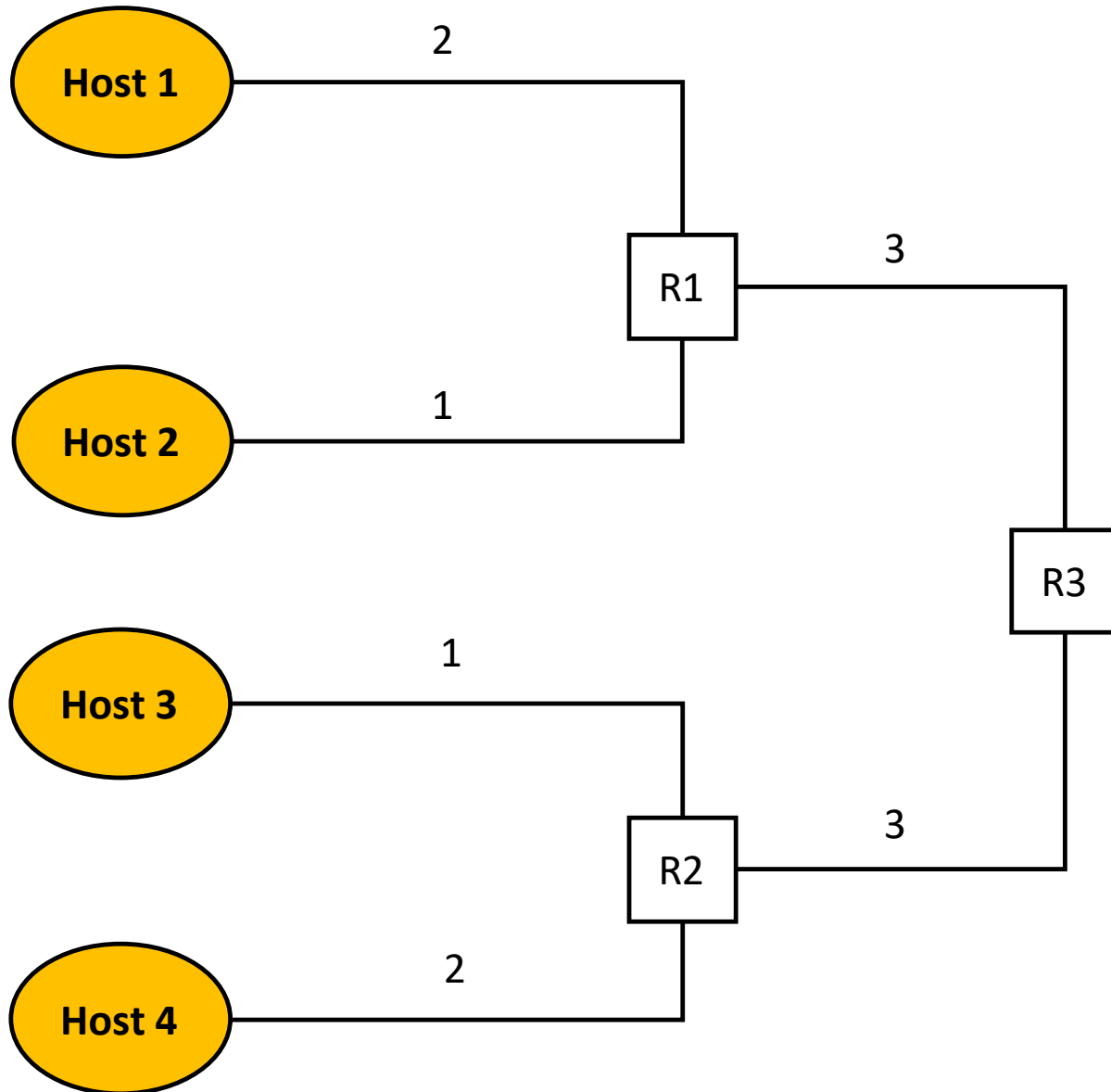


Homework 4 Discussion

Flow Network

- (1) Connectionless network: all datagrams are completely independent of each other.
- (2) Connection-oriented network: all datagrams are delivered in the same order as they were sent.
- (3) Flow: a sequence of packets sent between a source/destination pair and following the same route through the network. It is a gray area between (1) and (2).



The bandwidth of each link is shown.
What is the theoretical max flow if,

Case One: Host 1 sends data to Host 4

Case Two: Host 1 sends data to Host 4
and simultaneously Host 2 sends data
to Host 3.

