EECS 489 Discussion 5

Plans

- Assignment 2 is due in ~ 10 days
- Hints on passing more Assignment 2 Autograder tests
- Problem sets
- Quick demo on the Autograder

Assignment 2

Due date: **10/22 2018, 11:59 PM**

Please make sure to follow the exact submission instructions. (No exception will be made for A2.)

Try running the autograder multiple times before submission.

Design your own tests to fully test your program.

Assignment 2 Testing Hints: Part 1

- **Part 1: Proxy server test (10 Tests total)**
  - Bitrate adaption is indeed working
  - Initial bitrate starts from the lowest option
  - Final bitrate stabilizes to correct values according to different network conditions
  - Can output certain number of log lines in a specific duration (not too few, not too many)
  - Works in multiple browser scenarios. (We indeed check the log file to see if all browsers are working.)
  - Correct log format

Assignment 2 Testing Hints: Part 2

- **Part 2: DNS server test (13 tests total)**
  - Only single proxy talks to single DNS server (with multiple requests)
  - RR: Should be straightforward to pass
  - RR: Will run many times to check if the pattern is indeed Round-Robin
  - Geo: Topologies won't be too complicated, but there could be circles
  - Geo: # Nodes < 20, # Links < 50
  - Geo: Topologies don't have to exist in Mininet. Use different imaginary input files to test your code.
  - Network condition is not a concern

