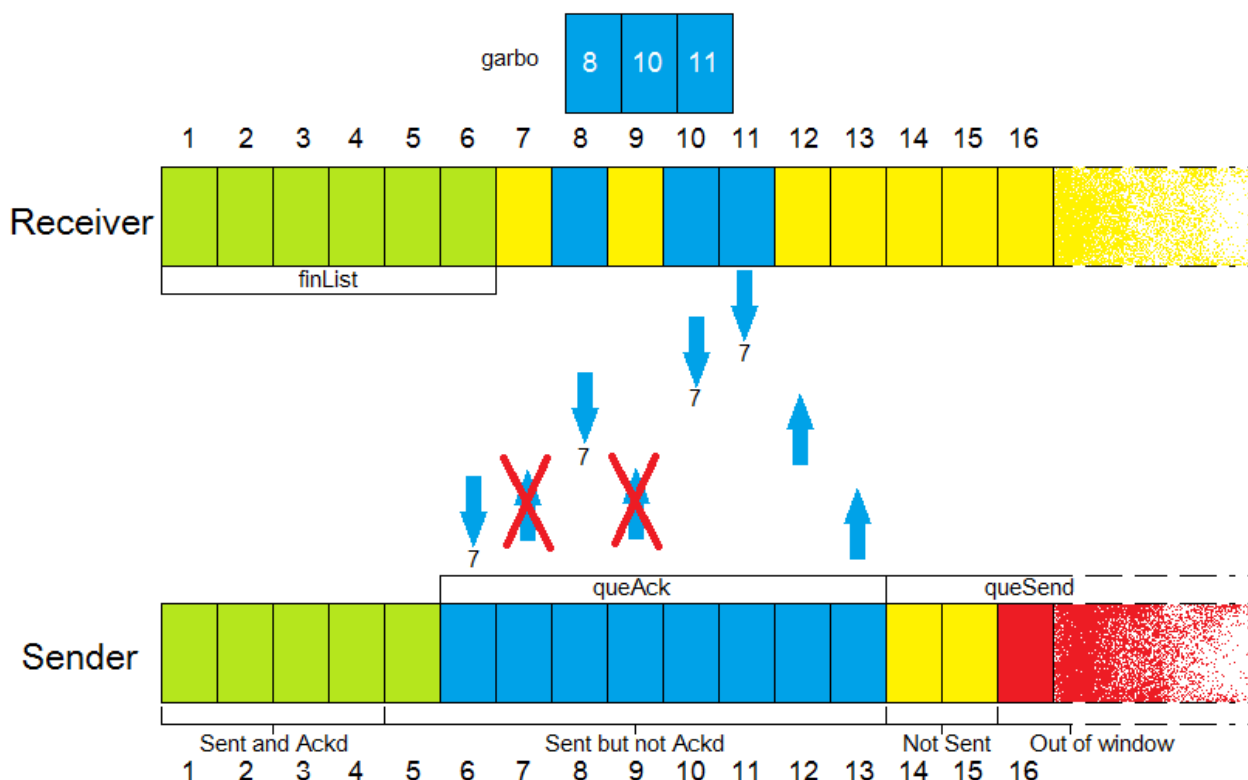


This project was completed using python 2.7.12, but seems to work fine on the uni default (2.7.3). Note that the explanation of how the program works uses packet numbers as segment numbers for readability (and segment numbers are too difficult to do in Microsoft paint). The program uses a byte count for segment and acknowledgement numbers (as you can see in the STP Header section)

The STP protocol has been implemented in five very distinct steps:

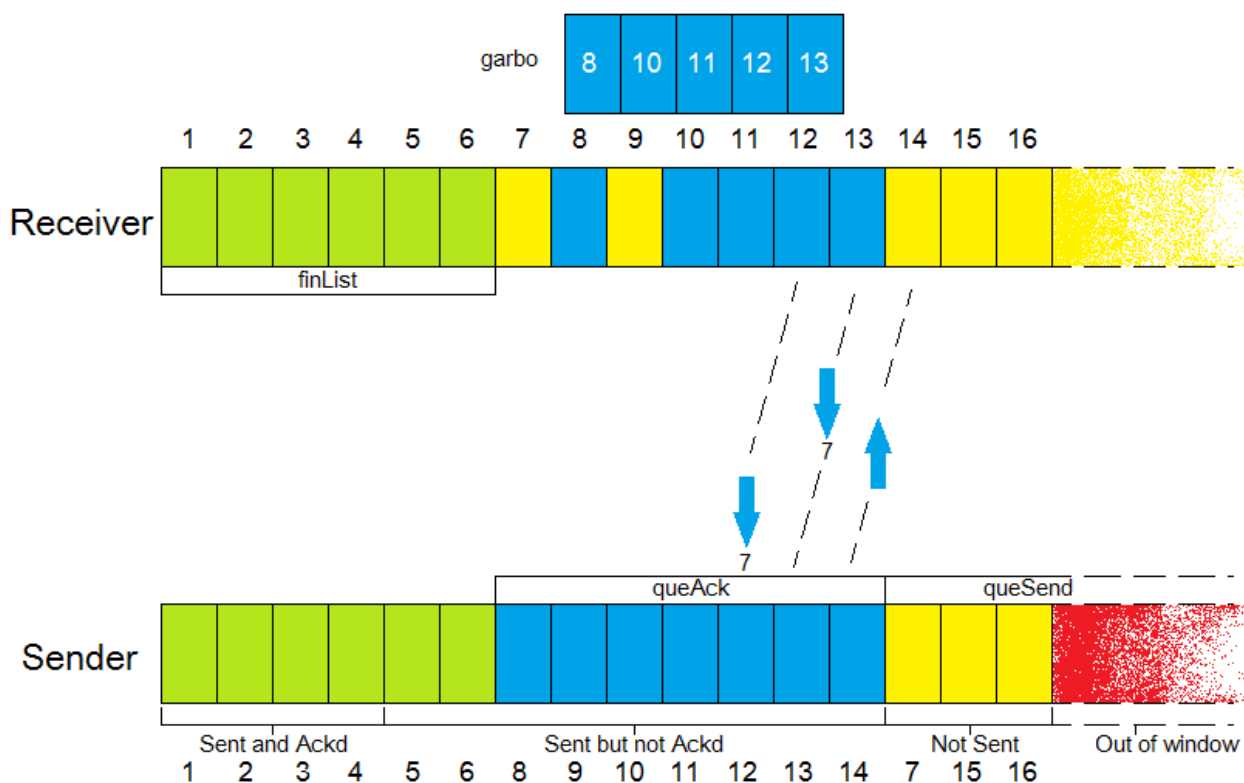
1. The receiver binds itself to the port number it was given and waits for a request. Meanwhile, the Sender takes in its arguments and breaks up the text file (that is to be delivered) into chunks that are all of size MSS (except for the last one, which is likely smaller). These chunks are stored in the packet[] list in a class called dataSeg, where they have 5 fields:
 - num (the order that the dataSeg is in, 0 being the first dataSeg),
 - data (the actual text of the dataSeg),
 - size,
 - timeSent and
 - retrains (a flag used solely for logging purposes)
2. Both the sender and receiver go through the formality of the SYN, SYNACK, and ACK handshake. It is worth noting that there is no error-checking or recovery done at this stage
3. The sender sends its data to the receiver. In ending this step, both programs start step 4.
4. Both sender and receiver go through the formality of the FIN, ACK-FIN, ACK teardown process before closing their sockets. Once again, like step 2, since these packets are guaranteed to make it, no error checking is done.
5. The receiver constructs the output file before both programs make their log file and close.

Obviously, some more information about step 3 is required, but it is hoped that this gives enough of an overview over the other four steps. To handle reading and writing from the same socket, I've opted to go for a solution that involves polling of the socket using the select.select() call. This allows both programs to constantly loop while checking to see whether or not their respective sockets are available for reading or writing. A diagram showing how the windows and dropped packets are handled is below (window size 10):



The sender maintains two double ended queues, queAck and queSend. queAck holds packets that have been sent but not acked, while queSend holds packets that have yet to be sent (regardless of whether or not they are in the window or not). When data transfer starts, queSend is filled with all the packets that the sender needs to send. As packets get sent by the sender, those packets get put into queAck. When those packets are acknowledged, they are dropped from queAck. The sender recognizes that it has finished its job when both queAck and queSend are empty.

