Practice Questions: Congestion Control and Queuing

COS 461: Computer Networks

http://www.cs.princeton.edu/courses/archive/spr14/cos461/

Today's Plan

- Fork() example
- Wireshark practice
- TCP Review Questions

Handle Multiple Clients using fork()

- Steps to handle multiple clients
  - Go to a loop and accept connections using accept()
  - After a connection is established, call fork() to create a new child process to handle it
  - Go back to listen for another socket in the parent process
  - close() when you are done

```
while (1) {
  fd = accept (srv_fd, (struct sockaddr *) &caddr, &clen);
  ...
  pid = fork(); children++;
  /* child process to handle request */
  if (pid == 0) {
     /* exit(0) on success, exit(1) on error */
  }
  /* parent process */
  else if (pid > 0) {
     while ((waitpid(-1, &status, WNOHANG)) > 0)
        children--;
     if (children > MAX_PROCESSES)
        ...
  }
  else {
    perror("ERROR on fork");
    exit(1);
}}
```

Wireshark

- Selecting and listening on interface
  - Root for promiscuous mode: sniff on neighbors!
- Writing filters to select packets
  - “udp.dstport == 53”, “http.request_method is present”
- Examining packet formats
  - Look at Ethernet, IP, TCP, HTTP headers
- Following TCP streams
  - Trace HTTP request(s) belonging to a TCP connection

One node on an Ethernet network uses TCP to send data to another node on the same network. If there are no other nodes transmitting on the network, can there be any collisions?

A. Yes
B. No

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A. **Yes** – *Can collide with TCP ACKs*
B. No

Ben Bitdiddle's home network connection can upload at 125,000 bytes/second. His router has a 100,000 byte first in first out buffer for packets awaiting transmission.

If the buffer is completely full, how long will it take for the buffer to clear?

A. 0.4 seconds
B. 0.6 seconds
C. 0.8 seconds
D. 1 second
E. 1.25 seconds

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B. 3 seconds
C. 4 seconds
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If a sliding window protocol with acknowledgement packets is used, and there is a *FIXED* window size of 4 packets, what is the maximum rate of traffic on the link?

A. 20 pkts / s
B. 40 pkts / s
C. 80 pkts / s
D. 100 pkts /s

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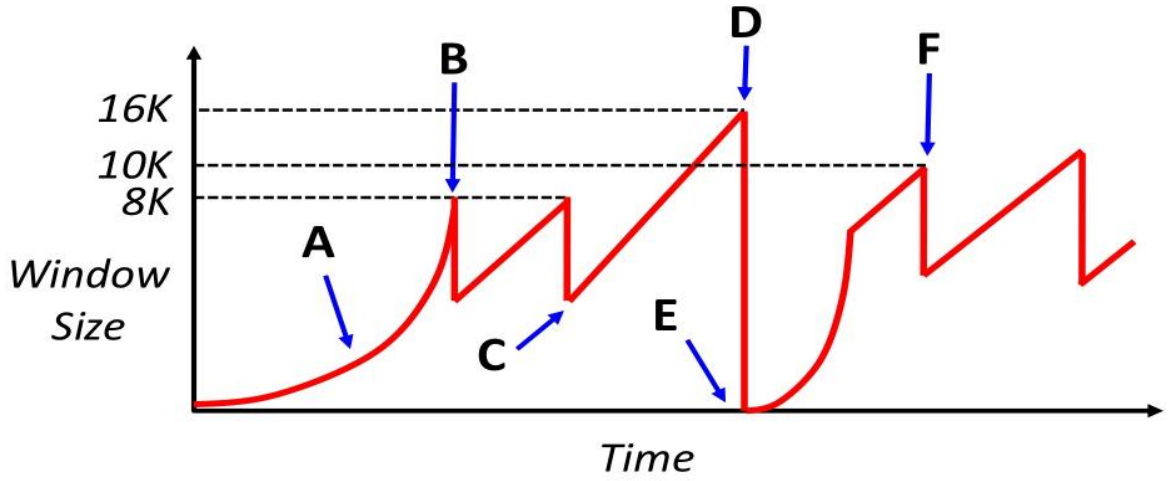
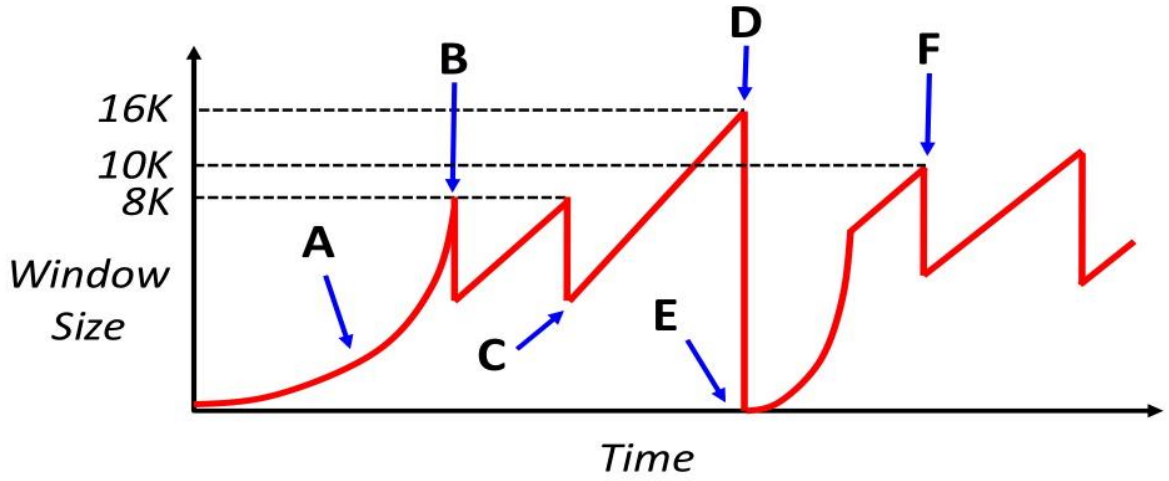