Case Three: Host 1 sends data to Host
3 and simultaneously Host 2 sends
data to Host 4.

When Congestion Happens

Resource Allocation: network elements try to meet the competing demands that applications have for network resources—primarily link bandwidth and buffer space in routers or switches

Congestion Control: To prevent or respond to network congestion.

Congestion Avoidance: (1) predict when overload is about to happen and (2) reduce data transmission rate to avoid network congestion.

Congestion Avoidance (RED)

If average queue length $<$ minimum threshold:

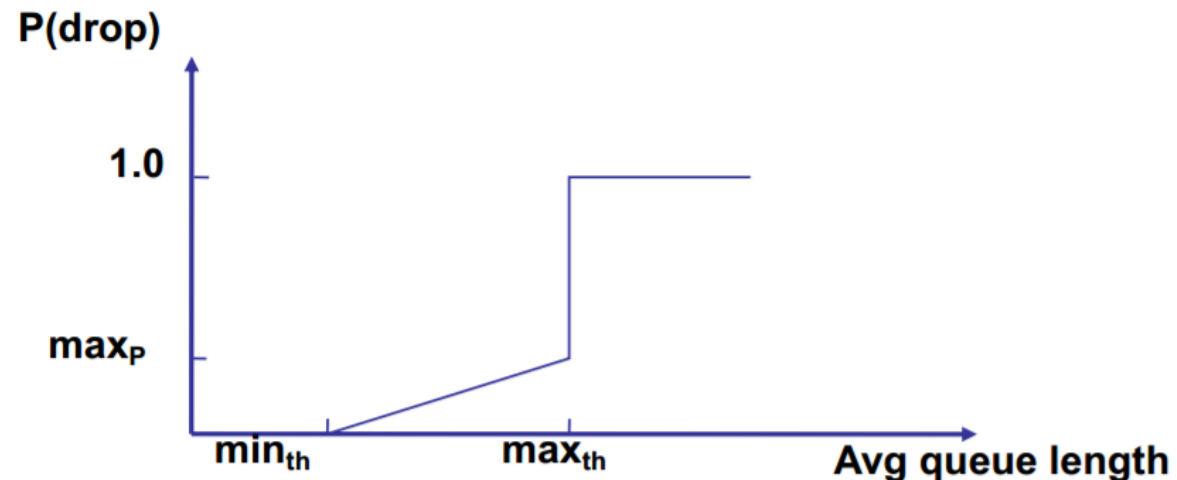
Queue the packet

Else If average queue length $>$ maximum threshold:

Drop the packet

Else:

drop the packet with probability that is proportional to queue length



Congestion Avoidance (RED)

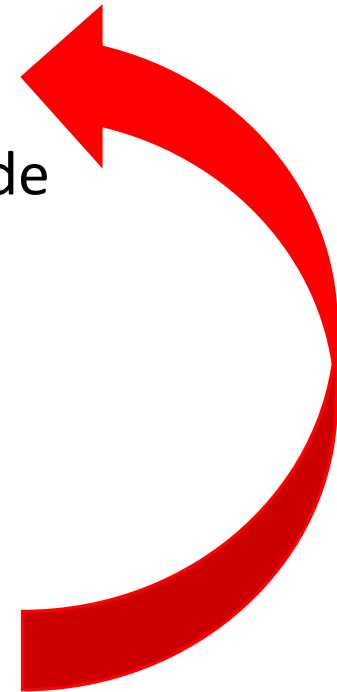
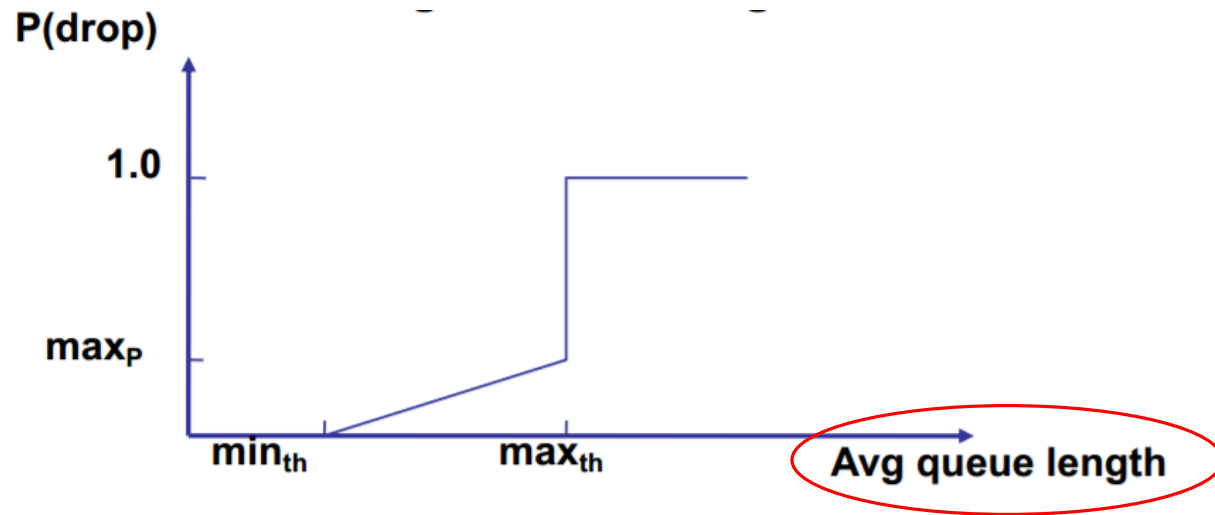
Average queue length(AvgLen):