The receiver also maintains two lists (not queues), finList and garbo. finList is fairly straightforward; it holds all of the data from the in-order packets it has received from sender. Garbo holds the data and segment number of all of the out-of-order packets. For every packet it receives, it sends out an ACK with the segment number of the next in-order packet it expects. In the previous image, you can see that packets 7 and 9 are not going to make it. Packets 8,10 and 11 are already in garbo (as they have arrived out of order) and it looks like 12 and 13 are also going to end up in garbo, while you can see that receiver is still waiting on packet 7.



When the four ACK packets asking for packet 7 (3 duplicate ACKs) arrive at the sender, the sender performs a fast retransmit and puts packet 7 at the front queSend such that it is the next packet to be sent. While handling the four ACK packets, sender has already sent packet 14 (which will end up in garbo). Notice that because packet 6 has been acknowledged, the window has moved forwards by one packet. Assuming that packet 7 makes it, packet 9 will perform a fast retransmit when packet 17 is acked by the receiver (or it times out). When packet 7 makes it to the receiver, the receiver will add it to finList and look through garbo for packet 8. When it finds packet 8 it will look through garbo for 9. Not finding that, it will then send an ACK for packet 9 in response to packets 7, 15,16 and 17 (as 17 and 18 will have entered the window by then). The size of the window is maintained by the subtracting the last byte acked (6 in this case – because 7 is the next expected one) from the last byte sent (14 in this case). As the window size is 10, the sender will keep transmitting until the window is full.

After the sender has checked its socket to see whether or not it can be written or read from, it then looks through `queAck` and checks the `timeSent` field in each of the `dataSegs` inside `queAck`. If the `timeSent` field is more than `<timeout>` milliseconds ago, it removes that packet from `queAck` and puts it at the front of `queSend` again.

It should be worth noting that if a packet has timed out, it can be fast retransmitted by the sender again (two examples of this actually happen in one of the later questions).

The sender will keep looping until `queAck` and `queSend` are both empty, whereupon it will send a FIN segment and loop while waiting for a FINACK response from the receiver. The receiver will keep looping until it receives a FIN segment from the sender, whereupon it will send a FINACK in response and prepare to finish connection teardown.

Features implemented:

All of the features detailed in the assignment specification for both the Sender and the Receiver have been implemented. In more detail, this means:

- A three-way handshake is used to establish a connection. It does not recover if the handshake is interrupted by anything, but that feature is not required
- A four-segment connection termination. This is done in three stages (FIN, ACK-FIN, ACK), again because these packets were guaranteed and we were allowed to do so. This occasionally gets broken up by some ACK segments for duplicate packets that the sender has already realized that it doesn't need to wait for. An example would involve the sender timing out on some packets and sending out the last 3 packets again just as the receiver replies with an ACK for everything. The sender will then send a FIN segment but the receiver will still send three more ACKs before seeing the FIN segment and replying with ACK-FIN
- Timeout operations are conducted using a universal timer (`time.time()`), timing out based on the supplied argument
- The simplified TCP sender is implemented where each segment is the same size as MSS (with the usual exception of the final segment) and labelled accordingly with the correct sequence number
- Fast retransmits are implemented. A packet will only be retransmitted once unless the retransmitted packet also times out, upon which that packet becomes re-eligible for fast retransmit again.
- All packets are immediately acknowledged with cumulative acknowledgements
- Out-of-order packets are all buffered and put into their correct place once the in-order packet is received
- Sequence and acknowledgement numbers are in the STP header and byte-encoded, following a system that is similar to TCP (using 16-bit numbers instead of 32-bit numbers)
- Both sequence and acknowledgement numbers will properly overflow back to 0 if they go above $2^{16}-1$.
- Segment and acknowledgement numbers will increment by 1 during the handshake process
- MSS and MWS restrictions are followed (program sets internal maximum of 20000 for both variables)
- MWS is implemented by following the invariant that $LastByteSent - LastByteAcked \leq MWS$
- The PLD module is implemented by an if statement just before the packet is sent. If the randomly generated number is more than `pdrop`, then the packet is sent. Otherwise, it is not sent, but the program assumes it has been sent.
- Logs are supplied after the completion of a file upload
- The receiver will put the transferred file into the filename given to it in the program arguments

STP Header

Just before a packet is sent, a 5 byte header is tacked onto the front of it using the `packHeader(SYN,ACK,FIN,segNum,ackNum)` function. When a packet is received, the first 5 bytes are broken back up into their individual pieces using the `unpackHeader(header)` function. The header is as follows:

- Byte 1: 5x0 (padding bits), SYN, ACK, FIN e.g. 00000110 is SYN+ACK
- Byte 2-3: 16-bit Segment number (first byte sent) e.g. if 500 bytes of data have currently been sent and a 50 byte packet is sent, the segment number of that packet is 500 and segment number of the next packet is 550
- Byte 4-5: 16-bit ACK number (next in-order byte expected) e.g. if 500 bytes of data have already been sent and the sender sends a 50 byte packet (segment number 500) the receiver will respond with an ACK number of 550, which is the segment number of the next expected packet from the sender.

0	0	0	0	0	SYN	ACK	FIN
16-bit Segment number (first byte sent)							
16-bit ACK number (next byte expected)							

Program testing

For testing my program, I chose a timeout of 10ms, seeing as picking very low values resulted in a transmission speed that was slightly slower (about 5ms) but making it higher caused the sender to spend too much time idling. Picking a nice round number also makes looking through the logs a lot easier as spotting timeouts is fairly trivial.

Running the previous experiment (pdrop = .1 & .3, MWS = 500, MSS = 50, seed = 300, timeout = 10ms) on test1.txt, I observed these packets at the receiver:

I have marked out duplicate packets in **yellow highlighting**, fast retransmitted packets in green and retransmitted packets due to timeout in blue. Packets that had to be sent more than twice are in red (for various reasons that will be explored in further detail). When you see two entries in bold, it means that packets have dropped between them.

When pdrop was equal to 0.1 transmission went very smoothly (as one would expect). Dropped packets tended to be spaced out far enough away from each other such that they could be picked up by fast retransmits.

When pdrop was raised to 0.3, things got a little trickier. A much larger number of packets dropped and we also saw 2 packets getting resent more than 2 times (the ones coloured red). A quick rundown of exactly what happened to those two is below.

39619 – drop, timeout (drop), fast retransmit

40319 – drop, timeout (drop), fast retransmit

pdrop = .1		pdrop = .3	
time	seq	time	seq
0	39168	0	39168
0	39169	0.001	39169
0.001	39169	0.002	39169
0.001	39269	0.002	39269
0.001	39319	0.002	39319
0.001	39369	0.002	39369
0.001	39419	0.002	39419
0.001	39469	0.002	39519
0.001	39519	0.002	39219
0.001	39569	0.003	39719
0.001	39619	0.003	39769
0.001	39219	0.003	39819
0.002	39719	0.003	39869
0.002	39769	0.003	39919
0.002	39819	0.003	39469
0.002	39869	0.003	40019
0.002	39919	0.003	40069
0.002	39669	0.013	39569
0.002	39969	0.013	39669

Both of the packets that got dropped three times got dropped when they timed out (they could not have been fast retransmitted because another fast retransmit had occurred too recently – see packets 39469 and 40269), but got fast retransmitted after they timed out.

It is interesting that in this case none of the fast retransmits dropped (in other runs on older versions of the code a packet had to be resent 3 times), but the sender does have the capability to handle any combination of drops during fast retransmit or timeout retransmissions.

Of course, some of the fast retransmits still worked just fine (packets 39219, 39469, 40269) and once again the timeout at the end was caused by a lack of available duplicate ACKS for the sender to make a fast retransmit.