1. Name the event at B which occurs that causes the sender to decrease its window

(a) Triple Duplicate Ack
(b) Slow Start
(c) Packet loss
(d) Time out



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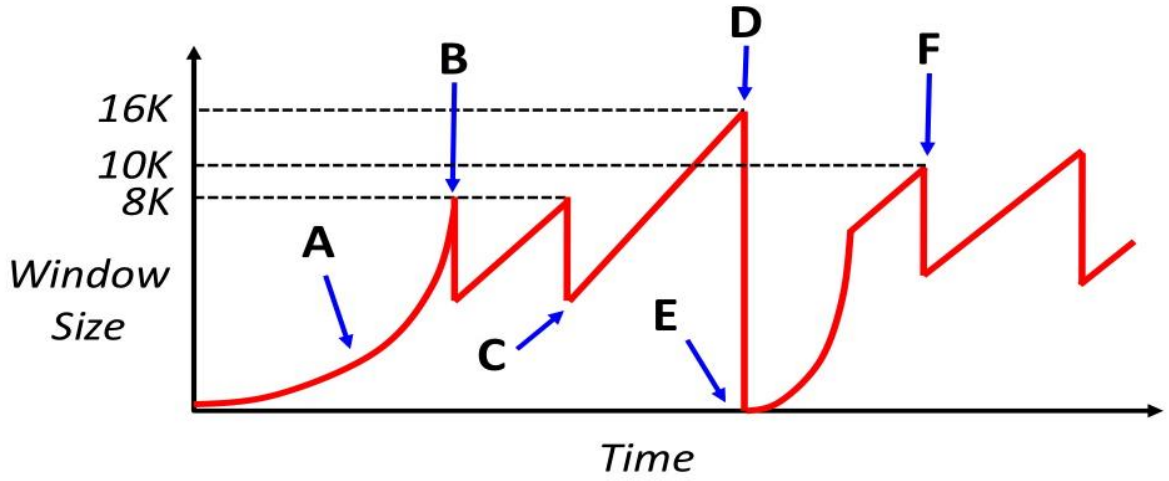
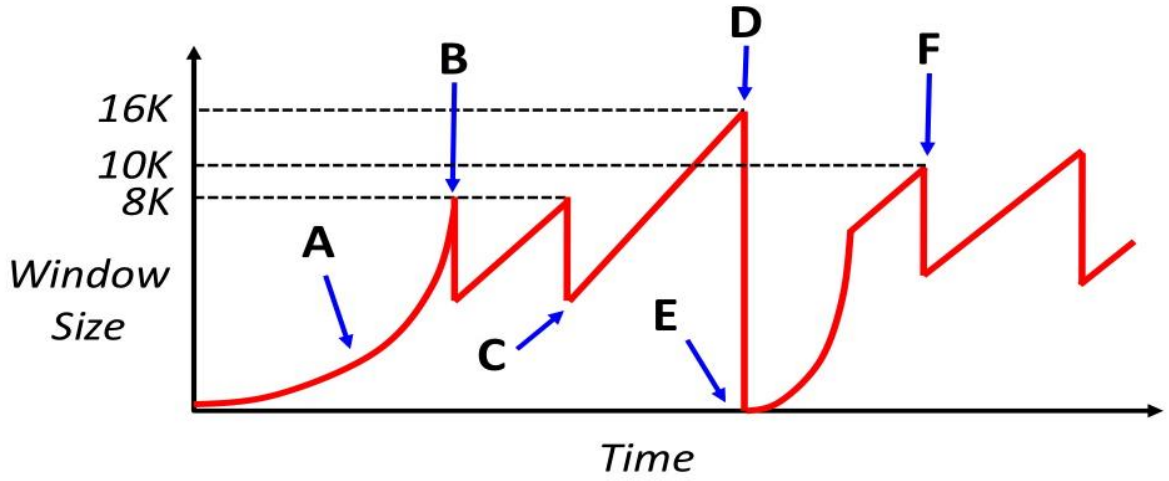