bursty nature of network

$$\text{AvgLen} = (1-w) \times \text{AvgLen} + w \times \text{SampleLen}$$

w: weight between 0 and 1

SampleLen: instantaneous queue length when measurement is made

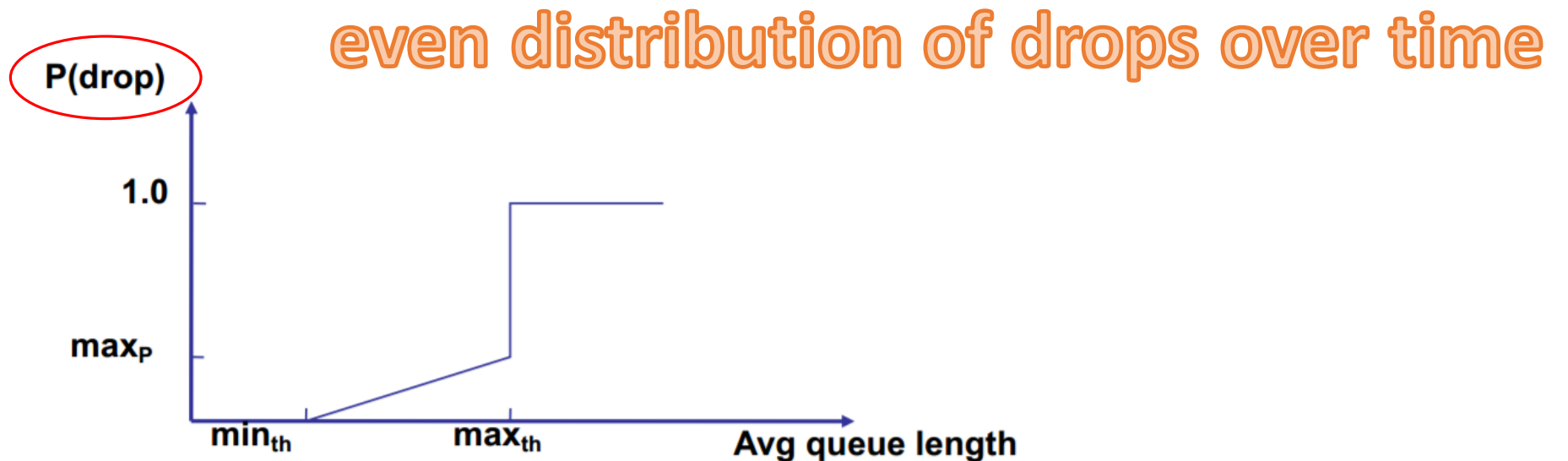


Congestion Avoidance (RED)

P(drop) is not the real drop probability (RealP).

$$\text{RealP} = P / (1 - \text{count} \times P)$$

count: number of successive packets that have been queued



Congestion Avoidance (RED)

Example:

MaxP = 0.04, AvgLen is halfway between two thresholds. What is RealP if,

count = 0?

count = 25?

count = 49?

Guarantee at least one drop for every 50 newly arrived packet

TCP Congestion Control

Slow start

Fast retransmit

Triple duplicate acknowledgement

Timeout

Slow start threshold

Questions?