0.002	40019	0.013	40169
0.002	40069	0.014	39719
0.002	40119	0.014	39769
0.002	40169	0.014	39819
0.002	40269	0.014	39869
0.002	40319	0.014	39619
0.002	40369	0.014	39969
0.002	40419	0.014	40019
0.002	40469	0.014	40069
0.002	40219	0.014	40119
0.002	40519	0.014	40219
0.002	40619	0.014	40369
0.002	40669	0.014	40419
0.003	40719	0.014	40469
0.003	40569	0.015	40569
0.003	40760	0.015	40269
		0.015	40669
		0.015	40719
		0.025	40369
		0.025	40419
		0.025	40469
		0.025	40319
		0.026	40519
		0.026	40619
		0.026	40719
		0.026	40760

Finally, I ran 3 experiments with pdrop 0.1, MWS = 500, MSS = 50, seed = 300 and timeout values set at 10, 40, 2.5 and 1ms using test2.txt, giving me a table:

Timeout (ms)	No. of transmitted packets	Time taken
10	44	2ms
40	44	2ms
2.5	44	3ms
1	46	3ms

Note that I do not include the time it took for the handshake since that isn't affected by the timeout. They also do not count in the number of transmitted packets since again, they aren't affected by the timeout. That being said, a timeout did not happen for the given values of $T_{current}$, $4T_{current}$ and $T_{current}/4$ (all 4 dropped packets were being fast retransmitted before they could be timed out), so I feel as though the time taken measurement is mostly down to the speed at which my computer could handle the data transfer. To see what would happen if timeouts did occur, I also tested a timeout of 1 millisecond. This DID result in a few timeouts and is reflected in the higher number of retransmitted packets. I would theorise that at higher pdrop values a value between 10 and 2.5ms would be optimal such that fast retransmits would still have time to execute so that timeouts don't send duplicate packets, but the timeout would not be too high such that the sender spends too long waiting idly for its packets to time out.

APPENDIX

Sending test1.txt with mss = 50, mws = 500, timeout = 10ms, pdrop = .1, seed = 300

Sender_log

Action	time	type	seq	size	ack
snd	0.0	S	39168	0	0
rcv	0.001	SA	6186	0	39168
snd	0.001	A	39169	0	6186
rcv	0.001	A	6187	0	39169
snd	0.002	D	39169	50	6187
drop	0.002	D	39219	50	6187
snd	0.002	D	39269	50	6187
snd	0.002	D	39319	50	6187
snd	0.002	D	39369	50	6187
snd	0.002	D	39419	50	6187
snd	0.002	D	39469	50	6187
rcv	0.002	A	6187	0	39219
snd	0.002	D	39519	50	6187
rcv	0.002	A	6187	0	39219
snd	0.002	D	39569	50	6187
rcv	0.002	A	6187	0	39219
snd	0.002	D	39619	50	6187
rcv	0.002	A	6187	0	39219
snd	0.002	D	39219	50	6187
rcv	0.002	A	6187	0	39219
drop	0.002	D	39669	50	6187
rcv	0.002	A	6187	0	39219
snd	0.002	D	39719	50	6187
rcv	0.002	A	6187	0	39219
snd	0.003	D	39769	50	6187
rcv	0.003	A	6187	0	39219
rcv	0.003	A	6187	0	39219
rcv	0.003	A	6187	0	39669
snd	0.003	D	39819	50	6187
rcv	0.003	A	6187	0	39669
snd	0.003	D	39869	50	6187
rcv	0.003	A	6187	0	39669
snd	0.003	D	39919	50	6187
rcv	0.003	A	6187	0	39669
snd	0.003	D	39669	50	6187
rcv	0.003	A	6187	0	39669
snd	0.003	D	39969	50	6187
rcv	0.003	A	6187	0	39669
snd	0.003	D	40019	50	6187
snd	0.003	D	40069	50	6187
rcv	0.003	A	6187	0	39969
snd	0.003	D	40119	50	6187
rcv	0.003	A	6187	0	40019
snd	0.003	D	40169	50	6187
rcv	0.003	A	6187	0	40069
drop	0.003	D	40219	50	6187
rcv	0.003	A	6187	0	40119

snd	0.003	D	40269	50	6187
rcv	0.003	A	6187	0	40169
snd	0.003	D	40319	50	6187
rcv	0.003	A	6187	0	40219
snd	0.003	D	40369	50	6187
rcv	0.003	A	6187	0	40219
snd	0.003	D	40419	50	6187
rcv	0.003	A	6187	0	40219
snd	0.003	D	40469	50	6187
rcv	0.003	A	6187	0	40219
snd	0.003	D	40219	50	6187
rcv	0.003	A	6187	0	40219
snd	0.003	D	40519	50	6187
rcv	0.003	A	6187	0	40219
drop	0.003	D	40569	50	6187
rcv	0.003	A	6187	0	40519
snd	0.003	D	40619	50	6187
rcv	0.003	A	6187	0	40569
snd	0.003	D	40669	50	6187
snd	0.003	D	40719	41	6187
rcv	0.003	A	6187	0	40569
rcv	0.004	A	6187	0	40569
rcv	0.004	A	6187	0	40569
snd	0.004	D	40569	50	6187
rcv	0.004	A	6187	0	40760
snd	0.004	F	40760	0	6187
rcv	0.005	A	6187	0	40760
rcv	0.005	FA	6187	0	40760
snd	0.008	A	40761	0	6187

Amount of (original) Data Transferred (in bytes): 1591

Number of Data Segments Sent (excluding retransmissions): 32

Number of (all) Packets Dropped (by the PLD module): 4

Number of Retransmitted Segments: 4

Number of Duplicate Acknowledgements received: 22

Receiver_log

Action	time	type	seq	size	ack
rcv	0.0	S	39168	0	0
snd	0.0	SA	6186	0	39168
rcv	0.0	A	39169	0	6186
snd	0.0	A	6187	0	39169
rcv	0.001	D	39169	50	6187
snd	0.001	A	6187	0	39219
rcv	0.001	D	39269	50	6187
snd	0.001	A	6187	0	39219
rcv	0.001	D	39319	50	6187
snd	0.001	A	6187	0	39219
rcv	0.001	D	39369	50	6187
snd	0.001	A	6187	0	39219
rcv	0.001	D	39419	50	6187
snd	0.001	A	6187	0	39219

rcv	0.001	D	39469	50	6187
snd	0.001	A	6187	0	39219
rcv	0.001	D	39519	50	6187
snd	0.001	A	6187	0	39219
rcv	0.001	D	39569	50	6187
snd	0.001	A	6187	0	39219
rcv	0.001	D	39619	50	6187
snd	0.001	A	6187	0	39219
rcv	0.001	D	39219	50	6187
snd	0.001	A	6187	0	39669
rcv	0.002	D	39719	50	6187
snd	0.002	A	6187	0	39669
rcv	0.002	D	39769	50	6187
snd	0.002	A	6187	0	39669
rcv	0.002	D	39819	50	6187
snd	0.002	A	6187	0	39669
rcv	0.002	D	39869	50	6187
snd	0.002	A	6187	0	39669
rcv	0.002	D	39919	50	6187
snd	0.002	A	6187	0	39669
rcv	0.002	D	39669	50	6187
snd	0.002	A	6187	0	39969
rcv	0.002	D	39969	50	6187
snd	0.002	A	6187	0	40019
rcv	0.002	D	40019	50	6187
snd	0.002	A	6187	0	40069
rcv	0.002	D	40069	50	6187
snd	0.002	A	6187	0	40119
rcv	0.002	D	40119	50	6187
snd	0.002	A	6187	0	40169
rcv	0.002	D	40169	50	6187
snd	0.002	A	6187	0	40219
rcv	0.002	D	40269	50	6187
snd	0.002	A	6187	0	40219
rcv	0.002	D	40319	50	6187
snd	0.002	A	6187	0	40219
rcv	0.002	D	40369	50	6187
snd	0.002	A	6187	0	40219
rcv	0.002	D	40419	50	6187
snd	0.002	A	6187	0	40219
rcv	0.002	D	40469	50	6187
snd	0.002	A	6187	0	40219
rcv	0.002	D	40219	50	6187
snd	0.002	A	6187	0	40519
rcv	0.002	D	40519	50	6187
snd	0.002	A	6187	0	40569
rcv	0.002	D	40619	50	6187
snd	0.002	A	6187	0	40569
rcv	0.002	D	40669	50	6187
snd	0.002	A	6187	0	40569
rcv	0.003	D	40719	41	6187

snd	0.003	A	6187	0	40569
rcv	0.003	D	40569	50	6187
snd	0.003	A	6187	0	40760
rcv	0.003	F	40760	0	6187
snd	0.004	FA	6187	0	40760

Amount of (original) Data Received (in bytes): 1591

Number of (original) Data Segments Received: 32

Number of duplicate segments received (if any): 0

Sending test1.txt with mss = 50, mws = 500, timeout = 10ms, pdrop = .3, seed = 300