2. Does the event at B necessitate that the network discarded a packet ?

(a) Yes
(b) No
(c) Don't know



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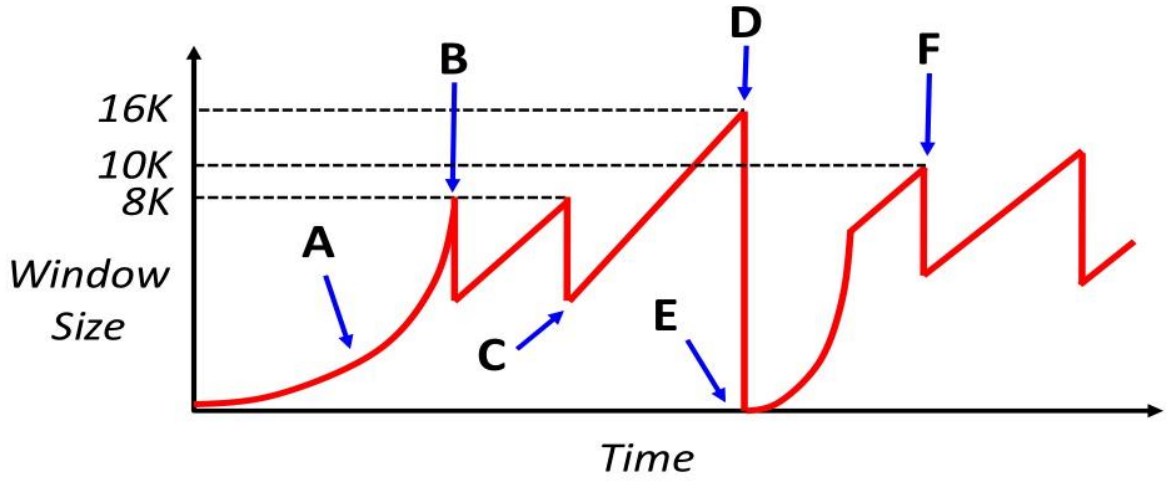
No. It could be due to either reordering or queuing or asymmetric paths.



3. Name the event at D which occurs that causes the sender to decrease its window.

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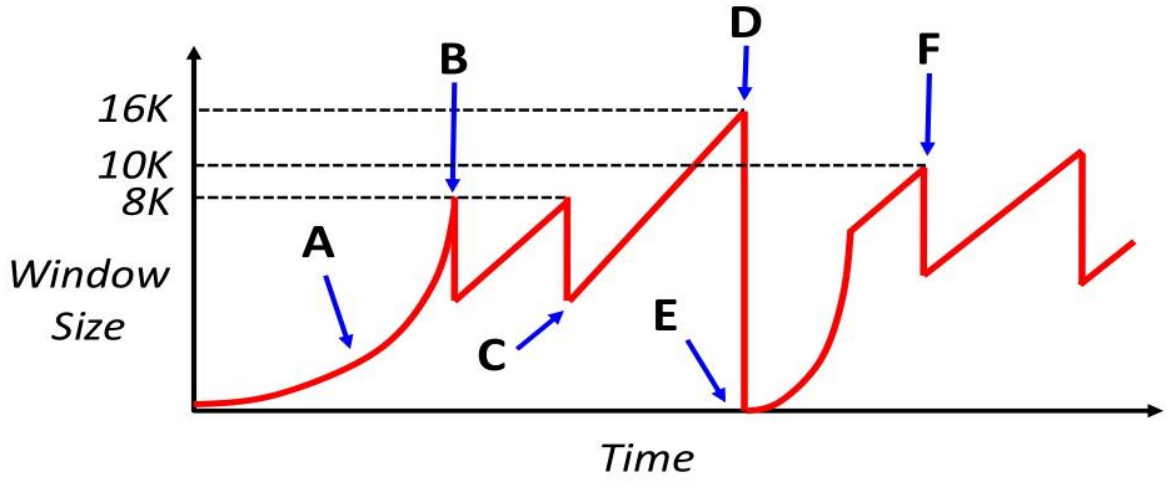

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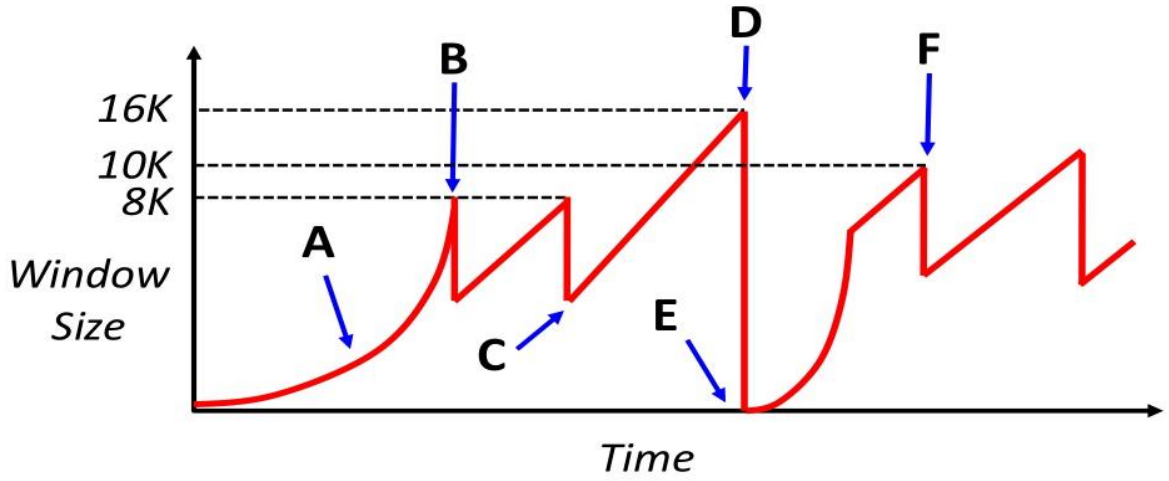