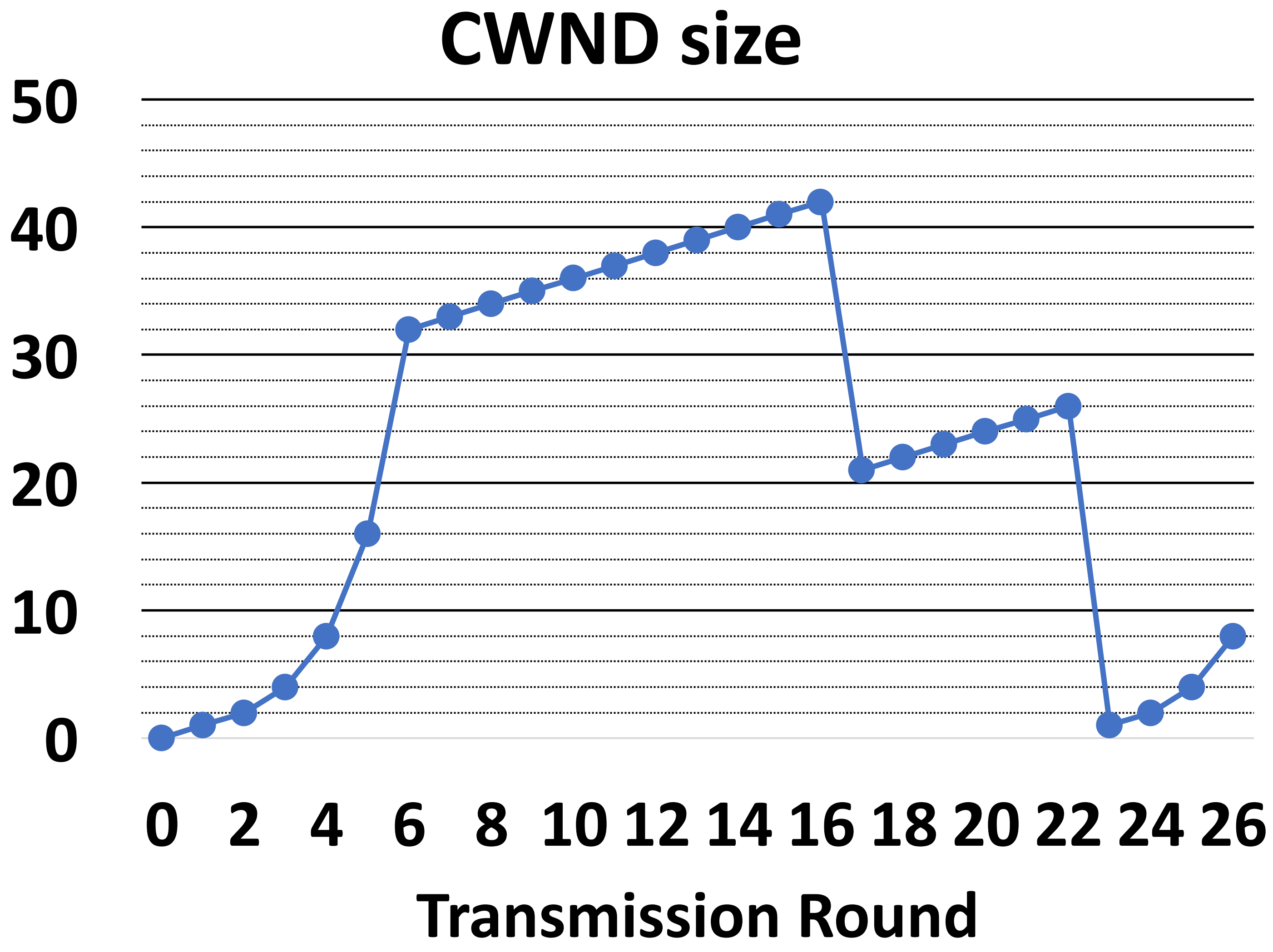
Assignment 2 Testing Hints: Part 3

- **Part 3: Integration test (10 Tests total)**
  - Will test both RR and Geo DNS setting
  - Will include multiple browsers talking to the proxy (i)
  - Will include multiple proxy servers talk to a single DNS (ii)
