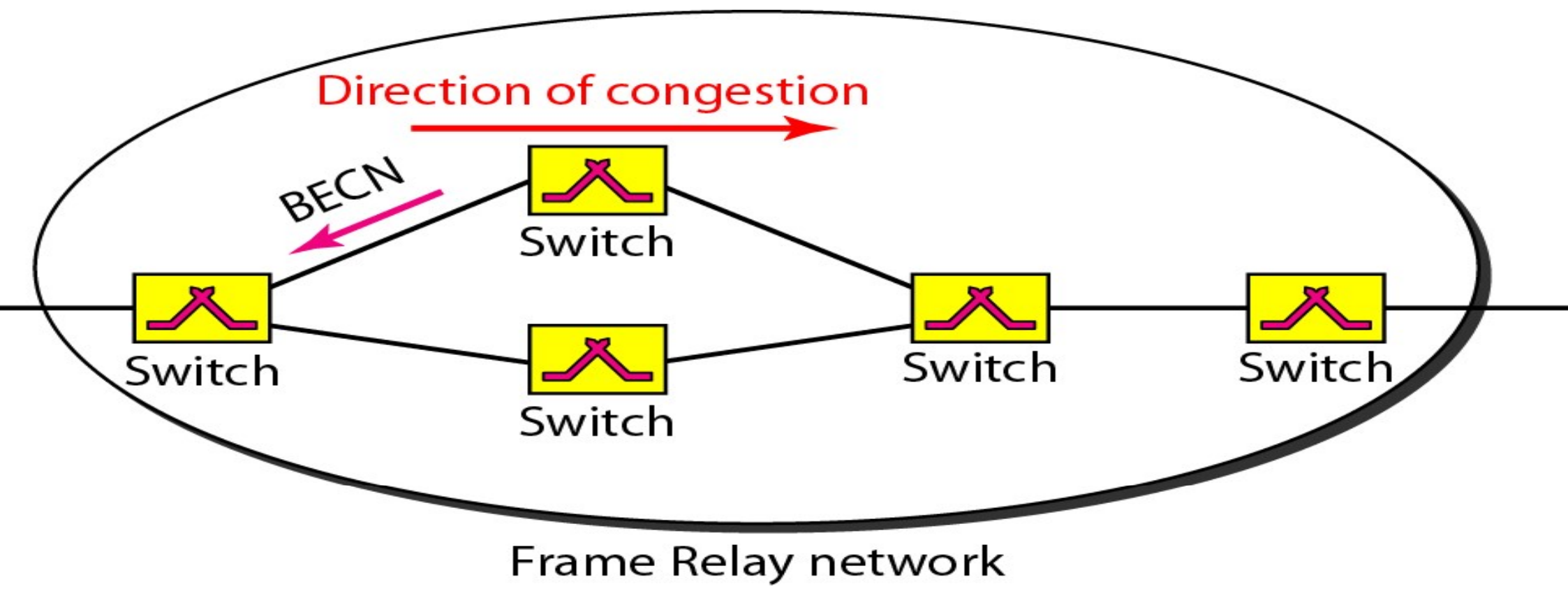


$ssthresh = 1/2$ window
 $cwnd = ssthresh$

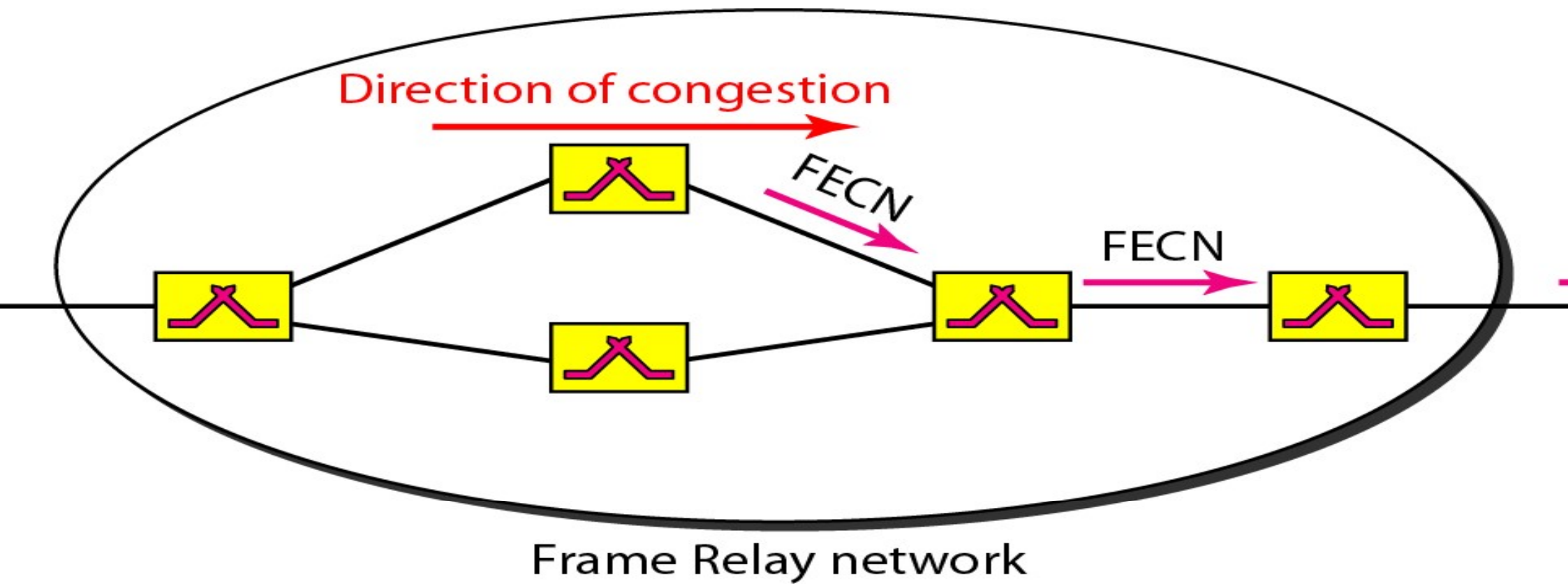