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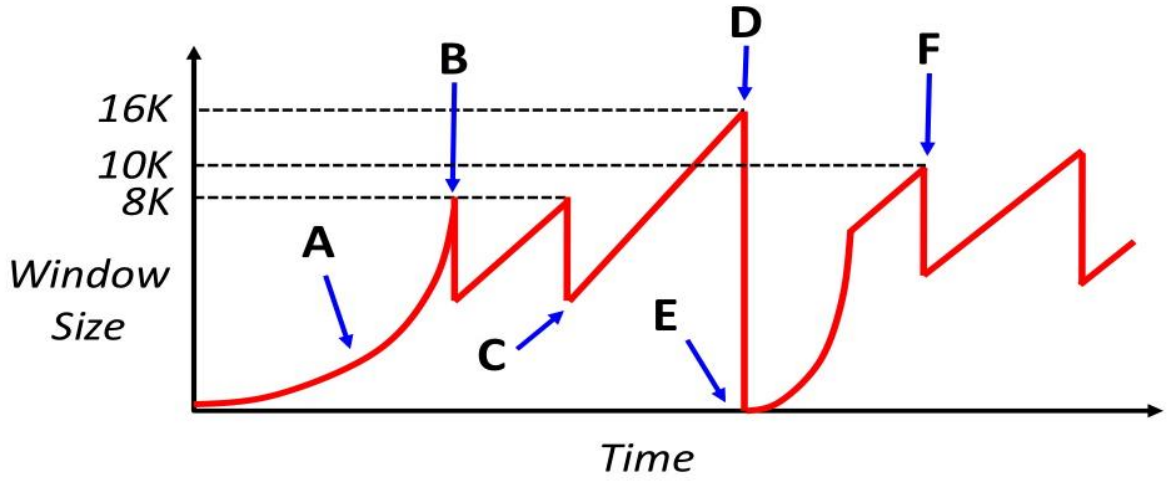

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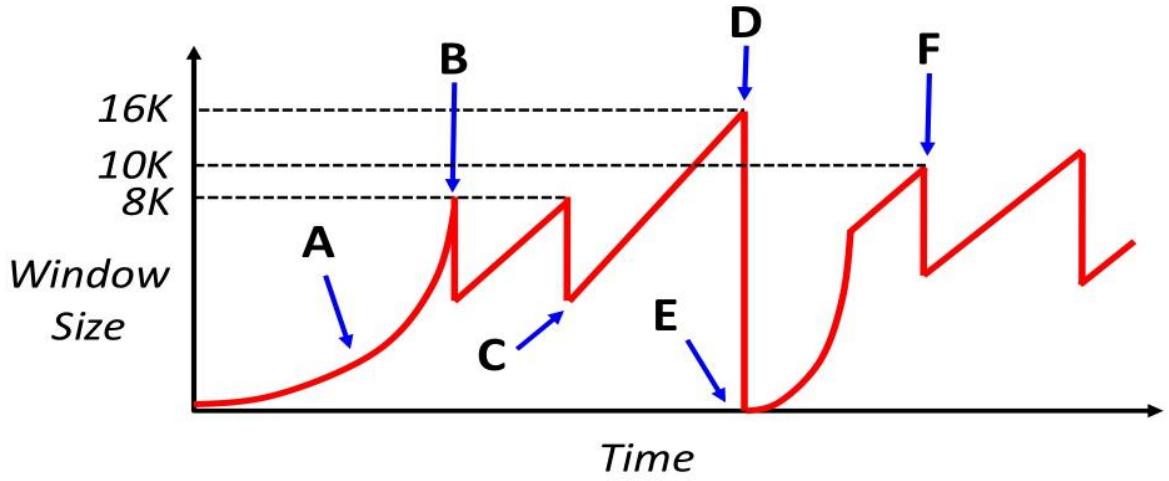
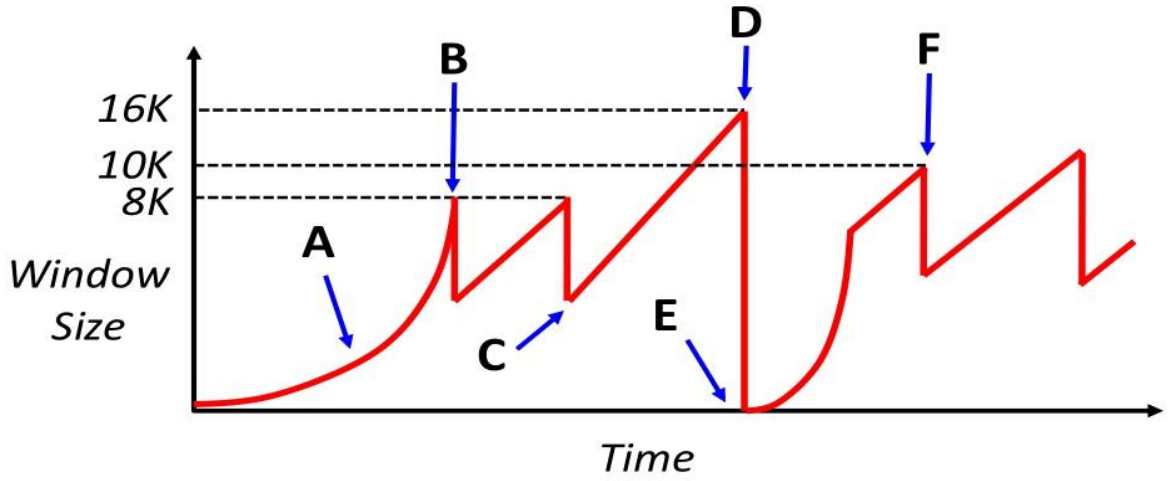
No. Congestion in either direction could cause RTT > RTO (retrans. timeout).