  - Case (i) and case (ii) will not coexist in a single test
  - Bitrate adaption should still work in a reasonable way
  - All DNS input files are real and the topologies exist in Mininet

Q1 from last Discussion

Identify:

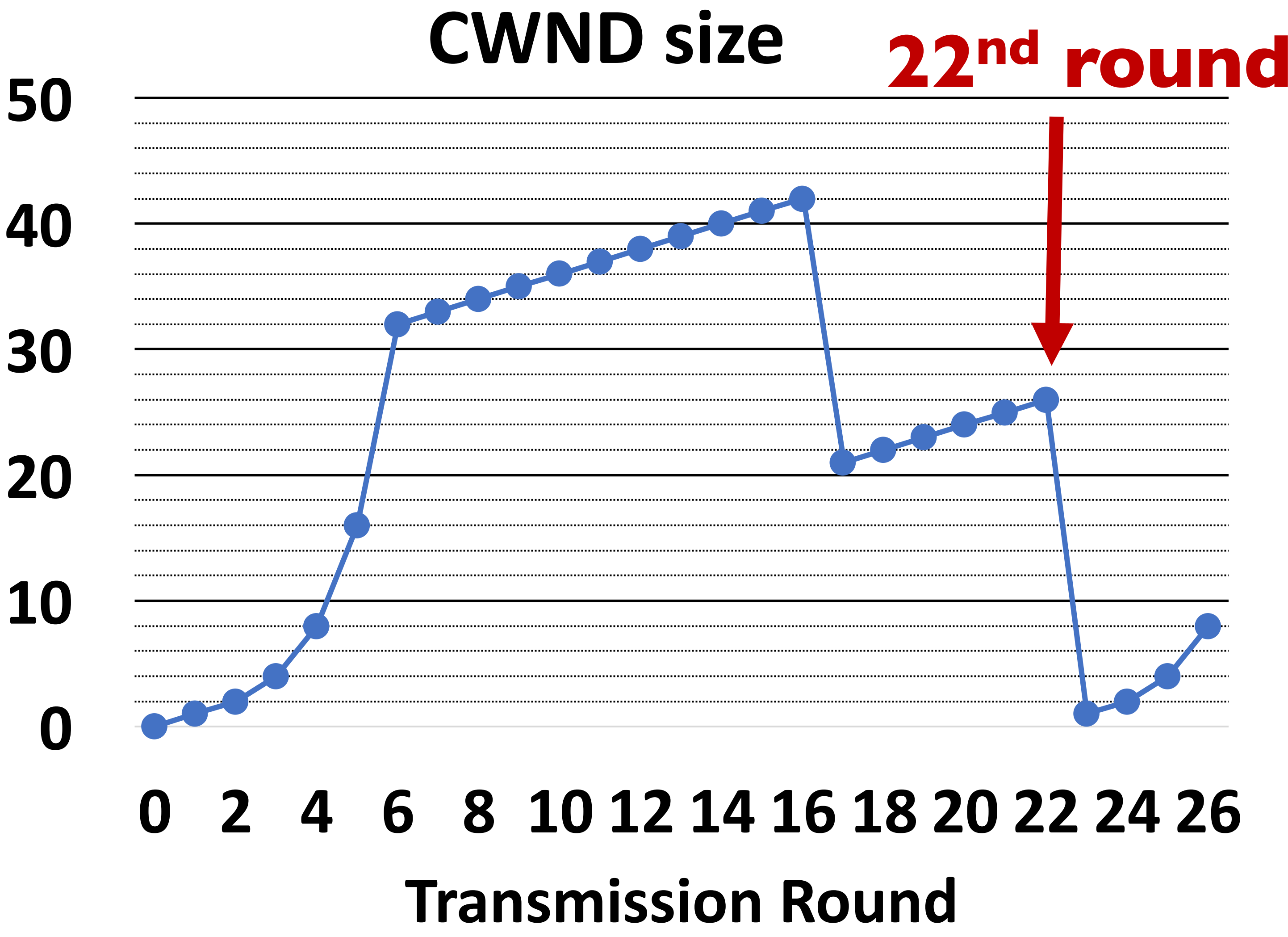
- TCP slow start
- Congestion avoidance (AIMD)
- Retransmission