Congestion example



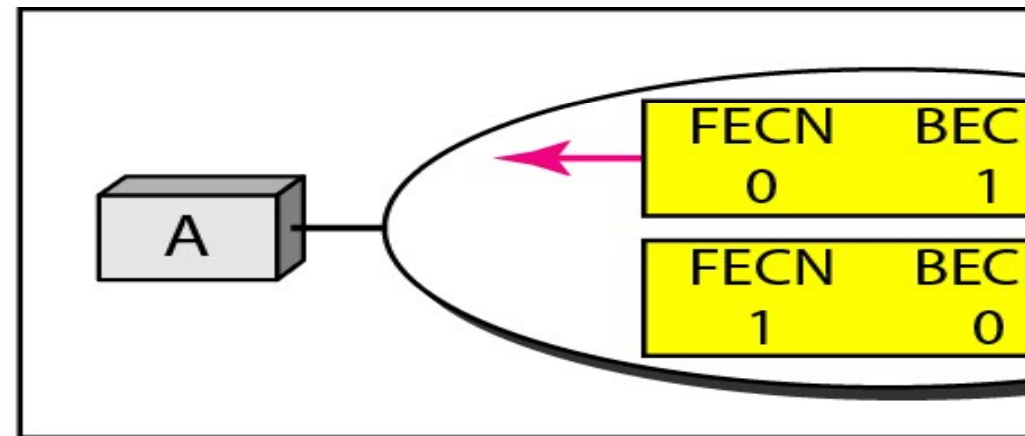
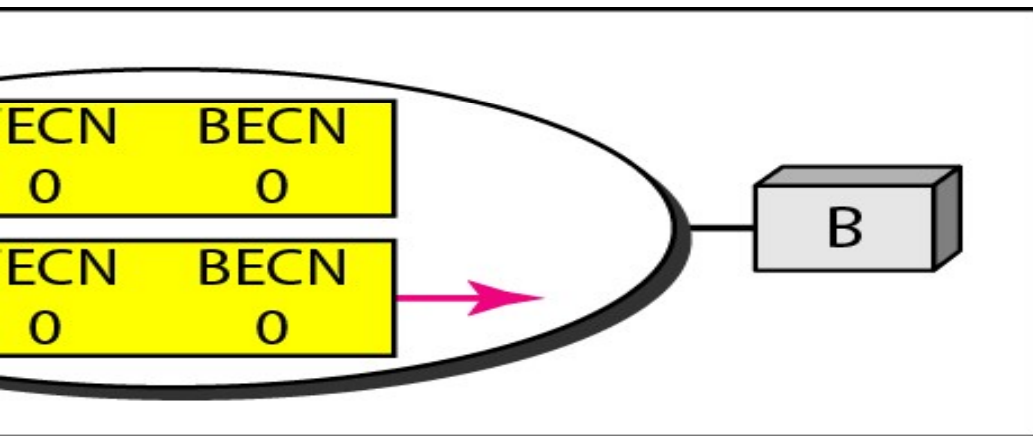
2 BECN