5. For a lightly-loaded network, is the event at D MORE likely or LESS likely to occur when the sender has multiple TCP segments outstanding

(a) MORE
(b) LESS
(c) ALMOST SAME



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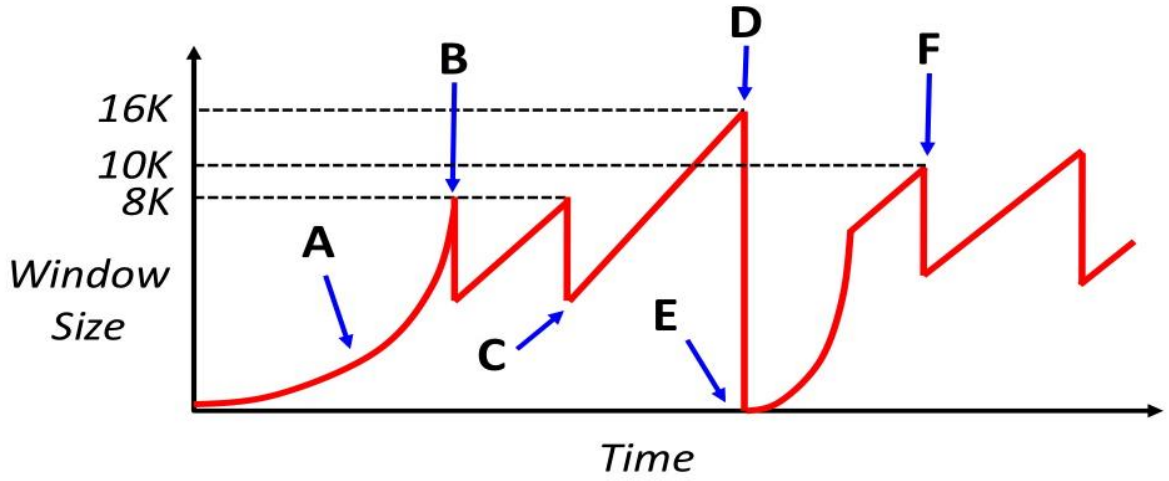
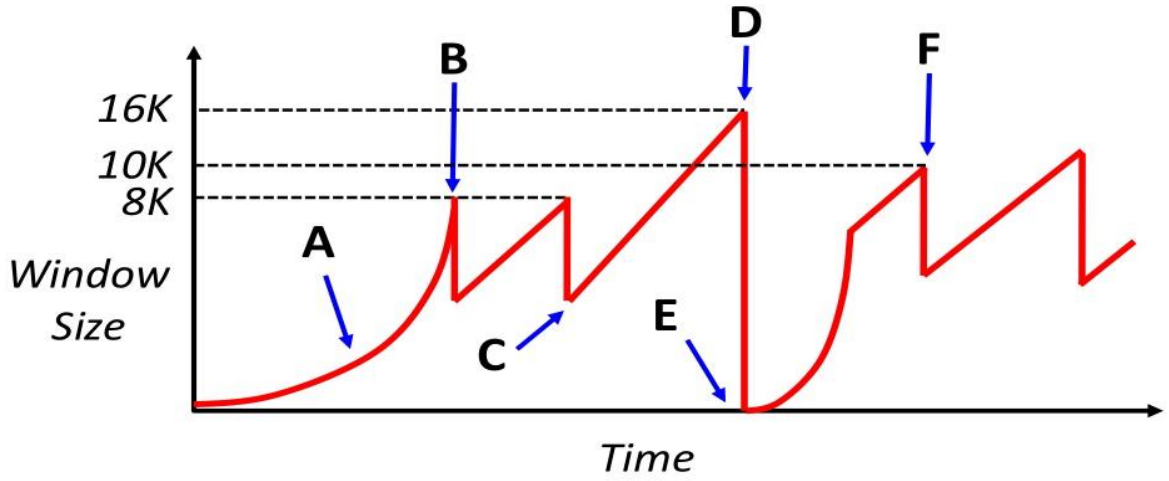


6. Consider the curved slope labeled by point A. Why does the TCP window behave in such a manner, rather than have a linear slope? (Put another way, why would it be bad if region A had a linear slope?)