Q1 from last Discussion

- What triggers retransmission at 22nd round?

- **Timeout**

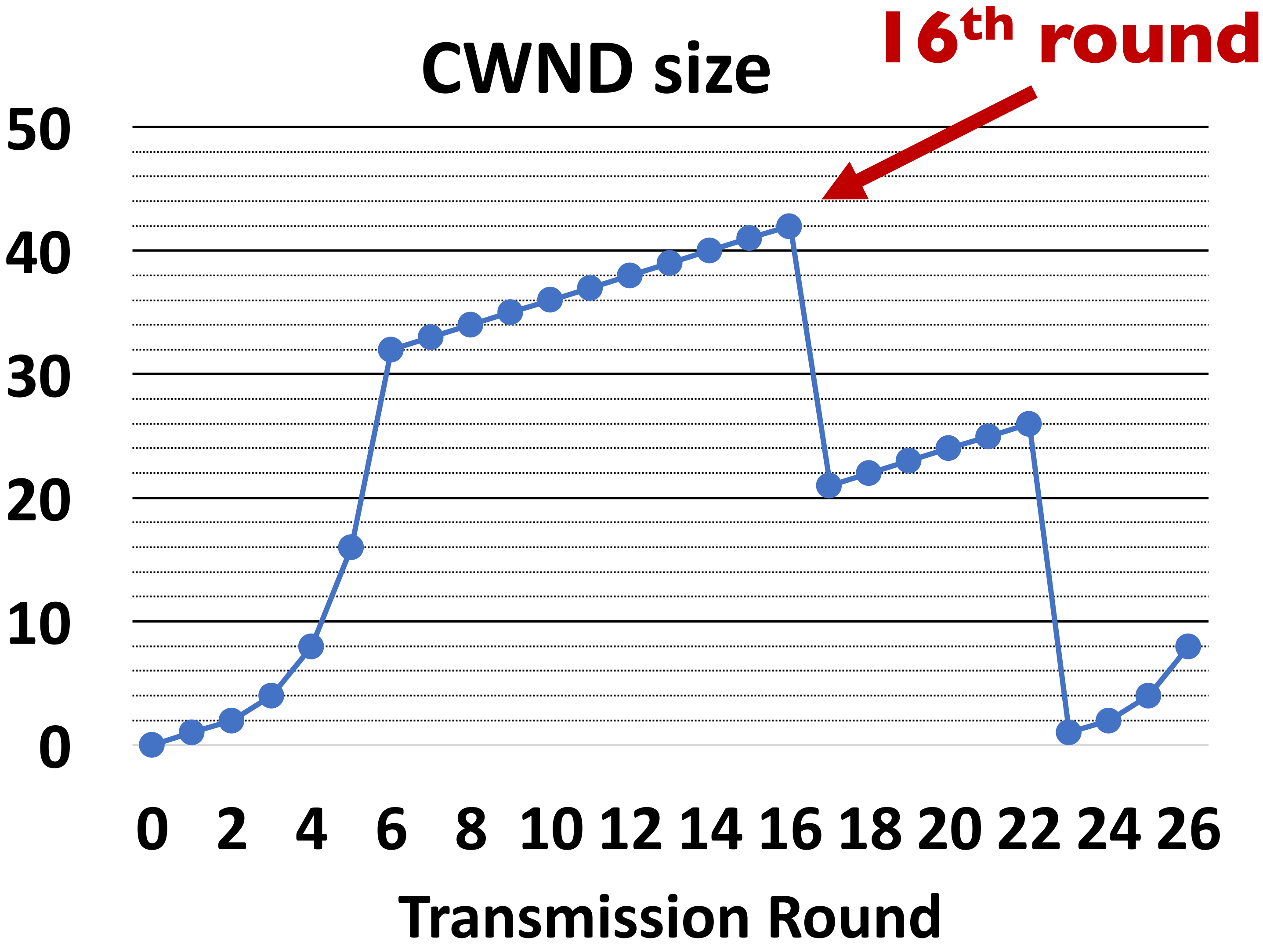


22nd round

Q1 from last Discussion

- What triggers retransmission at 16th round?

- **Duplicate ACK**



16th round

Q1 from last Discussion: Clarification

ssthresh at 1st round?