Sender_log

Action	time	type	seq	size	ack
snd	0.0	S	39168	0	0
rcv	0.001	SA	22956	0	39168
snd	0.001	A	39169	0	22956
rcv	0.001	A	22957	0	39169
snd	0.002	D	39169	50	22957
drop	0.002	D	39219	50	22957
snd	0.002	D	39269	50	22957
snd	0.002	D	39319	50	22957
snd	0.002	D	39369	50	22957
rcv	0.002	A	22957	0	39219
snd	0.002	D	39419	50	22957
rcv	0.002	A	22957	0	39219
drop	0.002	D	39469	50	22957
rcv	0.002	A	22957	0	39219
snd	0.002	D	39519	50	22957
rcv	0.002	A	22957	0	39219
snd	0.002	D	39219	50	22957
rcv	0.002	A	22957	0	39219
drop	0.002	D	39569	50	22957
rcv	0.002	A	22957	0	39219
drop	0.002	D	39619	50	22957
drop	0.002	D	39669	50	22957
rcv	0.002	A	22957	0	39469
snd	0.003	D	39719	50	22957
snd	0.003	D	39769	50	22957
snd	0.003	D	39819	50	22957
snd	0.003	D	39869	50	22957
rcv	0.003	A	22957	0	39469
snd	0.003	D	39919	50	22957
rcv	0.003	A	22957	0	39469
drop	0.003	D	39969	50	22957
rcv	0.003	A	22957	0	39469
snd	0.003	D	39469	50	22957
rcv	0.003	A	22957	0	39469
snd	0.003	D	40019	50	22957
rcv	0.003	A	22957	0	39469
rcv	0.003	A	22957	0	39569
snd	0.003	D	40069	50	22957
rcv	0.003	A	22957	0	39569

drop	0.003	D	40119	50	22957
rcv	0.003	A	22957	0	39569
snd	0.013	D	39569	50	22957
drop	0.013	D	39619	50	22957
snd	0.013	D	39669	50	22957
rcv	0.013	A	22957	0	39619
snd	0.013	D	40169	50	22957
rcv	0.013	A	22957	0	39619
rcv	0.013	A	22957	0	39619
snd	0.014	D	39719	50	22957
snd	0.014	D	39769	50	22957
snd	0.014	D	39819	50	22957
snd	0.014	D	39869	50	22957
rcv	0.014	A	22957	0	39619
snd	0.014	D	39619	50	22957
drop	0.014	D	39919	50	22957
rcv	0.014	A	22957	0	39619
snd	0.014	D	39969	50	22957
rcv	0.014	A	22957	0	39619
snd	0.014	D	40019	50	22957
snd	0.014	D	40069	50	22957
rcv	0.014	A	22957	0	39619
snd	0.014	D	40119	50	22957
rcv	0.014	A	22957	0	39969
snd	0.014	D	40219	50	22957
rcv	0.014	A	22957	0	40119
drop	0.014	D	40269	50	22957
rcv	0.014	A	22957	0	40119
drop	0.014	D	40319	50	22957
rcv	0.014	A	22957	0	40119
snd	0.014	D	40369	50	22957
rcv	0.014	A	22957	0	40219
snd	0.014	D	40419	50	22957
rcv	0.014	A	22957	0	40269
snd	0.014	D	40469	50	22957
rcv	0.014	A	22957	0	40269
drop	0.015	D	40519	50	22957
rcv	0.015	A	22957	0	40269
snd	0.015	D	40569	50	22957
rcv	0.015	A	22957	0	40269
snd	0.015	D	40269	50	22957
drop	0.015	D	40619	50	22957
rcv	0.015	A	22957	0	40269
snd	0.015	D	40669	50	22957
snd	0.015	D	40719	41	22957
rcv	0.015	A	22957	0	40319
rcv	0.015	A	22957	0	40319
rcv	0.015	A	22957	0	40319
drop	0.025	D	40319	50	22957
snd	0.025	D	40369	50	22957
snd	0.025	D	40419	50	22957

snd	0.025	D	40469	50	22957
rcv	0.025	A	22957	0	40319
snd	0.025	D	40319	50	22957
rcv	0.025	A	22957	0	40319
rcv	0.025	A	22957	0	40319
rcv	0.025	A	22957	0	40519
snd	0.026	D	40519	50	22957
drop	0.026	D	40569	50	22957
snd	0.026	D	40619	50	22957
drop	0.026	D	40669	50	22957
snd	0.026	D	40719	41	22957
rcv	0.026	A	22957	0	40619
rcv	0.026	A	22957	0	40760
snd	0.026	F	40760	0	22957
rcv	0.028	A	22957	0	40760
rcv	0.028	A	22957	0	40760
rcv	0.028	FA	22957	0	40760
snd	0.031	A	40761	0	22957

Amount of (original) Data Transferred (in bytes): 1591

Number of Data Segments Sent (excluding retransmissions): 32

Number of (all) Packets Dropped (by the PLD module): 16

Number of Retransmitted Segments: 21

Number of Duplicate Acknowledgements received: 31

Receiver_log

Action	time	type	seq	size	ack
rcv	0.0	S	39168	0	0
snd	0.001	SA	22956	0	39168
rcv	0.001	A	39169	0	22956
snd	0.001	A	22957	0	39169
rcv	0.002	D	39169	50	22957
snd	0.002	A	22957	0	39219
rcv	0.002	D	39269	50	22957
snd	0.002	A	22957	0	39219
rcv	0.002	D	39319	50	22957
snd	0.002	A	22957	0	39219
rcv	0.002	D	39369	50	22957
snd	0.002	A	22957	0	39219
rcv	0.002	D	39419	50	22957
snd	0.002	A	22957	0	39219
rcv	0.002	D	39519	50	22957
snd	0.002	A	22957	0	39219
rcv	0.002	D	39219	50	22957
snd	0.002	A	22957	0	39469
rcv	0.003	D	39719	50	22957
snd	0.003	A	22957	0	39469
rcv	0.003	D	39769	50	22957
snd	0.003	A	22957	0	39469
rcv	0.003	D	39819	50	22957
snd	0.003	A	22957	0	39469

rcv	0.003	D	39869	50	22957
snd	0.003	A	22957	0	39469
rcv	0.003	D	39919	50	22957
snd	0.003	A	22957	0	39469
rcv	0.003	D	39469	50	22957
snd	0.003	A	22957	0	39569
rcv	0.003	D	40019	50	22957
snd	0.003	A	22957	0	39569
rcv	0.003	D	40069	50	22957
snd	0.003	A	22957	0	39569
rcv	0.013	D	39569	50	22957
snd	0.013	A	22957	0	39619
rcv	0.013	D	39669	50	22957
snd	0.013	A	22957	0	39619
rcv	0.013	D	40169	50	22957
snd	0.013	A	22957	0	39619
rcv	0.014	D	39719	50	22957
snd	0.014	A	22957	0	39619
rcv	0.014	D	39769	50	22957
snd	0.014	A	22957	0	39619
rcv	0.014	D	39819	50	22957
snd	0.014	A	22957	0	39619
rcv	0.014	D	39869	50	22957
snd	0.014	A	22957	0	39619
rcv	0.014	D	39619	50	22957
snd	0.014	A	22957	0	39969
rcv	0.014	D	39969	50	22957
snd	0.014	A	22957	0	40119
rcv	0.014	D	40019	50	22957
snd	0.014	A	22957	0	40119
rcv	0.014	D	40069	50	22957
snd	0.014	A	22957	0	40119
rcv	0.014	D	40119	50	22957
snd	0.014	A	22957	0	40219
rcv	0.014	D	40219	50	22957
snd	0.014	A	22957	0	40269
rcv	0.014	D	40369	50	22957
snd	0.014	A	22957	0	40269
rcv	0.014	D	40419	50	22957
snd	0.014	A	22957	0	40269
rcv	0.014	D	40469	50	22957
snd	0.014	A	22957	0	40269
rcv	0.015	D	40569	50	22957
snd	0.015	A	22957	0	40269
rcv	0.015	D	40269	50	22957
snd	0.015	A	22957	0	40319
rcv	0.015	D	40669	50	22957
snd	0.015	A	22957	0	40319
rcv	0.015	D	40719	41	22957
snd	0.015	A	22957	0	40319
rcv	0.025	D	40369	50	22957

snd	0.025	A	22957	0	40319
rcv	0.025	D	40419	50	22957
snd	0.025	A	22957	0	40319
rcv	0.025	D	40469	50	22957
snd	0.025	A	22957	0	40319
rcv	0.025	D	40319	50	22957
snd	0.025	A	22957	0	40519
rcv	0.026	D	40519	50	22957
snd	0.026	A	22957	0	40619
rcv	0.026	D	40619	50	22957
snd	0.026	A	22957	0	40760
rcv	0.026	D	40719	41	22957
snd	0.026	A	22957	0	40760
rcv	0.026	F	40760	0	22957
snd	0.028	FA	22957	0	40760