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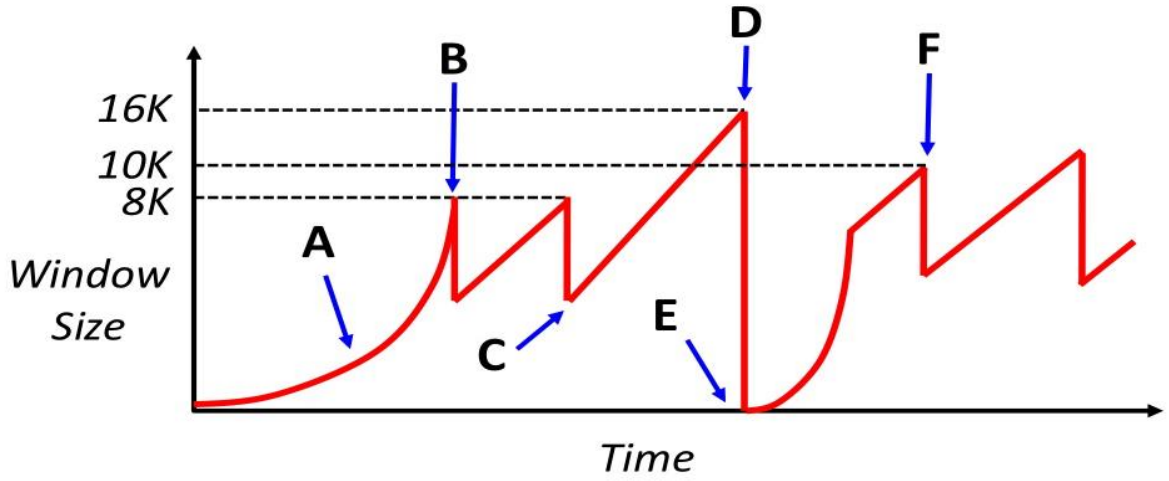
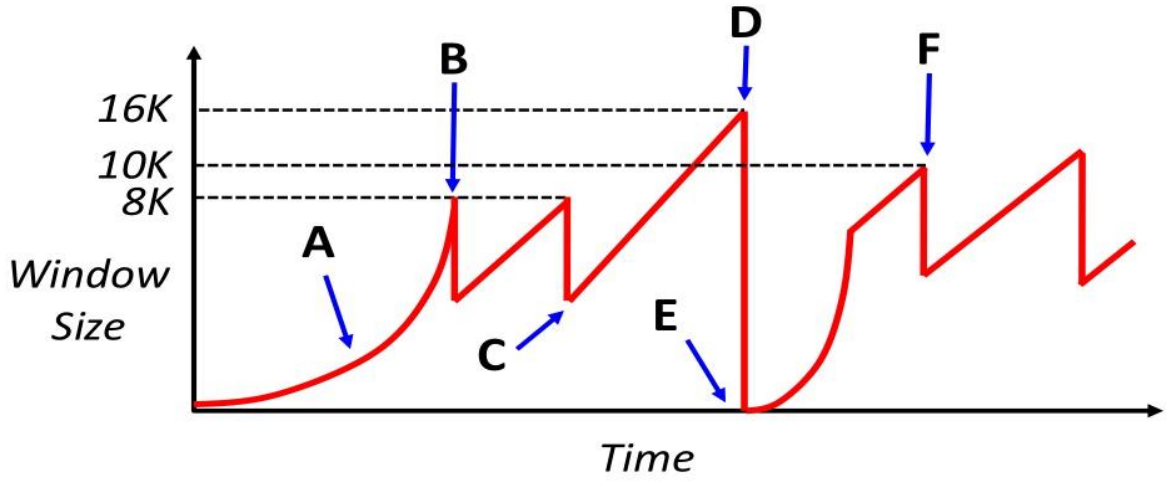
This “slow-start” period quickly discovers the maximum acceptable throughput that the path supports – otherwise, AI (additive increase) could take too long (each a full RTT).



Assume that the network has an MSS of 1000 bytes and the round-trip-time between sender and receiver of 100 milliseconds.

Assume at time 0 the sender attempts to open the connection.

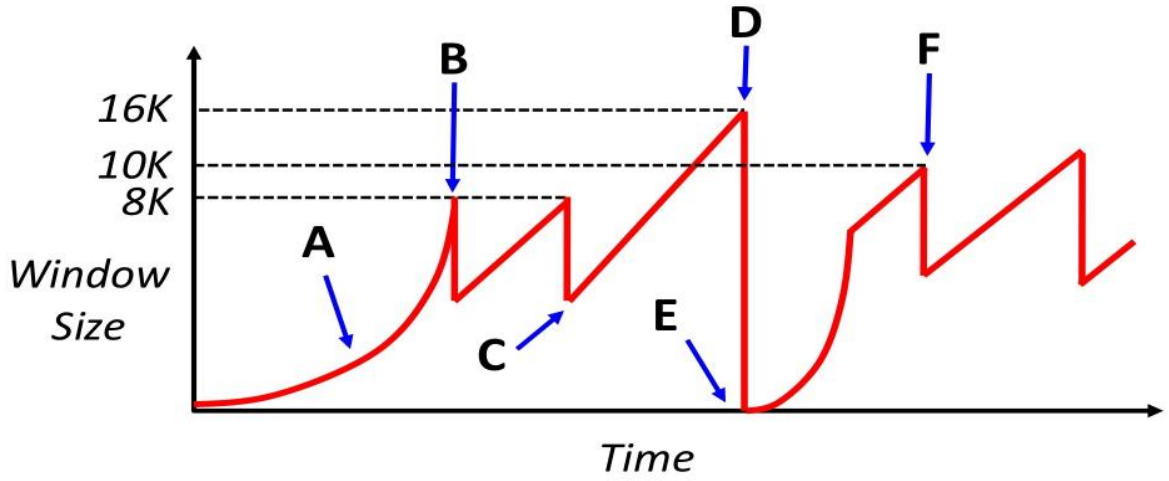
Also assume that the sender can “write” a full window’s worth of data instantaneously, so the only latency you need to worry about is the actual propagation delay of the network.