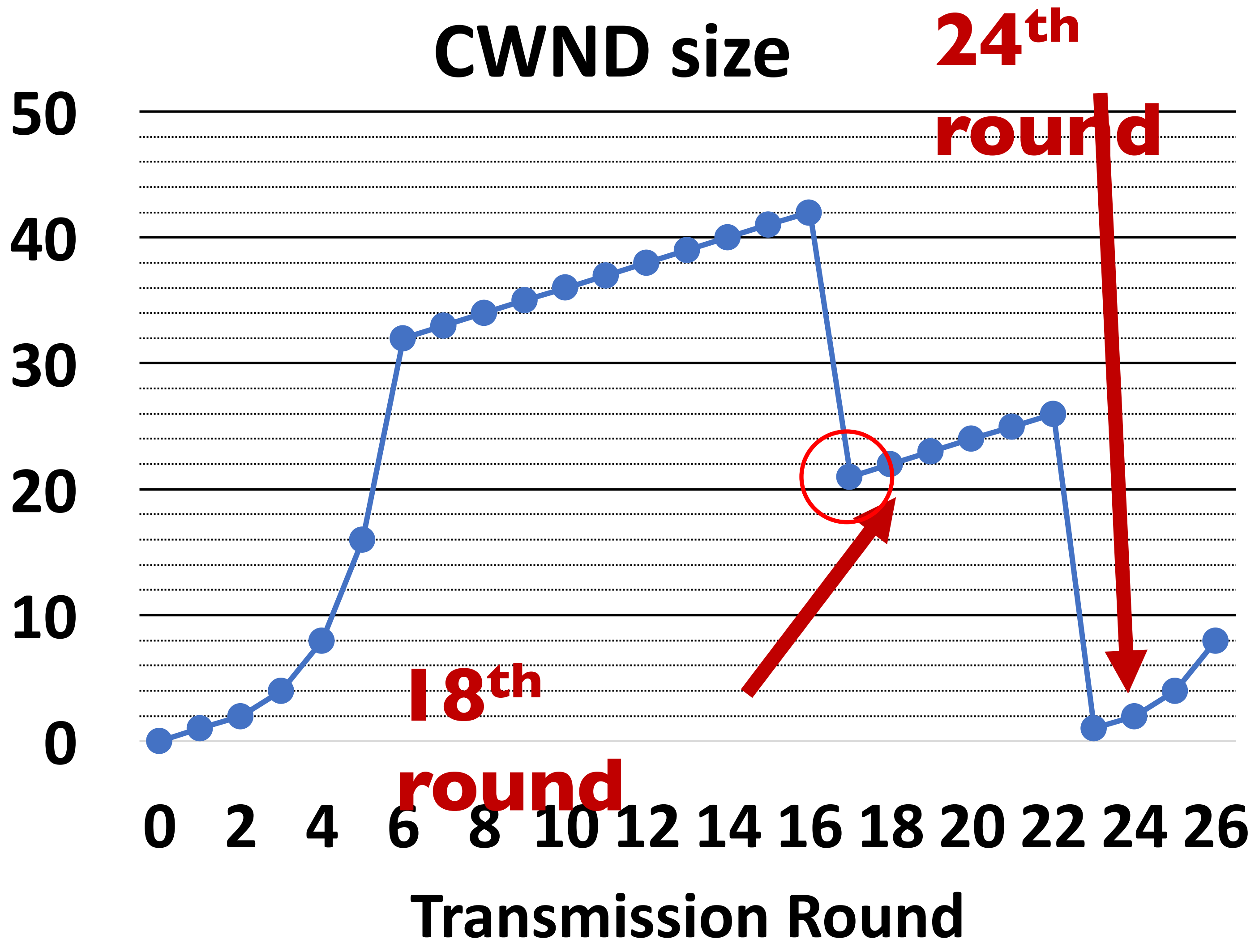
32

ssthresh at 18th round?

21

ssthresh at 24th round?

13



Q2

Consider transferring an enormous file of L bytes from Host A to Host B. Assume an MSS of 536 bytes.

- What is the maximum value of L such that TCP sequence numbers are not exhausted? Recall the TCP sequence number field has 4 bytes.

  2^{32}

- For the L you obtain, find how long it takes to transmit the file. Assume that a total of 66 bytes of transport, network, and data-link header are added to each segment before the resulting packet is sent out over a 155 Mbps link. Ignore flow control and congestion control so A can pump out the segments back to back and contiguously.

  $$(2^{32}+\lceil 2^{32}/536\rceil\times 66)/(155\times\frac{10^6}{8}) = 248.97\ seconds$$

Q3

Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgement whether it receives a segment from Host A.

- In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number? $207, 302, 80$

- If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment, what is the acknowledgement number? 127

Q4

Consider sending a large file from a host to another over a TCP connection that has no loss.

- Suppose TCP uses AIMD for its congestion control without slow start. Assuming CWND increases by 1 MSS every time a batch of ACKs is received and assuming approximately constant round-trip times, how long does it take for CWND to increase from 6 MSS to 12 MSS (assuming no loss events)? $6\ RTT$

- What is the average throughput (in terms of MSS and RTT) for this connection up through time = 6 RTT if CWND initially starts at 5 MSS?

$$\frac{5+6+7+8+9+10}{6} = 7.5\ MSS/RTT$$

Q5

Consider a single TCP Reno connection uses one 10 Mbps link which does not buffer any data. Assume that the TCP sender has a huge file to send to the receiver, and the receiver's receive buffer is much larger than the congestion window.
Assume each TCP segment size is 1500 bytes; the two-way propagation delay is 300 msec; assume the connection starts with congestion avoidance phase (No slow start).

- What is the maximum window size (in segments) that this TCP connection can achieve? $(10\times10^6/8)\times0.3/1500=250$

- How long would it take for this TCP connection to reach its maximum window again after recovering from a packet loss (assume 3 dupACK's received)?

$$\left(\frac{250}{2}\right)\times0.3=37.5\ seconds; For\ TCP\ newReno: \left(\frac{250}{2}-3\right)\times0.3=36.6\ seconds$$