Amount of (original) Data Received (in bytes): 1591

Number of (original) Data Segments Received: 32

Number of duplicate segments received (if any): 10

Sending test2.txt with mss = 50, mws = 500, timeout = 10ms, pdrop = .1, seed = 300

Sender_log

Action	time	type	seq	size	ack
snd	0.0	S	39168	0	0
rcv	0.0	SA	55845	0	39168
snd	0.0	A	39169	0	55845
rcv	0.001	A	55846	0	39169
snd	0.002	D	39169	50	55846
drop	0.002	D	39219	50	55846
snd	0.002	D	39269	50	55846
snd	0.002	D	39319	50	55846
snd	0.002	D	39369	50	55846
snd	0.002	D	39419	50	55846
rcv	0.002	A	55846	0	39219
snd	0.002	D	39469	50	55846
rcv	0.002	A	55846	0	39219
snd	0.002	D	39519	50	55846
rcv	0.002	A	55846	0	39219
snd	0.002	D	39569	50	55846
rcv	0.002	A	55846	0	39219
snd	0.002	D	39219	50	55846
rcv	0.002	A	55846	0	39219
snd	0.002	D	39619	50	55846
rcv	0.002	A	55846	0	39219
drop	0.002	D	39669	50	55846
rcv	0.002	A	55846	0	39219
snd	0.002	D	39719	50	55846
rcv	0.002	A	55846	0	39219
snd	0.002	D	39769	50	55846
rcv	0.002	A	55846	0	39619
snd	0.003	D	39819	50	55846
rcv	0.003	A	55846	0	39669

snd	0.003	D	39869	50	55846
rcv	0.003	A	55846	0	39669
snd	0.003	D	39919	50	55846
rcv	0.003	A	55846	0	39669
snd	0.003	D	39969	50	55846
rcv	0.003	A	55846	0	39669
snd	0.003	D	39669	50	55846
rcv	0.003	A	55846	0	39669
snd	0.003	D	40019	50	55846
rcv	0.003	A	55846	0	39669
snd	0.003	D	40069	50	55846
rcv	0.003	A	55846	0	39669
snd	0.003	D	40119	50	55846
rcv	0.003	A	55846	0	40019
snd	0.003	D	40169	50	55846
rcv	0.003	A	55846	0	40069
drop	0.003	D	40219	50	55846
rcv	0.003	A	55846	0	40119
snd	0.003	D	40269	50	55846
rcv	0.003	A	55846	0	40169
snd	0.003	D	40319	50	55846
rcv	0.003	A	55846	0	40219
snd	0.003	D	40369	50	55846
rcv	0.003	A	55846	0	40219
snd	0.003	D	40419	50	55846
rcv	0.003	A	55846	0	40219
snd	0.003	D	40469	50	55846
rcv	0.003	A	55846	0	40219
snd	0.003	D	40219	50	55846
rcv	0.003	A	55846	0	40219
snd	0.003	D	40519	50	55846
rcv	0.003	A	55846	0	40219
drop	0.003	D	40569	50	55846
rcv	0.003	A	55846	0	40519
snd	0.003	D	40619	50	55846
rcv	0.003	A	55846	0	40569
snd	0.003	D	40669	50	55846
snd	0.003	D	40719	50	55846
rcv	0.003	A	55846	0	40569
snd	0.003	D	40769	50	55846
rcv	0.004	A	55846	0	40569
snd	0.004	D	40819	50	55846
rcv	0.004	A	55846	0	40569
snd	0.004	D	40569	50	55846
rcv	0.004	A	55846	0	40569
snd	0.004	D	40869	50	55846
rcv	0.004	A	55846	0	40569
snd	0.004	D	40919	50	55846
snd	0.004	D	40969	50	55846
rcv	0.004	A	55846	0	40869
snd	0.004	D	41019	50	55846

rcv	0.004	A	55846	0	40919
snd	0.004	D	41069	50	55846
rcv	0.004	A	55846	0	40969
snd	0.004	D	41119	4	55846
rcv	0.004	A	55846	0	41019
rcv	0.004	A	55846	0	41069
rcv	0.004	A	55846	0	41119
rcv	0.004	A	55846	0	41123
snd	0.004	F	41123	0	55846
rcv	0.006	A	55846	0	41123
rcv	0.006	FA	55846	0	41123
snd	0.008	A	41124	0	55846

Amount of (original) Data Transferred (in bytes): 1954

Number of Data Segments Sent (excluding retransmissions): 40

Number of (all) Packets Dropped (by the PLD module): 4

Number of Retransmitted Segments: 4

Number of Duplicate Acknowledgements received: 24

Receiver_log

Action	time	type	seq	size	ack
rcv	0.0	S	39168	0	0
snd	0.0	SA	55845	0	39168
rcv	0.0	A	39169	0	55845
snd	0.001	A	55846	0	39169
rcv	0.002	D	39169	50	55846
snd	0.002	A	55846	0	39219
rcv	0.002	D	39269	50	55846
snd	0.002	A	55846	0	39219
rcv	0.002	D	39319	50	55846
snd	0.002	A	55846	0	39219
rcv	0.002	D	39369	50	55846
snd	0.002	A	55846	0	39219
rcv	0.002	D	39419	50	55846
snd	0.002	A	55846	0	39219
rcv	0.002	D	39469	50	55846
snd	0.002	A	55846	0	39219
rcv	0.002	D	39519	50	55846
snd	0.002	A	55846	0	39219
rcv	0.002	D	39569	50	55846
snd	0.002	A	55846	0	39219
rcv	0.002	D	39219	50	55846
snd	0.002	A	55846	0	39619
rcv	0.002	D	39619	50	55846
snd	0.002	A	55846	0	39669
rcv	0.002	D	39719	50	55846
snd	0.002	A	55846	0	39669
rcv	0.002	D	39769	50	55846
snd	0.002	A	55846	0	39669
rcv	0.003	D	39819	50	55846
snd	0.003	A	55846	0	39669
rcv	0.003	D	39869	50	55846

snd	0.003	A	55846	0	39669
rcv	0.003	D	39919	50	55846
snd	0.003	A	55846	0	39669
rcv	0.003	D	39969	50	55846
snd	0.003	A	55846	0	39669
rcv	0.003	D	39669	50	55846
snd	0.003	A	55846	0	40019
rcv	0.003	D	40019	50	55846
snd	0.003	A	55846	0	40069
rcv	0.003	D	40069	50	55846
snd	0.003	A	55846	0	40119
rcv	0.003	D	40119	50	55846
snd	0.003	A	55846	0	40169
rcv	0.003	D	40169	50	55846
snd	0.003	A	55846	0	40219
rcv	0.003	D	40269	50	55846
snd	0.003	A	55846	0	40219
rcv	0.003	D	40319	50	55846
snd	0.003	A	55846	0	40219
rcv	0.003	D	40369	50	55846
snd	0.003	A	55846	0	40219
rcv	0.003	D	40419	50	55846
snd	0.003	A	55846	0	40219
rcv	0.003	D	40469	50	55846
snd	0.003	A	55846	0	40219
rcv	0.003	D	40219	50	55846
snd	0.003	A	55846	0	40519
rcv	0.003	D	40519	50	55846
snd	0.003	A	55846	0	40569
rcv	0.003	D	40619	50	55846
snd	0.003	A	55846	0	40569
rcv	0.003	D	40669	50	55846
snd	0.003	A	55846	0	40569
rcv	0.003	D	40719	50	55846
snd	0.004	A	55846	0	40569
rcv	0.004	D	40769	50	55846
snd	0.004	A	55846	0	40569
rcv	0.004	D	40819	50	55846
snd	0.004	A	55846	0	40569
rcv	0.004	D	40569	50	55846
snd	0.004	A	55846	0	40869
rcv	0.004	D	40869	50	55846
snd	0.004	A	55846	0	40919
rcv	0.004	D	40919	50	55846
snd	0.004	A	55846	0	40969
rcv	0.004	D	40969	50	55846
snd	0.004	A	55846	0	41019
rcv	0.004	D	41019	50	55846
snd	0.004	A	55846	0	41069
rcv	0.004	D	41069	50	55846
snd	0.004	A	55846	0	41119


```
rcv    0.004  D      41119  4      55846
snd    0.004  A      55846  0      41123
rcv    0.004  F      41123  0      55846
snd    0.006  FA     55846  0      41123
```