RTT = 100ms, MSS = 1000 bytes

7. How much time has progressed by point B ?

(a) 200ms
(b) 300ms
(c) 400ms
(d) 600ms
(e) 700ms



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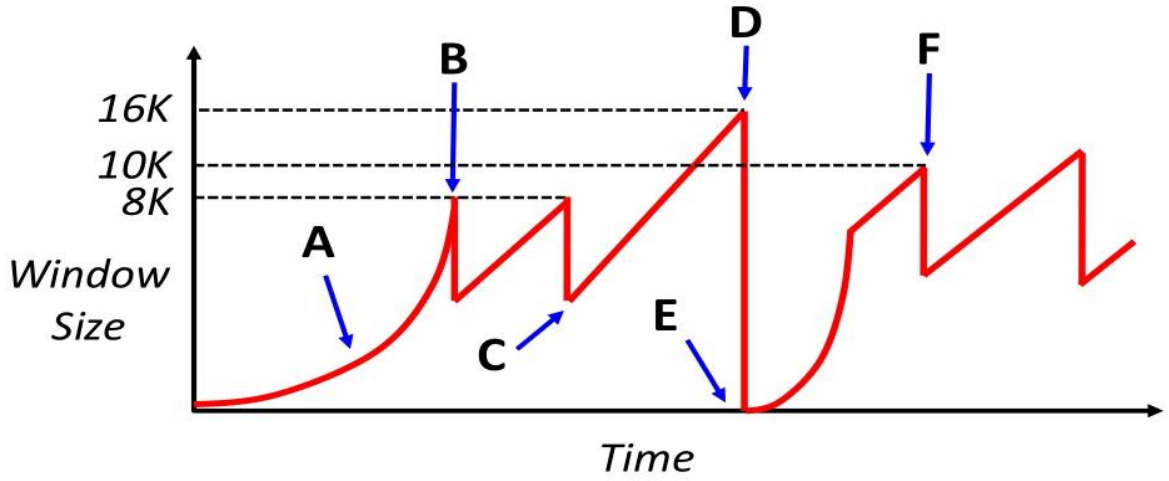

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8. How much time has progressed between points C and D?

(a) 800ms
(b) 1000ms
(c) 1200ms
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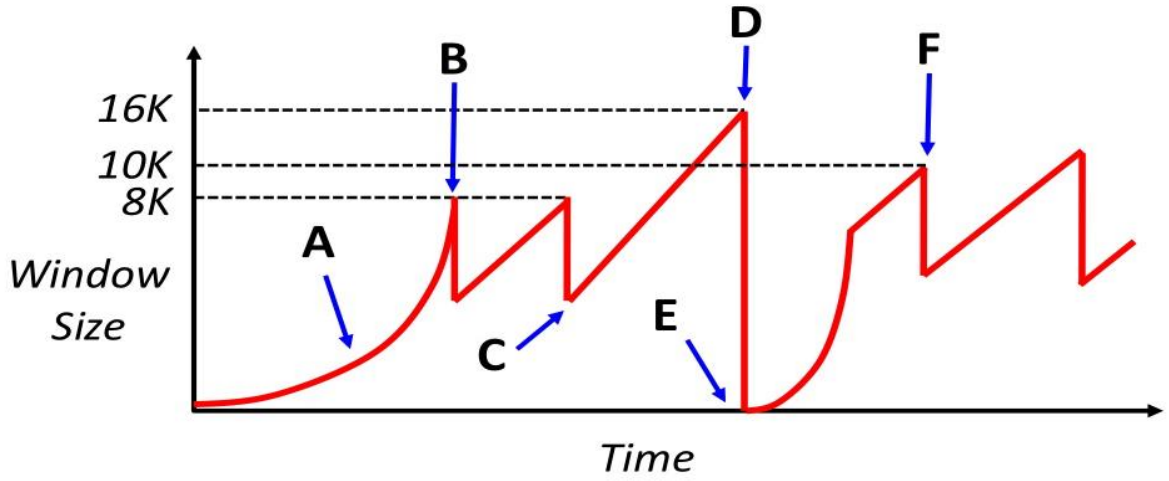

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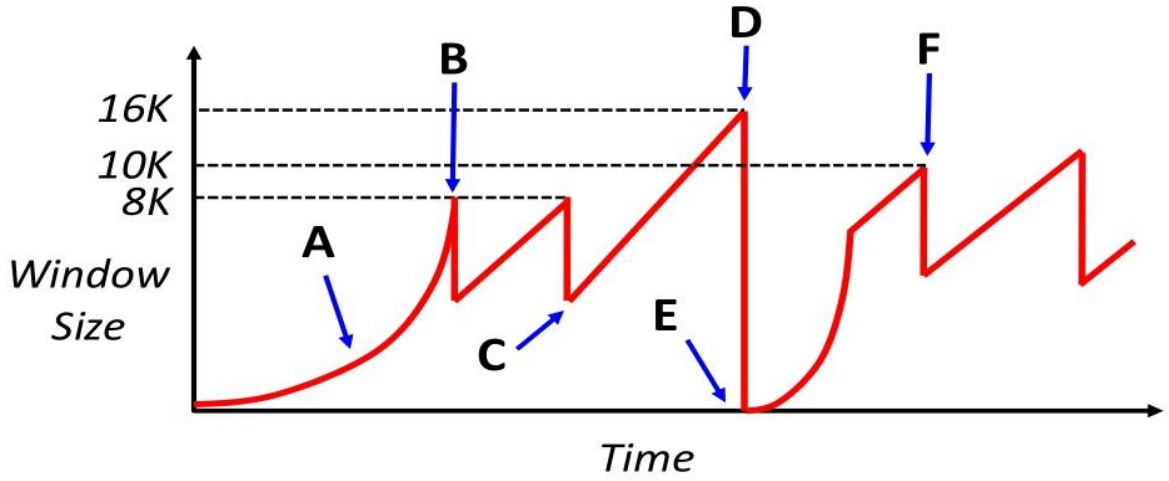

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9. How much time has progressed between points E and F?