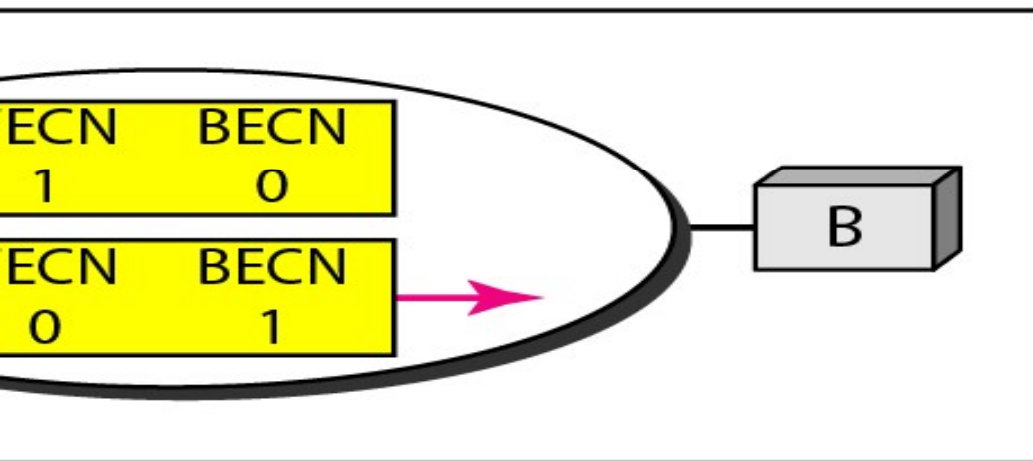
3 *FECN*



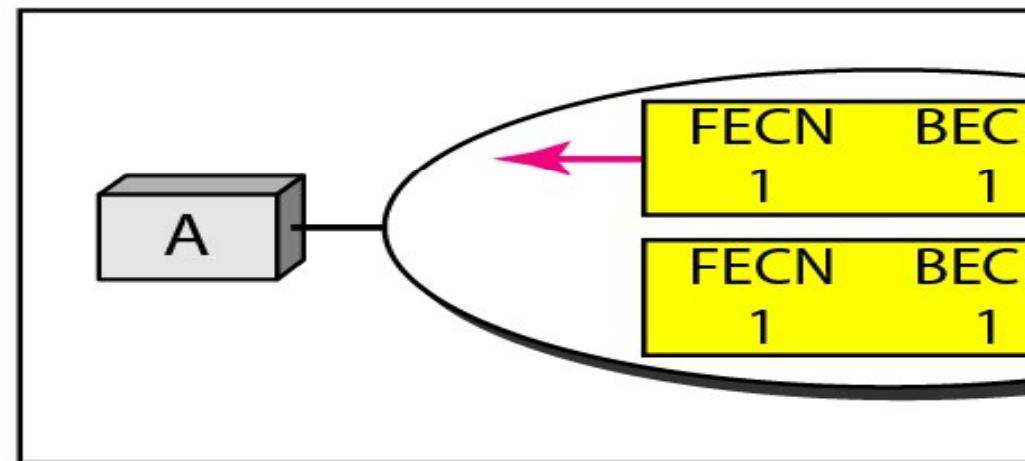
4 *Four cases of congestion*



b. Congestion in the direction A



direction B-A



d. Congestion in both direction

Thank You