Amount of (original) Data Received (in bytes): 1954

Number of (original) Data Segments Received: 40

Number of duplicate segments received (if any): 0

Sending test2.txt with mss = 50, mws = 500, timeout = 40ms, pdrop = .1, seed = 300

Sender_log

Action	time	type	seq	size	ack
snd	0.0	S	39168	0	0
rcv	0.0	SA	56354	0	39168
snd	0.0	A	39169	0	56354
rcv	0.001	A	56355	0	39169
snd	0.002	D	39169	50	56355
drop	0.002	D	39219	50	56355
snd	0.002	D	39269	50	56355
snd	0.002	D	39319	50	56355
snd	0.002	D	39369	50	56355
rcv	0.002	A	56355	0	39219
snd	0.002	D	39419	50	56355
rcv	0.002	A	56355	0	39219
snd	0.002	D	39469	50	56355
rcv	0.002	A	56355	0	39219
snd	0.002	D	39519	50	56355
rcv	0.002	A	56355	0	39219
snd	0.002	D	39219	50	56355
rcv	0.002	A	56355	0	39219
snd	0.002	D	39569	50	56355
rcv	0.002	A	56355	0	39219
snd	0.002	D	39619	50	56355
rcv	0.002	A	56355	0	39219
drop	0.002	D	39669	50	56355
rcv	0.002	A	56355	0	39569
snd	0.002	D	39719	50	56355
rcv	0.002	A	56355	0	39619
snd	0.002	D	39769	50	56355
rcv	0.003	A	56355	0	39669
snd	0.003	D	39819	50	56355
rcv	0.003	A	56355	0	39669
snd	0.003	D	39869	50	56355
rcv	0.003	A	56355	0	39669
snd	0.003	D	39919	50	56355
rcv	0.003	A	56355	0	39669
snd	0.003	D	39669	50	56355
rcv	0.003	A	56355	0	39669
snd	0.003	D	39969	50	56355
rcv	0.003	A	56355	0	39669
snd	0.003	D	40019	50	56355
snd	0.003	D	40069	50	56355

rcv	0.003	A	56355	0	39969
snd	0.003	D	40119	50	56355
rcv	0.003	A	56355	0	40019
snd	0.003	D	40169	50	56355
rcv	0.003	A	56355	0	40069
drop	0.003	D	40219	50	56355
rcv	0.003	A	56355	0	40119
snd	0.003	D	40269	50	56355
rcv	0.003	A	56355	0	40169
snd	0.003	D	40319	50	56355
rcv	0.003	A	56355	0	40219
snd	0.003	D	40369	50	56355
rcv	0.003	A	56355	0	40219
snd	0.003	D	40419	50	56355
rcv	0.003	A	56355	0	40219
snd	0.003	D	40469	50	56355
rcv	0.003	A	56355	0	40219
snd	0.003	D	40219	50	56355
rcv	0.003	A	56355	0	40219
snd	0.003	D	40519	50	56355
rcv	0.003	A	56355	0	40219
drop	0.004	D	40569	50	56355
rcv	0.004	A	56355	0	40519
snd	0.004	D	40619	50	56355
rcv	0.004	A	56355	0	40569
snd	0.004	D	40669	50	56355
rcv	0.004	A	56355	0	40569
snd	0.004	D	40719	50	56355
snd	0.004	D	40769	50	56355
rcv	0.004	A	56355	0	40569
snd	0.004	D	40819	50	56355
rcv	0.004	A	56355	0	40569
snd	0.004	D	40569	50	56355
rcv	0.004	A	56355	0	40569
snd	0.004	D	40869	50	56355
rcv	0.004	A	56355	0	40569
snd	0.004	D	40919	50	56355
rcv	0.004	A	56355	0	40869
snd	0.004	D	40969	50	56355
rcv	0.004	A	56355	0	40919
snd	0.004	D	41019	50	56355
rcv	0.004	A	56355	0	40969
snd	0.004	D	41069	50	56355
rcv	0.004	A	56355	0	41019
snd	0.004	D	41119	4	56355
rcv	0.004	A	56355	0	41069
rcv	0.004	A	56355	0	41119
rcv	0.004	A	56355	0	41123
snd	0.004	F	41123	0	56355
rcv	0.007	A	56355	0	41123
rcv	0.007	FA	56355	0	41123

snd 0.01 A 41124 0 56355

Amount of (original) Data Transferred (in bytes): 1954

Number of Data Segments Sent (excluding retransmissions): 40

Number of (all) Packets Dropped (by the PLD module): 4

Number of Retransmitted Segments: 4

Number of Duplicate Acknowledgements received: 22

Receiver_log

Action	time	type	seq	size	ack
rcv	0.0	S	39168	0	0
snd	0.0	SA	56354	0	39168
rcv	0.0	A	39169	0	56354
snd	0.001	A	56355	0	39169
rcv	0.002	D	39169	50	56355
snd	0.002	A	56355	0	39219
rcv	0.002	D	39269	50	56355
snd	0.002	A	56355	0	39219
rcv	0.002	D	39319	50	56355
snd	0.002	A	56355	0	39219
rcv	0.002	D	39369	50	56355
snd	0.002	A	56355	0	39219
rcv	0.002	D	39419	50	56355
snd	0.002	A	56355	0	39219
rcv	0.002	D	39469	50	56355
snd	0.002	A	56355	0	39219
rcv	0.002	D	39519	50	56355
snd	0.002	A	56355	0	39219
rcv	0.002	D	39219	50	56355
snd	0.002	A	56355	0	39569
rcv	0.002	D	39569	50	56355
snd	0.002	A	56355	0	39619
rcv	0.002	D	39619	50	56355
snd	0.002	A	56355	0	39669
rcv	0.002	D	39719	50	56355
snd	0.002	A	56355	0	39669
rcv	0.003	D	39769	50	56355
snd	0.003	A	56355	0	39669
rcv	0.003	D	39819	50	56355
snd	0.003	A	56355	0	39669
rcv	0.003	D	39869	50	56355
snd	0.003	A	56355	0	39669
rcv	0.003	D	39919	50	56355
snd	0.003	A	56355	0	39669
rcv	0.003	D	39669	50	56355
snd	0.003	A	56355	0	39969
rcv	0.003	D	39969	50	56355
snd	0.003	A	56355	0	40019
rcv	0.003	D	40019	50	56355
snd	0.003	A	56355	0	40069
rcv	0.003	D	40069	50	56355
snd	0.003	A	56355	0	40119

rcv	0.003	D	40119	50	56355
snd	0.003	A	56355	0	40169
rcv	0.003	D	40169	50	56355
snd	0.003	A	56355	0	40219
rcv	0.003	D	40269	50	56355
snd	0.003	A	56355	0	40219
rcv	0.003	D	40319	50	56355
snd	0.003	A	56355	0	40219
rcv	0.003	D	40369	50	56355
snd	0.003	A	56355	0	40219
rcv	0.003	D	40419	50	56355
snd	0.003	A	56355	0	40219
rcv	0.003	D	40469	50	56355
snd	0.003	A	56355	0	40219
rcv	0.003	D	40219	50	56355
snd	0.003	A	56355	0	40519
rcv	0.003	D	40519	50	56355
snd	0.003	A	56355	0	40569
rcv	0.004	D	40619	50	56355
snd	0.004	A	56355	0	40569
rcv	0.004	D	40669	50	56355
snd	0.004	A	56355	0	40569
rcv	0.004	D	40719	50	56355
snd	0.004	A	56355	0	40569
rcv	0.004	D	40769	50	56355
snd	0.004	A	56355	0	40569
rcv	0.004	D	40819	50	56355
snd	0.004	A	56355	0	40569
rcv	0.004	D	40569	50	56355
snd	0.004	A	56355	0	40869
rcv	0.004	D	40869	50	56355
snd	0.004	A	56355	0	40919
rcv	0.004	D	40919	50	56355
snd	0.004	A	56355	0	40969
rcv	0.004	D	40969	50	56355
snd	0.004	A	56355	0	41019
rcv	0.004	D	41019	50	56355
snd	0.004	A	56355	0	41069
rcv	0.004	D	41069	50	56355
snd	0.004	A	56355	0	41119
rcv	0.004	D	41119	4	56355
snd	0.004	A	56355	0	41123
rcv	0.005	F	41123	0	56355
snd	0.007	FA	56355	0	41123

Amount of (original) Data Received (in bytes): 1954

Number of (original) Data Segments Received: 40

Number of duplicate segments received (if any): 0

Sending test2.txt with mss = 50, mws = 500, timeout = 2.5ms, pdrop = .1, seed = 300