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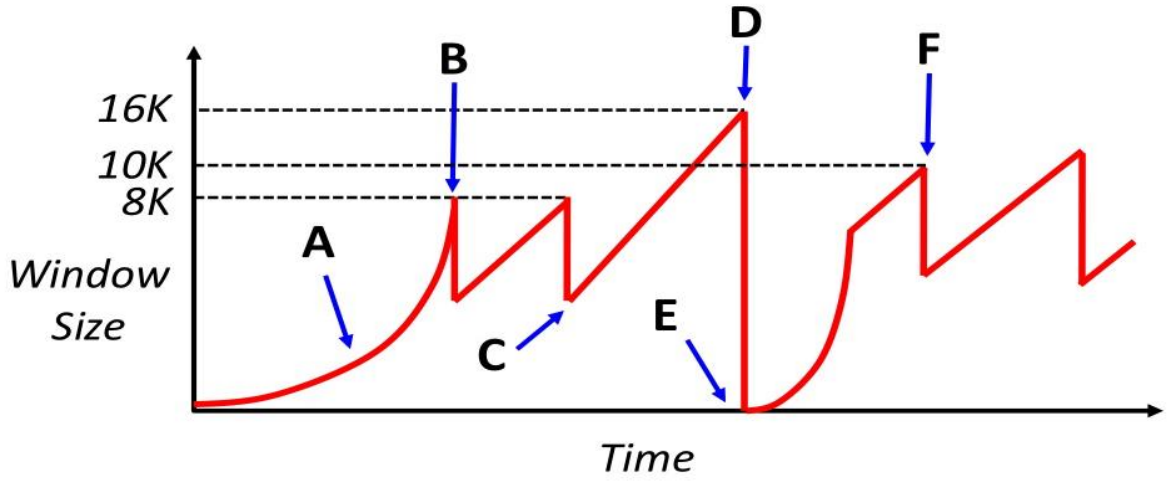

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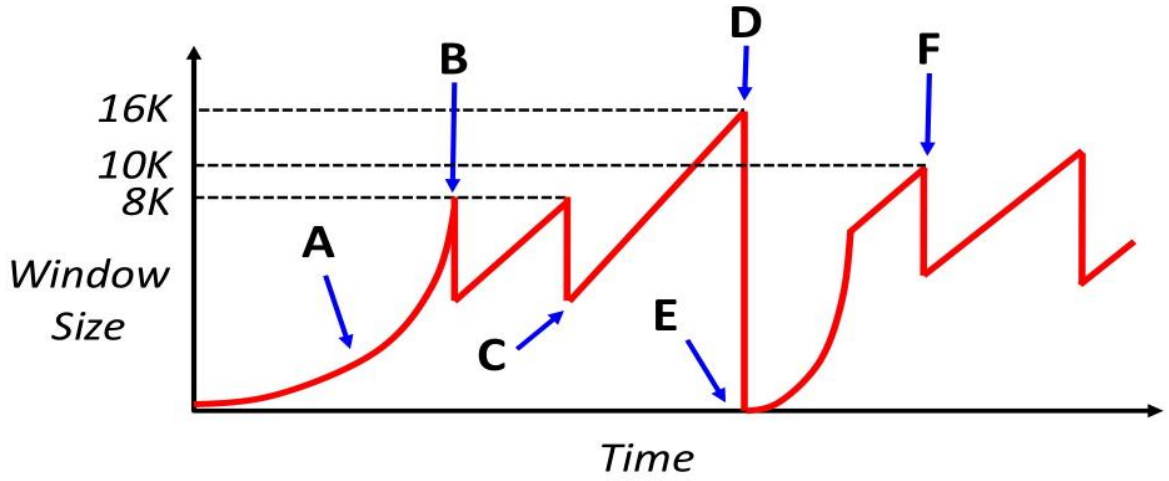

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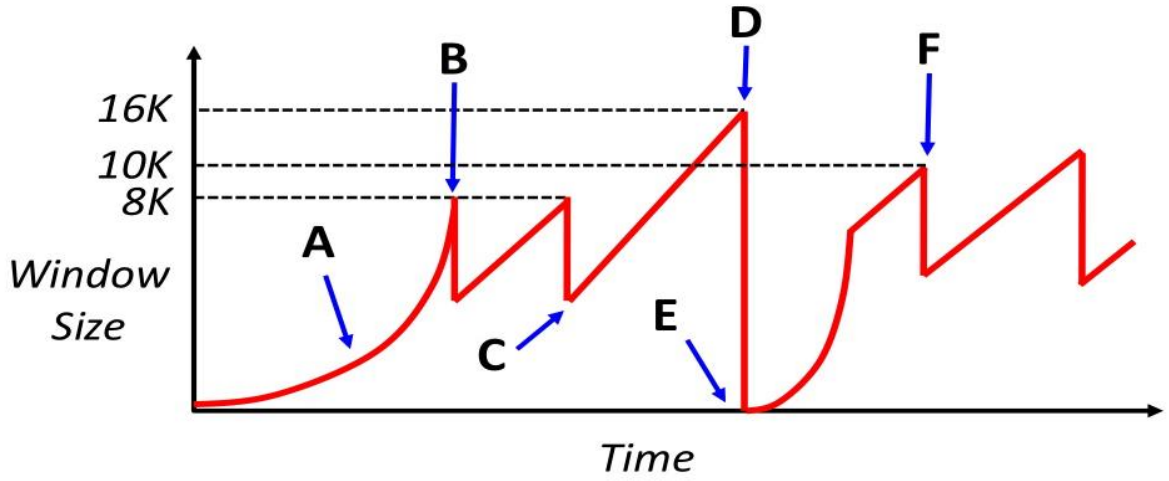

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Changing cross-traffic by other concurrent senders across same routers.

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T/**F** – TCP resets its window size to one MSS