Sender_log

Action	time	type	seq	size	ack
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snd	0.0	S	39168	0	0
rcv	0.0	SA	55178	0	39168
snd	0.0	A	39169	0	55178
rcv	0.001	A	55179	0	39169
snd	0.002	D	39169	50	55179
drop	0.002	D	39219	50	55179
snd	0.002	D	39269	50	55179
snd	0.002	D	39319	50	55179
snd	0.002	D	39369	50	55179
rcv	0.002	A	55179	0	39219
snd	0.002	D	39419	50	55179
rcv	0.002	A	55179	0	39219
snd	0.002	D	39469	50	55179
rcv	0.002	A	55179	0	39219
snd	0.002	D	39519	50	55179
rcv	0.002	A	55179	0	39219
snd	0.002	D	39219	50	55179
rcv	0.002	A	55179	0	39219
snd	0.002	D	39569	50	55179
rcv	0.002	A	55179	0	39219
snd	0.002	D	39619	50	55179
rcv	0.002	A	55179	0	39219
drop	0.002	D	39669	50	55179
rcv	0.002	A	55179	0	39569
snd	0.003	D	39719	50	55179
rcv	0.003	A	55179	0	39619
snd	0.003	D	39769	50	55179
rcv	0.003	A	55179	0	39669
snd	0.003	D	39819	50	55179
rcv	0.003	A	55179	0	39669
snd	0.003	D	39869	50	55179
rcv	0.003	A	55179	0	39669
snd	0.003	D	39919	50	55179
rcv	0.003	A	55179	0	39669
snd	0.003	D	39669	50	55179
rcv	0.003	A	55179	0	39669
snd	0.003	D	39969	50	55179
rcv	0.003	A	55179	0	39669
snd	0.003	D	40019	50	55179
snd	0.003	D	40069	50	55179
rcv	0.003	A	55179	0	39969
snd	0.003	D	40119	50	55179
rcv	0.003	A	55179	0	40019
snd	0.003	D	40169	50	55179
rcv	0.003	A	55179	0	40069
drop	0.003	D	40219	50	55179
rcv	0.004	A	55179	0	40119
snd	0.004	D	40269	50	55179
rcv	0.004	A	55179	0	40169
snd	0.004	D	40319	50	55179
rcv	0.004	A	55179	0	40219

snd	0.004	D	40369	50	55179
rcv	0.004	A	55179	0	40219
snd	0.004	D	40419	50	55179
rcv	0.004	A	55179	0	40219
snd	0.004	D	40469	50	55179
rcv	0.004	A	55179	0	40219
snd	0.004	D	40219	50	55179
rcv	0.004	A	55179	0	40219
snd	0.004	D	40519	50	55179
rcv	0.004	A	55179	0	40219
drop	0.004	D	40569	50	55179
rcv	0.004	A	55179	0	40519
snd	0.004	D	40619	50	55179
rcv	0.004	A	55179	0	40569
snd	0.004	D	40669	50	55179
snd	0.004	D	40719	50	55179
rcv	0.004	A	55179	0	40569
snd	0.004	D	40769	50	55179
rcv	0.004	A	55179	0	40569
snd	0.004	D	40819	50	55179
rcv	0.004	A	55179	0	40569
snd	0.004	D	40569	50	55179
rcv	0.004	A	55179	0	40569
snd	0.004	D	40869	50	55179
rcv	0.004	A	55179	0	40569
snd	0.004	D	40919	50	55179
snd	0.004	D	40969	50	55179
rcv	0.004	A	55179	0	40869
snd	0.004	D	41019	50	55179
rcv	0.004	A	55179	0	40919
snd	0.004	D	41069	50	55179
rcv	0.004	A	55179	0	40969
snd	0.004	D	41119	4	55179
rcv	0.004	A	55179	0	41019
rcv	0.004	A	55179	0	41069
rcv	0.004	A	55179	0	41119
rcv	0.004	A	55179	0	41123
snd	0.005	F	41123	0	55179
rcv	0.011	A	55179	0	41123
rcv	0.011	FA	55179	0	41123
snd	0.013	A	41124	0	55179

Amount of (original) Data Transferred (in bytes): 1954

Number of Data Segments Sent (excluding retransmissions): 40

Number of (all) Packets Dropped (by the PLD module): 4

Number of Retransmitted Segments: 4

Number of Duplicate Acknowledgements received: 22

Receiver_log

Action	time	type	seq	size	ack
rcv	0.0	S	39168	0	0
snd	0.0	SA	55178	0	39168

rcv	0.0	A	39169	0	55178
snd	0.0	A	55179	0	39169
rcv	0.002	D	39169	50	55179
snd	0.002	A	55179	0	39219
rcv	0.002	D	39269	50	55179
snd	0.002	A	55179	0	39219
rcv	0.002	D	39319	50	55179
snd	0.002	A	55179	0	39219
rcv	0.002	D	39369	50	55179
snd	0.002	A	55179	0	39219
rcv	0.002	D	39419	50	55179
snd	0.002	A	55179	0	39219
rcv	0.002	D	39469	50	55179
snd	0.002	A	55179	0	39219
rcv	0.002	D	39519	50	55179
snd	0.002	A	55179	0	39219
rcv	0.002	D	39219	50	55179
snd	0.002	A	55179	0	39569
rcv	0.002	D	39569	50	55179
snd	0.002	A	55179	0	39619
rcv	0.002	D	39619	50	55179
snd	0.002	A	55179	0	39669
rcv	0.003	D	39719	50	55179
snd	0.003	A	55179	0	39669
rcv	0.003	D	39769	50	55179
snd	0.003	A	55179	0	39669
rcv	0.003	D	39819	50	55179
snd	0.003	A	55179	0	39669
rcv	0.003	D	39869	50	55179
snd	0.003	A	55179	0	39669
rcv	0.003	D	39919	50	55179
snd	0.003	A	55179	0	39669
rcv	0.003	D	39669	50	55179
snd	0.003	A	55179	0	39969
rcv	0.003	D	39969	50	55179
snd	0.003	A	55179	0	40019
rcv	0.003	D	40019	50	55179
snd	0.003	A	55179	0	40069
rcv	0.003	D	40069	50	55179
snd	0.003	A	55179	0	40119
rcv	0.003	D	40119	50	55179
snd	0.003	A	55179	0	40169
rcv	0.003	D	40169	50	55179
snd	0.003	A	55179	0	40219
rcv	0.004	D	40269	50	55179
snd	0.004	A	55179	0	40219
rcv	0.004	D	40319	50	55179
snd	0.004	A	55179	0	40219
rcv	0.004	D	40369	50	55179
snd	0.004	A	55179	0	40219
rcv	0.004	D	40419	50	55179

snd	0.004	A	55179	0	40219
rcv	0.004	D	40469	50	55179
snd	0.004	A	55179	0	40219
rcv	0.004	D	40219	50	55179
snd	0.004	A	55179	0	40519
rcv	0.004	D	40519	50	55179
snd	0.004	A	55179	0	40569
rcv	0.004	D	40619	50	55179
snd	0.004	A	55179	0	40569
rcv	0.004	D	40669	50	55179
snd	0.004	A	55179	0	40569
rcv	0.004	D	40719	50	55179
snd	0.004	A	55179	0	40569
rcv	0.004	D	40769	50	55179
snd	0.004	A	55179	0	40569
rcv	0.004	D	40819	50	55179
snd	0.004	A	55179	0	40569
rcv	0.004	D	40569	50	55179
snd	0.004	A	55179	0	40869
rcv	0.004	D	40869	50	55179
snd	0.004	A	55179	0	40919
rcv	0.004	D	40919	50	55179
snd	0.004	A	55179	0	40969
rcv	0.004	D	40969	50	55179
snd	0.004	A	55179	0	41019
rcv	0.004	D	41019	50	55179
snd	0.004	A	55179	0	41069
rcv	0.004	D	41069	50	55179
snd	0.004	A	55179	0	41119
rcv	0.004	D	41119	4	55179
snd	0.004	A	55179	0	41123
rcv	0.005	F	41123	0	55179
snd	0.011	FA	55179	0	41123

Amount of (original) Data Received (in bytes): 1954

Number of (original) Data Segments Received: 40

Number of duplicate segments received (if any): 0

Sending test2.txt with mss = 50, mws = 500, timeout = 1ms, pdrop = .1, seed = 300

Sender_log

Action	time	type	seq	size	ack
snd	0.0	S	39168	0	0
rcv	0.001	SA	11688	0	39168
snd	0.001	A	39169	0	11688
rcv	0.001	A	11689	0	39169
snd	0.003	D	39169	50	11689
drop	0.003	D	39219	50	11689
snd	0.003	D	39269	50	11689
snd	0.003	D	39319	50	11689
snd	0.003	D	39369	50	11689
snd	0.003	D	39419	50	11689

snd	0.003	D	39469	50	11689
rcv	0.003	A	11689	0	39219
snd	0.003	D	39519	50	11689
rcv	0.003	A	11689	0	39219
snd	0.003	D	39569	50	11689
rcv	0.003	A	11689	0	39219
snd	0.003	D	39619	50	11689
rcv	0.003	A	11689	0	39219
snd	0.003	D	39219	50	11689
rcv	0.003	A	11689	0	39219
drop	0.003	D	39669	50	11689
rcv	0.003	A	11689	0	39219
snd	0.003	D	39719	50	11689
snd	0.003	D	39769	50	11689
rcv	0.003	A	11689	0	39219
rcv	0.003	A	11689	0	39219
rcv	0.003	A	11689	0	39219
rcv	0.003	A	11689	0	39669
snd	0.003	D	39819	50	11689
rcv	0.003	A	11689	0	39669
snd	0.003	D	39869	50	11689
rcv	0.003	A	11689	0	39669
snd	0.003	D	39919	50	11689
rcv	0.003	A	11689	0	39669
snd	0.003	D	39669	50	11689
snd	0.004	D	39969	50	11689
rcv	0.004	A	11689	0	39669
snd	0.004	D	40019	50	11689
snd	0.004	D	40069	50	11689
rcv	0.004	A	11689	0	39669
snd	0.004	D	40119	50	11689
snd	0.004	D	40169	50	11689
rcv	0.004	A	11689	0	39969
drop	0.004	D	40219	50	11689
rcv	0.004	A	11689	0	40019
snd	0.004	D	40269	50	11689
snd	0.004	D	40319	50	11689
snd	0.004	D	40369	50	11689
rcv	0.004	A	11689	0	40069
snd	0.004	D	40419	50	11689
rcv	0.004	A	11689	0	40119
snd	0.004	D	40469	50	11689
snd	0.004	D	40519	50	11689
rcv	0.004	A	11689	0	40169
snd	0.004	D	40569	50	11689
rcv	0.004	A	11689	0	40219
drop	0.004	D	40619	50	11689
rcv	0.004	A	11689	0	40219
snd	0.004	D	40669	50	11689
snd	0.005	D	40719	50	11689
snd	0.005	D	40769	50	11689

rcv	0.005	A	11689	0	40219
rcv	0.005	A	11689	0	40219
snd	0.005	D	40219	50	11689
rcv	0.005	A	11689	0	40219
rcv	0.005	A	11689	0	40219
rcv	0.005	A	11689	0	40219
rcv	0.005	A	11689	0	40219
rcv	0.005	A	11689	0	40219
rcv	0.005	A	11689	0	40219
rcv	0.005	A	11689	0	40219
rcv	0.005	A	11689	0	40619
snd	0.005	D	40819	50	11689
snd	0.005	D	40869	50	11689
snd	0.005	D	40919	50	11689
snd	0.005	D	40969	50	11689
rcv	0.005	A	11689	0	40619
snd	0.005	D	41019	50	11689
snd	0.005	D	41069	50	11689
rcv	0.005	A	11689	0	40619
snd	0.005	D	41119	4	11689
rcv	0.006	A	11689	0	40619
snd	0.006	D	40619	50	11689
rcv	0.006	A	11689	0	40619
snd	0.006	D	40669	50	11689
snd	0.006	D	40619	50	11689
rcv	0.006	A	11689	0	40619
rcv	0.006	A	11689	0	40619
rcv	0.006	A	11689	0	40619
rcv	0.006	A	11689	0	41123
snd	0.006	F	41123	0	11689
rcv	0.009	A	11689	0	41123
rcv	0.009	A	11689	0	41123
rcv	0.009	A	11689	0	41123
rcv	0.009	FA	11689	0	41123
snd	0.012	A	41124	0	11689

Amount of (original) Data Transferred (in bytes): 1954

Number of Data Segments Sent (excluding retransmissions): 40

Number of (all) Packets Dropped (by the PLD module): 4

Number of Retransmitted Segments: 6

Number of Duplicate Acknowledgements received: 33

Receiver_log

Action	time	type	seq	size	ack
rcv	0.0	S	39168	0	0
snd	0.0	SA	11688	0	39168
rcv	0.0	A	39169	0	11688
snd	0.0	A	11689	0	39169
rcv	0.002	D	39169	50	11689
snd	0.002	A	11689	0	39219
rcv	0.002	D	39269	50	11689
snd	0.002	A	11689	0	39219

rcv	0.002	D	39319	50	11689
snd	0.002	A	11689	0	39219
rcv	0.002	D	39369	50	11689
snd	0.002	A	11689	0	39219
rcv	0.002	D	39419	50	11689
snd	0.002	A	11689	0	39219
rcv	0.002	D	39469	50	11689
snd	0.002	A	11689	0	39219
rcv	0.002	D	39519	50	11689
snd	0.002	A	11689	0	39219
rcv	0.002	D	39569	50	11689
snd	0.002	A	11689	0	39219
rcv	0.002	D	39619	50	11689
snd	0.002	A	11689	0	39219
rcv	0.002	D	39219	50	11689
snd	0.002	A	11689	0	39669
rcv	0.002	D	39719	50	11689
snd	0.002	A	11689	0	39669
rcv	0.002	D	39769	50	11689
snd	0.002	A	11689	0	39669
rcv	0.002	D	39819	50	11689
snd	0.002	A	11689	0	39669
rcv	0.002	D	39869	50	11689
snd	0.002	A	11689	0	39669
rcv	0.003	D	39919	50	11689
snd	0.003	A	11689	0	39669
rcv	0.003	D	39669	50	11689
snd	0.003	A	11689	0	39969
rcv	0.003	D	39969	50	11689
snd	0.003	A	11689	0	40019
rcv	0.003	D	40019	50	11689
snd	0.003	A	11689	0	40069
rcv	0.003	D	40069	50	11689
snd	0.003	A	11689	0	40119
rcv	0.003	D	40119	50	11689
snd	0.003	A	11689	0	40169
rcv	0.003	D	40169	50	11689
snd	0.003	A	11689	0	40219
rcv	0.003	D	40269	50	11689
snd	0.003	A	11689	0	40219
rcv	0.003	D	40319	50	11689
snd	0.003	A	11689	0	40219
rcv	0.003	D	40369	50	11689
snd	0.003	A	11689	0	40219
rcv	0.003	D	40419	50	11689
snd	0.004	A	11689	0	40219
rcv	0.004	D	40469	50	11689
snd	0.004	A	11689	0	40219
rcv	0.004	D	40519	50	11689
snd	0.004	A	11689	0	40219
rcv	0.004	D	40569	50	11689

snd	0.004	A	11689	0	40219
rcv	0.004	D	40669	50	11689
snd	0.004	A	11689	0	40219
rcv	0.004	D	40719	50	11689
snd	0.004	A	11689	0	40219
rcv	0.004	D	40769	50	11689
snd	0.004	A	11689	0	40219
rcv	0.004	D	40219	50	11689
snd	0.004	A	11689	0	40619
rcv	0.004	D	40819	50	11689
snd	0.004	A	11689	0	40619
rcv	0.004	D	40869	50	11689
snd	0.004	A	11689	0	40619
rcv	0.004	D	40919	50	11689
snd	0.004	A	11689	0	40619
rcv	0.005	D	40969	50	11689
snd	0.005	A	11689	0	40619
rcv	0.005	D	41019	50	11689
snd	0.005	A	11689	0	40619
rcv	0.005	D	41069	50	11689
snd	0.005	A	11689	0	40619
rcv	0.005	D	41119	4	11689
snd	0.005	A	11689	0	40619
rcv	0.005	D	40619	50	11689
snd	0.005	A	11689	0	41123
rcv	0.005	D	40669	50	11689
snd	0.005	A	11689	0	41123
rcv	0.005	D	40619	50	11689
snd	0.005	A	11689	0	41123
rcv	0.005	F	41123	0	11689
snd	0.008	FA	11689	0	41123

Amount of (original) Data Received (in bytes): 1954

Number of (original) Data Segments Received: 40

Number of duplicate segments received (if any): 2